



SCHOLAR COACH

Boutique Academic Coaching & Tutoring

AP PSYCHOLOGY · COURSE REVIEW AND PRACTICE

AP Psychology Mastery.

Every unit on the exam: clear explanations, worked research examples, practice questions with full explanations, free-response practice, and two full-length practice exams.

INSIDE

Scientific Foundations and Research Methods · Biological Bases of Behavior · Cognition · Development and Learning · Social Psychology and Personality · Mental and Physical Health · Two Practice Exams · Reference

Table of Contents.

Six chapters covering the whole AP Psychology course, an exam toolkit, two practice exams, and a reference section.

Contents

Each section has an explanation, worked examples, and practice problems. Answers and explanations close every chapter. Click any entry to jump to that page.

PART I: START HERE

Start Here: The Exam and Your Toolkit	6
0.1 The AP Psychology Exam: Format, Scoring, and Study Plan	6
0.2 Reading Research and Writing the Free-Response Questions	9
Key Answers and Explanations	12

PART II: THE UNITS

Chapter 1: Scientific Foundations and Research Methods	15
1.1 History and Approaches to Psychology	15
1.2 Research Methods: Description and Correlation	17
1.3 Experiments	20
1.4 Sampling, Bias, Validity, and Reliability	22
1.5 Ethics in Psychological Research	25
1.6 Descriptive Statistics	27
1.7 Inferential Statistics and Interpreting Results	29
1.8 Multiple-Choice Practice: Scientific Foundations and Research Methods	32
1.9 Free-Response Practice: Scientific Foundations and Research Methods	34
Key Answers and Explanations	35
Chapter 2: Biological Bases of Behavior	41
2.1 Heredity, Environment, and Evolution	41
2.2 Neurons and Neural Communication	43
2.3 Neurotransmitters, Hormones, and Drugs	46
2.4 The Nervous System and Brain Structures	48
2.5 Brain Research, Lateralization, and Plasticity	51
2.6 Sleep, Dreams, and Consciousness	54
2.7 Psychoactive Drugs	56
2.8 Sensation: Vision and Hearing	58
2.9 Chemical, Body, and Other Senses	61
2.10 Multiple-Choice Practice: Biological Bases of Behavior	63
2.11 Free-Response Practice: Biological Bases of Behavior	65
Key Answers and Explanations	66

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BOOK NOW →

Chapter 3: Cognition	73
3.1 Perception: Organizing the World	73
3.2 Thinking, Problem Solving, and Creativity	75
3.3 Language	78
3.4 Memory: Encoding and Storage	80
3.5 Memory: Retrieval, Forgetting, and Reconstruction	83
3.6 Biology of Memory and Improving Memory	86
3.7 Intelligence	89
3.8 Testing and Psychometrics	92
3.9 Multiple-Choice Practice: Cognition	95
3.10 Free-Response Practice: Cognition	97
Key Answers and Explanations	98
Chapter 4: Development and Learning	105
4.1 Developmental Psychology: Research and Prenatal Development	105
4.2 Attachment and Social Development in Childhood	107
4.3 Cognitive Development: Piaget and Vygotsky	110
4.4 Moral Development, Adolescence, and Adulthood	113
4.5 Classical Conditioning	115
4.6 Operant Conditioning	118
4.7 Observational and Cognitive Learning	120
4.8 Applying Learning Principles	123
4.9 Multiple-Choice Practice: Development and Learning	125
4.10 Free-Response Practice: Development and Learning	128
Key Answers and Explanations	129
Chapter 5: Social Psychology and Personality	135
5.1 Attribution and Social Cognition	135
5.2 Conformity, Obedience, and Group Behavior	137
5.3 Prejudice, Aggression, and Prosocial Behavior	139
5.4 Personality Theories I: Psychodynamic and Humanistic	142
5.5 Personality Theories II: Trait and Social-Cognitive	144
5.6 Personality Assessment	147
5.7 Motivation	150
5.8 Emotion	152
5.9 Multiple-Choice Practice: Social Psychology and Personality	154
5.10 Free-Response Practice: Social Psychology and Personality	157
Key Answers and Explanations	158
Chapter 6: Mental and Physical Health	165
6.1 Defining and Classifying Psychological Disorders	165
6.2 Anxiety, OCD, and Trauma-Related Disorders	167
6.3 Mood Disorders and Suicide	170
6.4 Schizophrenia, Personality, and Other Disorders	173
6.5 Biomedical Treatments	175
6.6 Psychotherapies	178
6.7 Stress and Coping	181
6.8 Health Psychology and Well-Being	183
6.9 Multiple-Choice Practice: Mental and Physical Health	186
6.10 Free-Response Practice: Mental and Physical Health	188
Key Answers and Explanations	189

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BOOK NOW →

Chapter 7: Deep Dives and Mixed Review	196
7.1 Classic Studies in Brain, Memory, and Language Thought	196
7.2 Gender, Sexuality, and Lifespan Extremes	198
7.3 Culture, Work Motivation, and Expectations	201
7.4 Somatic, Dissociative, and Personality Disorders in Depth	204
7.5 Therapy Delivery, Stress Biology, and Health	207
7.6 Mixed Review Multiple Choice	209
7.7 Mixed Free-Response Clinic	212
Key Answers and Explanations	213
PART III: PRACTICE AND REFERENCE	
Practice Exams	218
E1 Practice Exam 1	218
Key Practice Exam 1: Answers and Explanations	226
E2 Practice Exam 2	228
Key Practice Exam 2: Answers and Explanations	237
Reference	240
R.1 Who's Who, Studies, and Stats Formulas	240
R.2 Glossary and Skills Checklist	245

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Welcome to AP Psychology.

The content, the research skills, the writing methods, and the practice you need for the exam.

Welcome

How to Use This Book

A complete AP Psychology course: clear explanations, worked examples, practice problems with full explanations, and practice exams.

What is inside

The whole AP Psychology course organized around the five units of the current exam (Biological Bases, Cognition, Development and Learning, Social Psychology and Personality, Mental and Physical Health), with a Chapter 1 on scientific foundations and research methods that every other unit relies on. Every topic from the older nine-unit outline is covered. Each chapter has explanations, worked examples, three practice sets per section, a multiple-choice set and free-response practice. Two practice exams and a reference section close the book.

Your situation	Study plan
Taking the course now	Work one chapter at a time as your class does, then do that chapter's multiple-choice and free-response sets.
Starting 6 weeks before the exam	Read Start Here and Chapter 1, do two sections a day, make a who's-who card for each chapter, and take Practice Exam 1 at the end of week 4.
Final week	Redo missed problems, drill the reference tables, and take Practice Exam 2 under timed conditions.

A routine that works

- 1. Read.** Study the key boxes, then work each example yourself before reading its solution.
- 2. Practice.** Do every Set A problem, then Sets B and C. Write your answers before you look.
- 3. Check.** Compare with the answers and explanations at the end of the chapter. Mark mistakes and note the reason, not just the right answer.
- 4. Review.** Return to missed problems the next day, then do the multiple-choice and free-response sections and the practice exams.

Research skills are everywhere

Expect a research scenario in almost any question. Identify the variables, the design, and the conclusion the evidence supports before you read the answer choices.

Free-response habits

Use the vocabulary precisely and tie every claim to the evidence in the prompt. Define a term only when the question asks you to.

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Start Here: The Exam and Your Toolkit.

2 sections with explanations and worked examples, then 26 practice problems. Answers and full explanations are at the end of the chapter.

0.1 The AP Psychology Exam: Format, Scoring, and Study Plan

Learn exactly how the AP Psychology exam is built and scored, how the five units are weighted, how research methods hide inside every unit, and how to turn that into a study plan.

The AP Psychology exam rewards two things: knowing the content of the course and thinking like a researcher. Before you study a single unit, you should know what the test looks like, because that tells you how to practice.

Exam structure. The exam has two sections. **Section I** is 100 multiple-choice questions in 70 minutes and counts for two-thirds of your exam score. **Section II** is two free-response questions in 50 minutes and counts for one-third. Each multiple-choice question has five choices, and there is no penalty for a wrong answer, so you should never leave one blank.

Part	Questions	Time	Share of score
Section I: Multiple choice	100 questions, 5 choices each	70 minutes	About 66.7%
Section II: Article Analysis Question (AAQ)	1 question about a short research summary	About 25 minutes	About 16.7%
Section II: Evidence-Based Question (EBQ)	1 question built on several short sources	About 25 minutes	About 16.7%

Exam facts to memorize

Section I: 100 multiple-choice questions, 70 minutes, no guessing penalty.

Section II: Article Analysis Question plus Evidence-Based Question, 50 minutes total, each worth 7 points.

Your raw composite is converted to a score of 1 to 5; a 3 is considered qualified, 4 is well qualified, 5 is extremely well qualified.

Always confirm current details in the official course and exam description, because timing and rubric wording can be updated.

The five units. The course is divided into five units, and each one makes up roughly 15 to 25 percent of the multiple-choice questions. No unit can be ignored, and none is a free pass.

Exam unit	Share of MC	Where it lives in this book	Older nine-unit label
Biological Bases of Behavior	15-25%	Chapter 2	Biological Bases; Sensation (the sensory part); States of Consciousness
Cognition	15-25%	Chapter 3	Sensation and Perception (perception); Cognitive Psychology; Intelligence and testing
Development and Learning	15-25%	Chapter 4	Developmental Psychology; Learning
Social Psychology and Personality	15-25%	Chapter 5	Motivation, Emotion, Personality; Social Psychology
Mental and Physical Health	15-25%	Chapter 6	Clinical Psychology; stress and health

Older review materials use nine units, with Scientific Foundations as its own unit. Today that material is not a separate unit. Instead, it is woven through all five. Chapter 1 of this book teaches the foundations (history, perspectives, research methods, statistics, ethics) as the toolkit you will use everywhere else.

Research methods are tested everywhere. A question about neurons, memory, conformity, or depression will often describe a study. You may be asked to name the independent variable, spot a confounding variable, say whether a conclusion about cause is justified, or identify an ethical problem. That is why this book teaches research reading first.

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EXAMPLE 1: FINDING THE RESEARCH SKILL INSIDE A CONTENT QUESTION

Researchers recruit 60 adults and randomly assign half to sleep 5 hours and half to sleep 8 hours. The next day, all participants take the same memory test. The 5-hour group recalls fewer words. (a) Which exam unit does this belong to? (b) Name the independent and dependent variables. (c) Can the researchers conclude that less sleep caused worse recall? Explain.

SOLUTION

(a) Sleep is a topic in Biological Bases of Behavior, while memory belongs to Cognition. The question tests both content and method, which is typical.

(b) The independent variable is the amount of sleep (5 versus 8 hours), because the researchers manipulate it. The dependent variable is the number of words recalled, because it is measured as the outcome.

(c) Yes, with reasonable confidence. Random assignment spreads other differences (such as age or natural memory ability) evenly across groups, and the researchers manipulated sleep. This is an experiment, so a cause-and-effect conclusion is justified, as long as the memory test and conditions were the same for everyone.

Time management on Section I. One hundred questions in 70 minutes is 4,200 seconds, or about 42 seconds per question. Many items are quick recall, which buys time for the stimulus-based questions that require reading a graph or a research description.

EXAMPLE 2: BUILDING A PACING PLAN

You reach question 50 with 40 minutes left. Are you on pace? What should you do with a question that stalls you?

SOLUTION

Half the questions equal 50, and half the time equals 35 minutes. You have used 30 minutes, so you are 5 minutes ahead of schedule (30 minutes for 50 questions is 36 seconds each).

Because you are ahead, you can afford to read stimulus questions slowly. But do not spend more than about a minute on any one item.

For a stalled question, eliminate the choices you know are wrong, pick the best remaining guess, mark it, and move on. Since there is no penalty, an unanswered question can only cost you.

Building a study plan. Use this routine over the weeks before the exam:

- 1 Diagnose** Take a short practice set for each unit and record your score. Your lowest unit gets the most time, but every unit gets some.
- 2 Learn actively** After each lesson, close the book and write the key terms and one example from memory. Self-testing beats rereading.
- 3 Space it out** Revisit each unit at increasing intervals: a day later, a week later, a month later. Mix older units into every session.
- 4 Practice both formats** Do timed multiple-choice sets weekly, and write a full free-response answer at least every other week.
- 5 Keep an error log** For every missed question, write why you missed it (did not know the term, misread the stimulus, fell for a distractor). Patterns tell you what to fix.
- 6 Final two weeks** Take full-length practice exams under real timing, then review only your weakest topics and the reference tables at the back of this book.

Common point loss	Why it happens	Fix
Mixing up similar terms	Terms like negative reinforcement and punishment, or sensation and perception, feel alike	Make comparison tables and test yourself on the difference
Defining but not applying	FRQ points require tying a concept to the scenario	Always quote or paraphrase the scenario in your answer
Claiming causation from a correlation	Correlational headlines are tempting	Ask: was the cause manipulated and were people randomly assigned?
Misreading the stimulus	Rushing past labels, units, or group names	Underline the variables and groups before looking at the choices
Skipping questions	No penalty exists, yet students leave blanks	Guess on every item

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How this book is organized

Chapter 1 is the foundation: history, perspectives, research methods, statistics, ethics.

Chapters 2 to 6 match the five exam units; each has lessons, a multiple-choice set, and free-response practice.

The back of the book holds a who's-who and statistics reference plus a glossary and skills checklist.

Use the checklist after each chapter to mark which skills you can do without notes.

Exam tip

Treat every unit as a research-methods unit. When a question describes a study, first identify the method, the variables, the groups, and the claim being made. Doing so takes about ten seconds and prevents most careless errors.

Practice

SET A Check Your Understanding

Answer each question in one to three sentences.

1. State the number of multiple-choice questions, the time allowed, and the share of the exam score for Section I.
2. Name the two free-response questions in Section II and describe what each one asks students to work with.
3. Why should a student answer every multiple-choice question, even when unsure?
4. Which exam unit would a question on the hippocampus and memory consolidation most directly belong to, and why might it also test research skills?
5. Explain what happened to Scientific Foundations as a stand-alone unit and how this book handles that content.
6. Calculate the average seconds available per multiple-choice question and explain how to use that figure.

SET B Exam-Style Multiple Choice

Choose the best answer.

7. A student is unsure of the answer to a multiple-choice question and has eliminated two choices. What should the student do?
(A) Leave it blank to avoid losing points
(B) Leave it blank and return only if time remains, because wrong answers are penalized
(C) Guess among the remaining choices, because there is no penalty for wrong answers
(D) Choose the longest remaining answer
(E) Spend five minutes working on it before moving on
8. Which of the following is NOT one of the five units of the current AP Psychology course?
(A) Scientific Foundations and Research Methods as a separate stand-alone unit
(B) Cognition
(C) Mental and Physical Health
(D) Development and Learning
(E) Social Psychology and Personality
9. Section II of the AP Psychology exam is worth what fraction of the exam score?
(A) One-fifth
(B) One-quarter
(C) One-half
(D) Three-quarters
(E) One-third
10. Which description best fits the Evidence-Based Question?
(A) A multiple-choice set about one graph
(B) An argument-based response that uses provided sources as evidence for a claim
(C) A definition list of ten vocabulary terms
(D) A request to design a new study from scratch with no stimulus
(E) A short answer on the history of psychology

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11. A student scores lowest on the Cognition practice set but highest on Biological Bases. Which plan is the most effective?
- (A) Study only Cognition until the exam
 - (B) Reread Biological Bases because it is easiest
 - (C) Skip Cognition because each unit is only worth 15 to 25 percent
 - (D) Give Cognition the most time, but keep reviewing all units with spaced self-testing and an error log
 - (E) Memorize the glossary in alphabetical order

SET C Apply and Extend

Write a complete response.

12. A student has eight weeks before the exam and says, "I will reread my notes for each unit once, then take one practice test the night before." Evaluate this plan and propose an improved eight-week plan with at least four specific components.
13. A study summary says: "Students who attended review sessions scored higher on the final exam, so review sessions cause higher scores." Explain what the student must ask before accepting this claim, and describe how the claim could be tested with an experiment.

0.2 Reading Research and Writing the Free-Response Questions

Learn a step-by-step method for dissecting any research summary and for writing high-scoring responses to the Article Analysis and Evidence-Based questions.

Every free-response question in AP Psychology starts with research you have never seen before. You cannot memorize it, so you need a method. Read the summary in layers: first what was studied, then how it was studied, then what was found, then what the finding can and cannot show.

Research vocabulary you must be able to apply

Hypothesis: a testable prediction about the relationship between variables.

Independent variable (IV): the factor the researcher manipulates; **dependent variable (DV):** the outcome that is measured.

Operational definition: a precise statement of how a variable is manipulated or measured (for example, "stress = score on a 20-item self-report scale").

Population is everyone of interest; **sample** is the subset studied; **random sampling** gives every member of the population an equal chance of selection, while **random assignment** places selected participants into groups by chance.

Confounding variable: an uncontrolled factor that varies along with the IV and could explain the results.

Step 1: Identify the design. The design determines which conclusions are allowed. Only an experiment, with a manipulated IV and random assignment, supports a cause-and-effect conclusion.

Design	What the researcher does	Strength	Limit
Experiment	Manipulates the IV, randomly assigns participants, measures the DV	Can support causation	May be artificial; ethics limit manipulations
Correlational study	Measures two variables and computes their relationship	Studies naturally occurring variables; allows prediction	Cannot show cause; third variables and direction problems
Quasi-experiment	Compares preexisting groups (such as gender or age) on a DV	Practical when assignment is impossible	Groups may differ in other ways
Survey	Asks many people questions	Large samples quickly	Self-report bias, wording effects
Case study	Examines one person or group in depth	Rich detail on rare cases	Hard to generalize
Naturalistic observation	Records behavior in the real setting without interference	High realism	No control; observer bias

Step 2: Check the sample and the groups. Ask who took part and how they were chosen. A sample that does not resemble the population limits **generalizability** (external validity). Then ask how groups were formed: random assignment means the groups were equivalent at the start, while self-selection does not. A control group receives no treatment or a placebo, and a **double-blind procedure** keeps both participants and experimenters unaware of group membership to limit placebo effects, demand characteristics, and experimenter bias.

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Step 3: Evaluate the measures. **Reliability** means consistency (the same result on repeated measurement or across raters). **Validity** means measuring what you claim to measure. A bathroom scale that is always five pounds off is reliable but not valid. **Internal validity** asks whether the IV really caused the DV; **external validity** asks whether results apply beyond this study; **construct validity** asks whether the operational definitions capture the concept.

Step 4: Interpret the statistics. A **correlation coefficient** runs from -1.00 to +1.00; the sign gives direction and the distance from zero gives strength. A result is **statistically significant** when the p value is below the chosen cutoff, usually $p < .05$, meaning the result would be unlikely to occur by chance alone if no real effect existed. Significance is not the same as importance: a tiny effect can be significant with a huge sample, so also look at effect size. Measures of spread, such as the standard deviation, show how much scores vary around the mean.

Causation checklist

A cause-and-effect conclusion needs: a manipulated IV, random assignment, a comparison or control group, and controlled confounds.

Correlation shows only that variables are related; it never alone shows which causes which, or whether a third variable is responsible.

Step 5: Check ethics. Standard protections include informed consent, protection from harm and discomfort, confidentiality, the right to withdraw, debriefing (especially after any deception), and approval by an Institutional Review Board (IRB). Deception is allowed only when it is justified by the study's value and no harmless alternative exists.

EXAMPLE 1: ARTICLE ANALYSIS WALK-THROUGH

Summary: A researcher wants to know whether silence aids study. She recruits 80 volunteer students from one college. By coin flip, 40 study a passage in a silent room and 40 study it while a recording of a busy cafe plays. Both groups study for 15 minutes. The next day each student takes the same 25-question quiz. The mean score is 18.4 for the silence group and 15.1 for the cafe group ($p = .01$). (a) Identify the research method. (b) Identify the IV and the DV with an operational definition of the DV. (c) State the conclusion supported. (d) Describe one limitation.

SOLUTION

(a) Experiment, because the researcher manipulated the study environment and used random assignment (the coin flip).

(b) IV: study environment (silence versus recorded cafe noise). DV: memory for the passage, operationally defined as the number of correct answers out of 25 on the next-day quiz.

(c) Students who studied in silence scored significantly higher (18.4 versus 15.1, $p = .01$, below $.05$), so the noise very likely caused lower scores in this sample. Because of random assignment, a causal claim is justified.

(d) The sample was volunteers from one college, which limits generalizability to other ages or settings. A second acceptable limitation: a recording may not match real-world noise, which limits external validity.

Writing the Article Analysis Question. Answer the parts in order, label them (a), (b), (c), and write in complete sentences. Always use the language of the scenario: name the actual variables and groups rather than writing generic definitions. If a part asks you to "explain," include a because-statement. Points are earned part by part, so a weak part never needs to sink the rest.

Writing the Evidence-Based Question. You receive several short sources, usually text excerpts and data such as a graph or table, and must argue a claim about a psychological question. A strong response has this skeleton:

- 1 State a defensible thesis** Answer the question directly in one sentence that takes a position, not a restatement of the prompt.
- 2 Use evidence from the sources** Cite specific details or numbers from each source and say which source supports which part of your claim.
- 3 Add psychological reasoning** Connect the evidence to a named concept or principle from the course, and explain the link (the because-statement).
- 4 Address a limit or counterpoint** Note what the data cannot prove, such as a correlation not showing cause, or a source that complicates your claim, and respond to it.

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EXAMPLE 2: EVIDENCE-BASED RESPONSE MODEL

Prompt: Does social media use lower adolescents' well-being? Source A (survey of 2,000 teens): hours of daily use correlates with a well-being score at $r = -.12$. Source B (experiment, 150 teens): reducing use to 30 minutes per day for three weeks increased well-being from a mean of 52 to 58 in the reduction group; the control group changed from 53 to 54. Source C (interview excerpt): "When I scroll at night, I compare myself to others and feel worse." Write a response that argues a claim.

SOLUTION

Thesis: Evidence suggests that heavy social media use modestly lowers adolescent well-being, mainly through social comparison, although the effect is small.

Evidence: Source A shows a weak negative correlation ($r = -.12$), so more use goes with slightly lower well-being. Source B strengthens the claim because the reduction group improved by 6 points (52 to 58) while the control group improved by only 1 (53 to 54).

Reasoning: Source C illustrates a mechanism, social comparison, which links the correlation to a psychological process. Because Source B manipulated usage and included a control group, it supports a causal conclusion that Source A alone cannot.

Limitation: The correlation in Source A is weak, so use explains little of the variation in well-being, and a three-week experiment says little about long-term effects. These limits justify the word 'modestly' in the thesis.

Statistic or result	What it tells you	Common misreading
$r = +.80$	Strong positive relationship	That one variable causes the other
$r = -.15$	Weak negative relationship	Treating a negative sign as 'bad' or as weak
$p = .03$	Significant at the .05 level	Saying it proves the hypothesis or that the effect is large
$p = .20$	Not significant at .05	Saying it proves there is no effect

Common mistakes

Do not restate the question as your answer, give a textbook definition without applying it, or write 'it is a correlation so there is no relationship.' Also avoid the phrase 'proves': data support or fail to support a hypothesis. Finally, do not confuse random sampling (how people are chosen, which affects generalizability) with random assignment (how they are placed in groups, which affects causal conclusions).

Practice**SET A Check Your Understanding**

Answer each question in one to three sentences.

1. Distinguish between random sampling and random assignment, and state what each one protects.
2. A study defines "anxiety" as the number of items endorsed on a 30-item checklist. What is this called, and why is it necessary?
3. A scale gives a reading of 140 pounds every time a 150-pound person steps on it. Is it reliable, valid, both, or neither? Explain.
4. Explain why a correlation of $r = -.70$ is stronger than $r = +.40$.
5. What does $p < .05$ mean, and what does it not mean?
6. List three ethical protections researchers must provide to participants.

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SET B Exam-Style Multiple Choice

Choose the best answer.

7. A researcher finds that cities with more ice cream sales have more drownings. Which explanation best reflects sound research reasoning?
 - (A) Ice cream causes drowning
 - (B) Drowning causes people to buy ice cream
 - (C) A third variable, such as hot weather, may increase both
 - (D) The correlation must be coincidence
 - (E) Ice cream sales are the dependent variable
8. In a study of a new tutoring program, volunteers chosen by the researcher are placed in the tutoring group, and unmotivated students end up in the control group. The main threat to internal validity is
 - (A) Failure of random assignment, so group differences may confound results
 - (B) Low reliability of the final exam
 - (C) Use of a double-blind procedure
 - (D) A lack of operational definitions
 - (E) An excessively large sample
9. A study reports a statistically significant result with $p = .04$. Which is the most appropriate conclusion?
 - (A) The hypothesis has been proven true
 - (B) The result would be unlikely if no real effect existed
 - (C) The effect must be large and important
 - (D) The study has high external validity
 - (E) The null hypothesis has a 4 percent chance of being true in every case
10. In a double-blind study of a new medication, who does NOT know which participants receive the drug?
 - (A) Only the participants
 - (B) Only the researchers
 - (C) Only the IRB
 - (D) Neither the participants nor the researchers collecting data
 - (E) Only the control group
11. A psychologist surveys 300 randomly selected adults from one town and reports $r = +.55$ between exercise hours and mood. Which statement is justified?
 - (A) Exercise improves mood
 - (B) Mood improvement causes exercise
 - (C) There is no relationship between the variables
 - (D) The result applies to all humans
 - (E) Exercise and mood are moderately to strongly positively related in this sample

SET C Apply and Extend

Write a complete response.

12. A psychologist recruits 120 volunteers with insomnia. Using random assignment, 60 receive cognitive-behavioral therapy for insomnia and 60 receive a placebo pill. Neither the participants nor the evaluators measuring sleep quality know the group assignments. After six weeks, the therapy group reports falling asleep an average of 22 minutes faster, and the placebo group 5 minutes faster ($p = .002$). (a) Identify the IV and DV. (b) Explain the role of the placebo group and blinding. (c) State a justified conclusion and one limitation.
13. Source A: A survey of 500 adults finds that people who report more friends also report higher life satisfaction ($r = +.30$). Source B: A 10-year follow-up of 200 adults shows that those who joined a community group showed larger gains in life satisfaction than those who did not (but participants chose whether to join). Write an Evidence-Based-style argument for the claim that social connection promotes well-being, using both sources and addressing a limitation.

Answers Start Here: Answers and Explanations

Answers for every practice problem, numbered to match. Read the explanation even when your answer is correct.

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0.1 The AP Psychology Exam: Format, Scoring, and Study Plan

SET A · CHECK YOUR UNDERSTANDING

1. Section I has 100 multiple-choice questions, lasts 70 minutes, and makes up about two-thirds (66.7%) of the exam score. Remember that each question has five choices.
2. The Article Analysis Question gives a short summary of a research study and asks students to analyze its method, variables, results, and limits. The Evidence-Based Question gives several short sources (data and text) and asks for an argument that uses them as evidence. Each is worth 7 points.
3. There is no penalty for wrong answers, so a blank earns zero while a guess has a chance of earning a point. Eliminating even one or two choices improves the odds further.
4. The hippocampus is a brain structure, so the question belongs in Biological Bases of Behavior (and memory content also overlaps with Cognition). It may also describe a study of patients or animals, requiring you to identify variables, the method, or what conclusions the evidence supports.
5. Scientific Foundations used to be its own unit in older nine-unit outlines. Now research methods, statistics, and ethics are tested inside all five units. This book therefore places them in Chapter 1 as a toolkit and keeps applying them in every later chapter.
6. 70 minutes is 4,200 seconds, divided by 100 questions gives 42 seconds per question. Use it as a benchmark: answer quick recall items faster and bank the time for stimulus questions, but never let one item exceed about a minute.

SET B · EXAM-STYLE MULTIPLE CHOICE

7. C. With no penalty for wrong answers, guessing can only help, especially after eliminating choices. A and B are tempting because many tests do penalize guessing, but this one does not. E wastes time that other questions need.
8. A. Scientific Foundations existed as a unit in older outlines, but today research methods are woven through all five units. The other four choices are real units. Students pick B to E rarely; the trap here is believing the old nine-unit outline still applies.
9. E. Section II counts for about 33.3 percent, which is one-third. Students confuse it with one-half because there are only two questions, but Section I's 100 questions carry two-thirds of the weight.
10. B. The Evidence-Based Question supplies several sources and requires a claim supported by that evidence and psychological reasoning. A describes multiple choice, and D describes a study-design prompt that is not what this question does. C and E are not exam formats.
11. D. Weak areas deserve the most time, yet each unit is 15 to 25 percent of the multiple-choice section, so none can be dropped. Spacing, self-testing, and an error log are better supported by research on learning than rereading. A and C neglect other units.

SET C · APPLY AND EXTEND

12. Model response (score up to 4 points). Evaluation: rereading is passive and uses massed review, and a single practice test at the end gives no time to fix weaknesses (1 point). Improved plan: week 1 diagnostic practice set for every unit (1 point); weeks 2 to 6 learn one unit at a time with end-of-lesson self-testing and a weekly timed multiple-choice set mixing older units for spaced review (1 point); an error log recording why each question was missed, plus a written free-response every other week (1 point); weeks 7 to 8 full-length timed practice exams and targeted review of weak topics using the reference tables.
13. Model response (score up to 4 points). The claim comes from observed attendance, which is correlational (1 point). Students who choose to attend may already be more motivated or have stronger prior achievement, so a third variable could explain the result (1 point). To test cause, recruit a sample of students and randomly assign half to attend review sessions (independent variable) and half to a control group, then give both the same exam (dependent variable) (1 point). Because random assignment equalizes motivation and ability across groups, a significant difference could support a causal conclusion (1 point).

0.2 Reading Research and Writing the Free-Response Questions

SET A · CHECK YOUR UNDERSTANDING

1. Random sampling selects participants from the population so that each person has an equal chance, which supports generalizability. Random assignment places selected participants into groups by chance, which makes the groups equivalent at the start and protects the ability to draw causal conclusions.
2. It is an operational definition. It states exactly how the variable is measured, so the study can be replicated and other researchers know precisely what "anxiety" meant in this study.
3. The scale is reliable because it gives the same reading consistently, but it is not valid because the reading is 10 pounds from the true weight. Reliability does not guarantee validity.
4. Strength depends on the distance from zero, not the sign. The value .70 is farther from zero than .40, so the relationship is stronger; the negative sign only means the variables move in opposite directions.
5. It means that if there were no real effect, results this extreme would occur by chance less than 5 percent of the time, so the result is called statistically significant. It does not prove the hypothesis, show the effect is large or important, or guarantee replication.
6. Any three of: informed consent, protection from harm, confidentiality, the right to withdraw, debriefing, and IRB review. Debriefing is especially required when deception was used.

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SET B · EXAM-STYLE MULTIPLE CHOICE

7. C. A confounding third variable (heat) plausibly drives both, which is why correlation does not show cause. A and B assume a direction without evidence; D is unjustified because the pattern has a plausible explanation; E misuses the term because no manipulation took place.
8. A. When the researcher picks who gets treatment, motivation may differ between groups, so a difference in outcomes could be due to motivation rather than tutoring. B is a measurement issue, and C would actually reduce bias. A large sample does not repair non-random assignment.
9. B. Significance means the finding would be unlikely under no real effect. A is wrong because evidence never proves; C confuses significance with effect size; D mixes up significance and generalizability; E misstates what p measures.
10. D. Double-blind means neither participants nor the experimenters interacting with them know the condition, reducing placebo and experimenter-bias effects. A describes a single-blind design, and the other choices describe groups that are not relevant to blinding.
11. E. A positive r of .55 describes a moderate relationship in the data. A and B require an experiment to claim a direction of cause. D overreaches because the sample came from one town.

SET C · APPLY AND EXTEND

12. Model response (up to 5 points). (a) IV: type of treatment (therapy versus placebo pill); DV: time to fall asleep in minutes (1 point each). (b) The placebo group controls for expectations of improvement, so any extra gain in the therapy group is not just due to belief in treatment; blinding prevents participant expectations and evaluator bias from influencing the outcomes (1 point). (c) Therapy produced a significantly greater reduction in time to fall asleep (22 versus 5 minutes, $p = .002$), and because participants were randomly assigned, causation is justified (1 point). A limitation is the volunteer sample or the short six-week follow-up, which limits generalizability (1 point).
13. Model response (up to 5 points). Thesis: Social connection is positively associated with, and likely contributes to, higher well-being (1 point). Source A reports a moderate positive correlation ($r = +.30$) between friendship and life satisfaction (1 point). Source B adds that people who joined a group improved more over ten years, suggesting social involvement precedes gains, which helps with the time order problem (1 point). Reasoning links this to the human need for belonging or social support buffering stress (1 point). Limitation: both sources are non-experimental; in Source B participants chose to join, so more outgoing or motivated people may differ at the start, which means causation cannot be firmly established (1 point).

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Chapter 1: Scientific Foundations and Research Methods.

9 sections with explanations and worked examples, then 124 practice problems. Answers and full explanations are at the end of the chapter.

1.1 History and Approaches to Psychology

You will trace how psychology developed from philosophy into a science, compare its major schools, and apply the modern perspectives to behavior.

Psychology is the scientific study of behavior and mental processes. **Behavior** is anything an organism does that can be observed; **mental processes** are internal experiences such as thoughts, memories, and feelings. Modern psychology grew out of philosophy and physiology, and its history is a story of competing answers to one question: what should psychology study, and how?

Wilhelm Wundt opened the first psychology laboratory in Leipzig, Germany, in 1879, which is why he is called the founder of experimental psychology. His approach, later named **structuralism** (promoted by his student Edward Titchener), tried to break conscious experience into basic elements such as sensations and feelings, using **introspection**, the systematic reporting of one's own immediate experience. Introspection proved unreliable because observers could not verify each other's reports. **Functionalism**, associated with **William James** and influenced by Darwin, asked instead what mental processes are for: how consciousness helps an organism adapt. James wrote the influential textbook *Principles of Psychology* (1890). Early women pioneers include **Mary Whiton Calkins** (first woman president of the American Psychological Association) and **Margaret Floy Washburn** (first woman to earn a psychology PhD). **G. Stanley Hall** founded the APA and pioneered child and adolescent study.

Key schools of thought

Structuralism (Wundt, Titchener): analyze the structure of the mind into elements by introspection.

Functionalism (James): study the purpose of mind and behavior for adaptation.

Gestalt (Wertheimer): the whole of an experience is more than the sum of its parts.

Psychoanalysis (Freud): unconscious conflicts and early childhood shape behavior.

Behaviorism (Watson, Skinner): study only observable behavior and its environmental causes.

Sigmund Freud developed psychoanalysis, arguing that unconscious drives, conflicts, and childhood experiences shape personality and disorders. Freud's ideas are hard to test scientifically, but they shaped therapy and culture. **John B. Watson** launched **behaviorism** in 1913, insisting that psychology be an objective science of observable behavior; **B. F. Skinner** extended it with operant conditioning, arguing that consequences control behavior. Behaviorism dominated American psychology until the mid-1900s. Meanwhile **Gestalt psychology** (Max Wertheimer and colleagues) argued that perception organizes parts into meaningful wholes. **Humanistic psychology** (Carl Rogers and Abraham Maslow) arose as a reaction against both psychoanalysis and behaviorism, stressing free will, personal growth, and self-actualization. In the 1950s and 1960s the **cognitive revolution** returned mental processes to center stage, helped by computer analogies, studies of memory and language, and criticism of behaviorism's limits.

Today psychologists rarely commit to one school. They use **perspectives** (also called approaches) as lenses, and often combine them in the **biopsychosocial approach**, which explains behavior through biological, psychological, and social-cultural factors together.

Perspective	Focus	Example explanation of test anxiety
Biological	Brain, genes, hormones, neurotransmitters	Overactive stress response and heightened arousal in the nervous system
Evolutionary	Natural selection of adaptive traits	Anxiety once helped ancestors detect threats and avoid danger
Psychodynamic	Unconscious conflict, early experience	Fear of failure rooted in unresolved childhood pressure from parents
Behavioral	Learning from the environment	A past bad grade was paired with the testing room, so the room now triggers fear

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Perspective	Focus	Example explanation of test anxiety
Cognitive	Thinking, memory, interpretation	Catastrophic thoughts such as 'I will fail everything'
Humanistic	Growth, free will, self-concept	Conditions of worth block the student's sense of self-worth and potential
Sociocultural	Culture, family, peers, social context	High family or cultural pressure to achieve

Common mistakes

Do not confuse structuralism (what the mind is made of) with functionalism (what the mind does). Do not call Freud's theory 'behavioral'; psychodynamic explanations center on the unconscious. On the exam, match the perspective to the explanation's focus, not to a keyword: an answer about neurotransmitters is biological even if it mentions stress. Also remember that Gestalt psychology is about perceiving wholes, not about the whole person, which is a humanistic idea.

Subfields and careers. Basic research builds knowledge (biological, cognitive, developmental, social, personality psychologists), while applied work uses it. **Clinical psychologists** diagnose and treat disorders (and hold a doctoral degree), **counseling psychologists** help with everyday adjustment problems, **psychiatrists** are medical doctors who can prescribe medication, **school psychologists** assess and support students, **industrial-organizational (I/O) psychologists** study workplaces, and **forensic** psychologists work in legal settings. **Psychometric** psychologists design tests, and **educational** psychologists study learning and teaching.

Biopsychosocial approach

Behavior is best explained by the interaction of biological, psychological, and social-cultural influences, not by any single one. Exam use: when a question asks for the most complete explanation, the answer often combines all three levels.

EXAMPLE 1

A student reads that a teenager who joined a gang had a family history of aggression, believes people are treated unfairly, and has friends who reward risk-taking. Identify the perspective for each cause.

SOLUTION

Family history of aggression → biological (genetic influence) or evolutionary.

Belief that people are treated unfairly → cognitive, because it describes thought patterns.

Friends who reward risk-taking → sociocultural (peer influence), and also behavioral since rewards reinforce the behavior.

Combining all three levels is the biopsychosocial approach.

EXAMPLE 2

A researcher in 1890 tries to explain why humans developed the ability to feel fear. Which early school fits, and why?

SOLUTION

Asking why a mental ability exists, and how it helps survival, is the question of functionalism.

Structuralism would instead ask what elements make up the feeling of fear.

The link to Darwin's natural selection points to William James and functionalism.

Practice

SET A Check Your Understanding

Answer each question in a few sentences.

1. Who established the first psychology laboratory, in what year, and what method did he use?
2. Contrast structuralism and functionalism.
3. Explain why behaviorists rejected introspection.
4. What led to the cognitive revolution?
5. Which perspective would explain a phobia of dogs as the result of a frightening bite followed by avoiding dogs? Justify.
6. Distinguish a clinical psychologist from a psychiatrist.

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SET B Exam-Style Multiple Choice

Choose the best answer for each question.

7. A psychologist studies how people's attention helps them adapt to a changing work environment. Which early school most directly shaped this question?
 - (A) Structuralism
 - (B) Functionalism
 - (C) Gestalt psychology
 - (D) Psychoanalysis
 - (E) Humanistic psychology
8. Which statement best describes the biopsychosocial approach?
 - (A) Behavior is determined mainly by genes and brain chemistry.
 - (B) Behavior is caused by unconscious conflicts from childhood.
 - (C) Only observable behavior can be studied scientifically.
 - (D) Behavior is best explained by one dominant perspective chosen by the researcher.
 - (E) Behavior results from the interaction of biological, psychological, and social-cultural factors.
9. Carl Rogers and Abraham Maslow are most associated with which perspective?
 - (A) Humanistic
 - (B) Behavioral
 - (C) Psychodynamic
 - (D) Evolutionary
 - (E) Cognitive
10. A researcher claims that a child's aggression is explained entirely by rewards the child received for hitting in the past. This claim best reflects which perspective?
 - (A) Evolutionary
 - (B) Cognitive
 - (C) Sociocultural
 - (D) Behavioral
 - (E) Biological
11. Which pairing of psychologist and contribution is correct?
 - (A) Wilhelm Wundt: founded behaviorism
 - (B) John Watson: created the first psychology laboratory
 - (C) Margaret Floy Washburn: first woman to earn a psychology PhD
 - (D) William James: developed structuralism
 - (E) G. Stanley Hall: developed psychoanalysis

SET C Apply and Extend

Respond in complete sentences. Model responses list the scoring points.

12. A school district wants to know why students are absent. Describe how a biological, a cognitive, and a sociocultural psychologist would each explain chronic absenteeism.
13. Explain why the cognitive revolution was a reaction to behaviorism, and give one limitation of each approach.

1.2 Research Methods: Description and Correlation

You will learn how psychologists form testable hypotheses, use descriptive and correlational methods, and avoid the trap of assuming causation.

Psychology uses the **scientific method**: ask a question, form a testable hypothesis, collect data systematically, analyze it, and share results so others can check them. A **theory** is an organized set of principles that explains observations and generates predictions; a **hypothesis** is a specific, testable prediction derived from a theory. A good hypothesis is **falsifiable**, meaning evidence could show it to be wrong. Researchers write **operational definitions**, precise statements of how each variable will be measured or manipulated (for example, 'stress' defined as score on a 20-item stress questionnaire). Operational definitions make studies replicable.

Basic research seeks knowledge for its own sake; **applied research** tackles practical problems. Descriptive methods let researchers describe behavior, but they do not show cause and effect.

Method	What it is	Strength	Weakness
Naturalistic observation	Watching behavior in its natural setting without interfering	High realism, shows real behavior	No control; observer bias; people may change if they know they are watched
Case study	In-depth study of one person or small group	Rich detail; useful for rare conditions	Cannot generalize; may rely on memory
Survey	Questionnaires or interviews given to a sample	Many responses cheaply	Wording effects; social desirability bias; unrepresentative samples

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Method	What it is	Strength	Weakness
Archival research	Analysis of existing records	Large data, no new participants	Records may be incomplete or biased

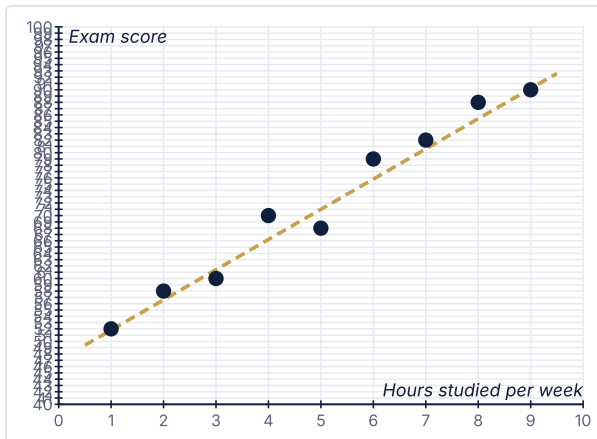
Correlational research measures two variables and asks whether they are related. The **correlation coefficient** (r) ranges from -1.00 to $+1.00$. The sign shows direction and the absolute value shows strength. A **positive correlation** means both variables rise together (hours studied and grades). A **negative correlation** means one rises as the other falls (absences and grades). An r near 0 means no linear relationship. A **scatterplot** displays each participant as a point; the tighter the points cluster around a line, the stronger the correlation.

Correlation coefficient

Range: -1.00 to $+1.00$. Direction = sign; strength = distance from 0.

$r = -.85$ is a stronger relationship than $r = +.40$.

Correlation does NOT prove causation.



A strong positive correlation: points rise from left to right and cluster near the line.

Descriptive versus correlational versus experimental

Descriptive methods: describe what happens (observation, case study, survey, archival).

Correlational: measure how two variables are related; no manipulation, no causal conclusion.

Experimental: manipulate one variable with random assignment; the only method that supports cause and effect.

Surveys deserve special care. Question wording can sway answers (people respond differently to 'estate tax' than to 'death tax'), and respondents often give **social desirability** answers that make them look good. A survey is only as informative as its sample: if the people who answer differ from the population, results are skewed. Naturalistic observers must also guard against **observer bias**, seeing what they expect to see, and often use several trained observers who record behavior with a checklist. Archival data are convenient, but the original record keepers may have collected them for another purpose, so important variables can be missing.

If two variables are correlated, there are three explanations beyond chance. A causes B, B causes A (the **directionality problem**), or a **third variable** (confounding variable) causes both. Ice cream sales and drowning deaths correlate because hot weather drives both. Only an experiment, with random assignment, can establish causation.

Researchers also choose how to follow people over time. A **longitudinal study** follows the same participants across years, which shows change within individuals but is slow, costly, and loses participants (attrition). A **cross-sectional study** compares people of different ages at one time, which is fast, but differences may reflect **cohort effects** (generation differences) rather than aging.

Common mistakes

Never say a correlation 'proves' or 'shows that A causes B'. Say 'is associated with'. Also, a negative correlation is not weak or bad: $r = -.90$ is stronger than $r = +.30$. Finally, a case study, survey, or observation describes behavior; none of them can establish causation, and none of them involves random assignment.

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EXAMPLE 1

A survey of 400 teens finds that hours of nightly social media use correlate with reported sadness, $r = +.45$. A journalist concludes that social media causes sadness. Evaluate.

SOLUTION

The correlation is moderate and positive, so higher use goes with greater sadness.

Directionality: sad teens may turn to social media for comfort.

Third variable: loneliness or family conflict could increase both.

Conclusion: the data show an association only; an experiment randomly assigning use levels would be needed to test causation.

EXAMPLE 2

Researchers want to know whether memory declines with age. One team tests 20-year-olds and 70-year-olds today; another tests the same 20-year-olds again at 70. Name each design and one weakness.

SOLUTION

Testing different ages at one time is cross-sectional; weakness: cohort effects, since the groups differ in education and generation.

Retesting the same people over 50 years is longitudinal; weakness: attrition, cost, and time.

Longitudinal better separates aging from cohort.

When naming a method on the exam, ask: did the researcher manipulate something and randomly assign people? If not, it is not an experiment. Is it studying one individual in depth (case study), watching behavior as it happens (naturalistic observation), asking people (survey), or reusing records (archival)?

Practice**SET A Check Your Understanding**

Answer each question in a few sentences.

1. State the difference between a theory and a hypothesis.
2. Why do researchers write operational definitions? Give one for aggression in children.
3. A researcher watches children in a playground for several weeks without interacting. Name the method and one weakness.
4. Why can a case study not be generalized to a population?
5. Describe the relationship shown by $r = -.72$ between hours of TV and test scores.
6. What is a third variable and why does it matter for interpreting correlations?

SET B Exam-Style Multiple Choice

Choose the best answer for each question.

7. A researcher finds $r = +.62$ between hours of exercise and positive mood. Which conclusion is best supported?
(A) Exercise causes positive mood.
(B) Positive mood causes people to exercise.
(C) Exercise and positive mood are moderately to strongly associated.
(D) Exercise and mood are unrelated.
(E) A third variable explains the entire relationship.
8. Which research method is most appropriate for studying a rare brain injury in one patient?
(A) Survey
(B) Naturalistic observation
(C) Archival research
(D) Cross-sectional study
(E) Case study
9. Which correlation coefficient indicates the strongest relationship?
(A) $-.91$
(B) $+.55$
(C) $+.88$
(D) $-.30$
(E) 0.00
10. A study comparing 10-year-olds, 30-year-olds, and 60-year-olds on reaction time at one point in time has the main weakness of:
(A) attrition
(B) the placebo effect
(C) demand characteristics
(D) cohort effects
(E) experimenter bias

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11. A psychologist reviews 15 years of hospital records to see whether admission rates for anxiety changed after a policy. She is using:
- (A) a survey (B) archival research
(C) a case study (D) a naturalistic observation
(E) an experiment

SET C Apply and Extend

Respond in complete sentences. Model responses list the scoring points.

12. A researcher reports that people who eat breakfast have higher GPAs ($r = +.35$). (a) Is this evidence that breakfast raises GPA? (b) Give two alternative explanations. (c) Describe how to test causation.
13. A team wants to learn whether people's attitudes toward recycling change from age 20 to age 60. Compare a longitudinal and a cross-sectional design for this question, and recommend one with a justification.

1.3 Experiments

You will learn what makes an experiment capable of showing cause and effect and how researchers control bias and confounds.

The **experiment** is the one research method that can show cause and effect. The researcher manipulates one factor, holds everything else constant, and measures the result. The **independent variable (IV)** is the factor the researcher manipulates; the **dependent variable (DV)** is the outcome measured. Memory aid: the DV *depends* on the IV. The IV has at least two **levels** or conditions. The **experimental group** receives the treatment; the **control group** does not, giving a baseline for comparison.

Two features make an experiment powerful. **Random assignment** means every participant has an equal chance of landing in any condition, which spreads pre-existing differences (age, motivation, intelligence) evenly across groups. Do not confuse it with random sampling, which is how participants are selected from a population. **Control** means holding other variables constant. A **confounding variable** is any factor other than the IV that varies systematically between groups and could explain the results, which destroys the ability to make causal claims.

Experiment checklist

Manipulated IV + measured DV + random assignment = experiment.

Random sampling helps generalize; random assignment helps establish causation.

Confound: a difference between groups other than the IV.

Bias can enter in several ways. The **placebo effect** is improvement due only to the expectation of receiving treatment, so researchers give the control group a **placebo**, an inactive substitute. In a **single-blind** study participants do not know their condition. **Experimenter bias** occurs when researchers' expectations subtly influence participants or the way data are recorded, so a **double-blind** study keeps both participants and the researchers who interact with them or score outcomes unaware of group membership. **Demand characteristics** are cues that suggest what the study is about and cause participants to act the way they think is expected; deception, filler tasks, and hidden measures reduce them.

Variables and groups

IV = manipulated, DV = measured, confound = uncontrolled difference.

Experimental group gets the treatment; control group gets none or a placebo.

Term	Meaning	Problem it prevents
Random assignment	Chance decides each participant's condition	Pre-existing group differences
Control group	Baseline group without the treatment	Mistaking normal change for treatment effect
Placebo	Inactive treatment	Expectation effects
Single blind	Participants unaware of condition	Participant bias
Double blind	Participants and researchers unaware	Participant and experimenter bias
Operational definition	Exact measurement of variables	Vague, unreplicable studies

Replication means repeating a study, ideally with different participants, to see if the results hold. Findings that replicate are far more trustworthy. A **quasi-experiment** compares groups that already differ on a characteristic (such as gender, age, or smokers versus nonsmokers) or are assigned by circumstance. Because the researcher cannot randomly assign participants, the study cannot support causal claims, even though it looks like an experiment. Experiments may be run in a **laboratory** (more control, less realism) or in a **field setting** (more realism, less control).

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EXAMPLE 3

In a study of caffeine and reaction time, participants who received caffeine pills were tested at 9 a.m. and the placebo group at 3 p.m. Identify the flaw and fix it.

SOLUTION

Time of day is a confound because reaction time varies across the day.

Test everyone at the same hour, or randomly assign testing times across both groups.

Also make the pills look identical and keep the experimenter blind to which pill each participant received.

Keep in mind that even a well-run experiment has limits. Volunteers may differ from the general public, and a laboratory task may not capture how people behave in daily life. Researchers therefore weigh **internal validity** (confidence that the IV caused the change) against **external validity** (how well results apply elsewhere), and they replicate in different settings to strengthen both.

Designing an experiment. (1) State a directional hypothesis. (2) Identify and operationally define the IV and DV. (3) Recruit participants, then randomly assign them. (4) Control extraneous variables such as time of day. (5) Use a placebo or blind procedures when expectations matter. (6) Collect and analyze data, then consider replication.

Exam tip

On the Article Analysis and other free-response questions, 'operational definition' answers must say how the variable is measured, not just restate the variable. A conclusion about causation needs both manipulation and random assignment. If the groups already existed (men and women, for instance), it is not an experiment, so you may only claim association.

EXAMPLE 1

A researcher thinks a new tutoring app increases quiz scores. She randomly assigns 80 students to use the app for four weeks or to practice with regular worksheets. Quiz scores are compared by a grader who does not know group assignments. Identify the IV, DV, control group, and the type of blinding.

SOLUTION

IV: type of practice (app versus worksheets).

DV: quiz score, an operational measure of learning.

Control group: the worksheet group, a baseline comparison.

The grader is blind to condition, which limits experimenter bias; because participants know which they use, it is not double blind in a strict sense.

EXAMPLE 2

A study finds that teens who attend an after-school sports program score higher on well-being surveys than teens who do not. Teens chose their own group. Why is this not evidence that sports cause well-being?

SOLUTION

There is no random assignment, so self-selection is a confound.

Healthier or more outgoing teens may choose sports, producing the group difference.

To test causation, randomly assign teens to the program or a wait list, then measure well-being.

Practice**SET A Check Your Understanding**

Answer each question in a few sentences.

1. Distinguish the independent variable from the dependent variable using a sleep and memory example.
2. What does random assignment accomplish that random sampling does not?
3. What is a confounding variable? Provide an example.
4. Why is a double-blind procedure better than a single-blind one for testing a new drug?
5. Explain how a placebo can make people feel better.

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6. Why can a quasi-experiment not show causation?

SET B Exam-Style Multiple Choice

Choose the best answer for each question.

7. Researchers randomly assign 60 adults to either meditate or listen to music for ten minutes, then measure blood pressure. The independent variable is:
 - (A) type of activity (meditation or music)
 - (B) blood pressure
 - (C) random assignment
 - (D) the 60 adults
 - (E) the ten-minute duration
8. A drug trial gives neither participants nor the nurses who record symptoms any information about who received the drug. This is a:
 - (A) single-blind procedure
 - (B) quasi-experiment
 - (C) naturalistic observation
 - (D) double-blind procedure
 - (E) longitudinal study
9. Participants guess the study is about prejudice and begin acting less prejudiced to look good. This problem is best called:
 - (A) the placebo effect
 - (B) random assignment
 - (C) demand characteristics
 - (D) attrition
 - (E) confirmation bias
10. Which feature allows an experiment to support a causal conclusion?
 - (A) A large sample
 - (B) Use of a survey
 - (C) A correlation coefficient greater than .80
 - (D) Using volunteers
 - (E) Random assignment of participants to conditions
11. A researcher compares memory in smokers and nonsmokers. This design is:
 - (A) a true experiment
 - (B) a quasi-experiment
 - (C) a case study
 - (D) an archival study
 - (E) a double-blind study

SET C Apply and Extend

Respond in complete sentences. Model responses list the scoring points.

12. A psychologist hypothesizes that background music lowers anxiety in dental patients. Design an experiment. Identify the IV, DV with an operational definition, how participants are assigned, one control, and one way to reduce bias.
13. A news report says students who use flashcards earn higher grades. Explain what additional information is needed to conclude flashcards cause the improvement and describe a possible confound.

1.4 Sampling, Bias, Validity, and Reliability

You will learn how samples are chosen, why they can mislead, and how psychologists judge whether measures are reliable and valid.

No study can include everyone, so researchers rely on samples. The **population** is the entire group a researcher wants to draw conclusions about; the **sample** is the subset actually studied. The way a sample is chosen determines whether results can be generalized.

Sampling method	How it works	Representative?
Random sampling	Every member of the population has an equal chance of selection	Best chance of representing the population
Stratified sampling	Population divided into subgroups (strata), then sampled in proportion to each	Yes, guarantees subgroup representation
Convenience sampling	Whoever is easy to reach (classmates, volunteers)	Often not; high risk of bias
Volunteer / self-selected	People choose to respond	Often not; volunteers differ from others

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Sampling bias occurs when the sample systematically differs from the population, so conclusions mislead. A famous example is a poll of people reached only by landline phones, which overrepresents older adults. Much psychological research has used **WEIRD** samples: participants who are Western, Educated, Industrialized, Rich, and Democratic, often college students. Results from such samples may not apply to other cultures or age groups, which limits **generalizability**, the extent to which findings apply beyond the specific sample and setting.

Sampling terms

Population: everyone of interest. Sample: the part studied.

Random sample: each member has an equal chance of selection.

Stratified sample: subgroups represented in proportion to the population.

Larger, representative samples generalize better; larger biased samples remain biased.

Validity asks whether a study measures or shows what it claims. **Internal validity** is the degree to which a study demonstrates that the IV caused changes in the DV, which depends on controlling confounds. **External validity** is the degree to which results generalize to other people, settings, and times, which depends heavily on sampling and realism. There is often a tradeoff: tight lab control raises internal validity but may lower external validity. **Construct validity** asks whether a test or operational definition truly measures the abstract concept it targets (does a 10-question quiz really measure 'intelligence'?). **Content validity** asks if a test covers the full domain, and **predictive (criterion) validity** asks whether scores predict a future outcome, such as SAT scores predicting college grades.

Reliability is the consistency of a measure. A measure can be reliable without being valid (a bathroom scale that is always five pounds off is consistent but wrong), but a measure cannot be valid unless it is reliable. Reliability is checked in several ways.

Type of reliability	Question it answers	Method
Test-retest	Does the same test give similar scores at two times?	Correlate scores from two administrations
Inter-rater	Do different observers or scorers agree?	Compare ratings from two or more raters
Split-half / internal consistency	Do items on the test measure the same thing?	Correlate scores on two halves of the test
Alternate forms	Do two versions give similar scores?	Correlate scores on version A and B

Reliability versus validity

Reliable = consistent. Valid = accurate (measures what it claims).

Reliable does not guarantee valid; valid requires reliable.

Why do these ideas matter for judging news about research? Ask four questions. Who was studied, and were they chosen at random? How were the key terms operationally defined? Was the measure consistent and did it capture the construct? Could the same result appear in a different setting or culture? A study with a small, self-selected, single-culture sample deserves caution even when its statistics look impressive. Conversely, a modest but carefully drawn random sample can support surprisingly accurate conclusions about a large population.

Response bias is another threat. People may answer to look good (social desirability), may agree with everything asked (acquiescence), or may not remember accurately. Careful researchers use anonymous surveys, neutral wording, and balanced questions to reduce it.

- ◆ Content validity: does the exam cover the whole unit?
- ◆ Predictive validity: do scores forecast later performance?
- ◆ Construct validity: does the test measure the intended trait?
- ◆ Face validity: does it appear, on the surface, to measure the trait? (the weakest evidence)

Common mistakes

Do not say a bigger sample automatically fixes bias; a large convenience sample is still unrepresentative. Do not confuse random sampling (selection from population, affects external validity) with random assignment (placement into groups, affects internal validity). Do not call a consistent but inaccurate test 'valid'.

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EXAMPLE 1

A psychologist surveys 1,000 students from a single wealthy private university about stress and concludes that stress levels in the nation's teenagers are low. Evaluate the sampling.

SOLUTION

The population is all teens in the nation; the sample is students from one wealthy school.

This is a convenience sample, so sampling bias is likely: the students are privileged and attend one school.

External validity is poor even though the sample is large.

Improvement: stratified random sampling by region, income, and school type.

EXAMPLE 2

Two teachers independently score the same essays on a rubric and give very different scores. Later, a new test of creativity gives students identical scores each time they take it, but the scores do not predict any creative achievement. Identify the problems.

SOLUTION

The essay scoring shows low inter-rater reliability.

The creativity test shows high test-retest reliability but poor predictive and construct validity.

The test is reliable but not valid.

Practice**SET A Check Your Understanding**

Answer each question in a few sentences.

1. Explain the difference between a population and a sample using a school example.
2. Why does stratified sampling improve representativeness over simple convenience sampling?
3. What does the term WEIRD refer to, and why is it a concern?
4. Contrast internal and external validity.
5. A scale reads 3 pounds heavy every time. Is it reliable? Is it valid? Explain.
6. Name and define two kinds of reliability.

SET B Exam-Style Multiple Choice

Choose the best answer for each question.

7. A pollster calls every 500th name in a phone directory. This procedure best illustrates a limitation of:
(A) random assignment
(B) double-blind procedures
(C) a quasi-experiment
(D) test-retest reliability
(E) sampling that excludes people without listed phones, causing bias
8. A researcher wants a sample that includes 60% women and 40% men because the school population has that composition. She should use:
(A) stratified sampling
(B) convenience sampling
(C) volunteer sampling
(D) single-blind sampling
(E) cluster observation
9. A new anxiety questionnaire yields scores that differ widely when students retake it a week later with no change in their condition. The questionnaire lacks:
(A) external validity
(B) random assignment
(C) test-retest reliability
(D) construct validity only
(E) inter-rater reliability
10. A laboratory experiment tightly controls all variables but uses an artificial task. It most likely has high:
(A) external validity but low internal validity
(B) internal validity but lower external validity
(C) reliability but no validity
(D) sampling bias but no confounds
(E) construct validity only

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11. Which finding most threatens the generalizability of a study of decision making conducted on 300 psychology undergraduates?
- (A) The sample was too large.
 - (B) The study used an operational definition.
 - (C) The researchers used statistical tests.
 - (D) The participants may not represent adults from other cultures and age groups.
 - (E) Participants were debriefed afterward.

SET C Apply and Extend

Respond in complete sentences. Model responses list the scoring points.

12. A psychologist posts an online survey on a fitness forum and finds that 85% of respondents say regular exercise improves mood.
(a) Identify the sampling method and a bias. (b) Explain a limit on generalizability. (c) Suggest an improvement.
13. A company uses a 20-item test to select employees. Describe how you would evaluate its reliability and its validity.

1.5 Ethics in Psychological Research

You will learn the ethical rules protecting research participants and apply them to landmark studies and new research plans.

Psychological research uses human and animal participants, so it is governed by ethical rules designed to protect them. The American Psychological Association (APA) publishes an ethics code, and every U.S. institution that receives federal research funding must have an **Institutional Review Board (IRB)**, a committee that reviews proposed studies and weighs risks against benefits before data are collected.

Core APA safeguards for human participants

Informed consent: participants learn the purpose, procedures, risks, and their right to withdraw before agreeing (parents consent for minors, who give assent).

Protection from harm: risks must be minimized and justified by the study's value.

Confidentiality: personal data are kept private; anonymous data have no identifying information.

Voluntary participation: participants may withdraw at any time without penalty.

Debriefing: after the study, participants are told the true purpose and any deception, and concerns are addressed.

Limited deception: used only if no non-deceptive alternative exists, the harm is minimal, and participants are debriefed.

These rules are rooted in the **Belmont Report** (1979), written after abuses in research. It names three principles: **respect for persons** (autonomy and informed consent, with extra protection for vulnerable people), **beneficence** (minimize harm and maximize benefit), and **justice** (fairly distribute the burdens and benefits of research, so no group is exploited).

Animal research is allowed because some questions cannot be studied in humans, but it is regulated. Guidelines require that animals be treated humanely, that housing be appropriate, that pain and distress be minimized, that research have a clear scientific purpose, and that the study be reviewed by an institutional animal care committee. Researchers should use the fewest animals needed and consider alternatives.

Belmont principles

Respect for persons: autonomy and informed consent.

Beneficence: minimize harm, maximize benefit.

Justice: fair selection and distribution of burdens and benefits.

Case	What happened	Ethical lesson
Milgram obedience (1960s)	Participants were told to give increasing 'shocks' to a learner; 65% went to 450 volts. The shocks were fake	Deception and severe distress; led to stronger consent and debriefing rules
Zimbardo Stanford prison (1971)	College students randomly assigned as guards or prisoners; the study stopped after about 6 days due to abuse and distress	Psychological harm; the right to withdraw; limits of roles and experimenter involvement
Tuskegee syphilis study (1932-1972)	U.S. health researchers observed Black men with syphilis and withheld effective treatment without informed consent	Led to the Belmont Report and IRBs; violations of consent, harm, and justice
Little Albert (Watson and Rayner, 1920)	An infant was conditioned to fear a white rat, and the fear generalized; no deconditioning	Harm to a child, inadequate consent and no deconditioning afterward

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Ethics are about trade-offs. Milgram's study taught us a great deal about obedience, yet many participants were upset. Today an IRB would require careful justification, safeguards, and a debriefing with follow-up support. Deception is not forbidden; unnecessary harm is.

Several other ideas appear on the exam. **Anonymity** means that no identifying information is collected at all, while confidentiality means the researcher knows identities but protects them. **Assent** is a minor's agreement to take part, given alongside a parent's consent. **Risk-benefit analysis** compares possible harm with the value of the knowledge gained, and an IRB can approve a study only if benefits justify any risk. Researchers also owe honesty in reporting: fabricating or altering data, or plagiarizing, is research misconduct. Finally, studies on vulnerable groups, such as children, prisoners, or people with cognitive impairments, receive special scrutiny because those participants may feel unable to refuse.

Keep the historical sequence straight. Little Albert (1920), Tuskegee (1932 to 1972), Milgram (early 1960s), and Zimbardo (1971) all preceded or inspired the safeguards that now exist. Public outrage over Tuskegee led directly to the Belmont Report and federal rules requiring IRB review. Today, a study resembling any of these would require much stronger consent, monitoring, and protections.

- ◆ Before: IRB review, informed consent from participants (or parents of minors), and risk-benefit analysis.
- ◆ During: monitoring for harm, voluntary participation, right to withdraw.
- ◆ After: debriefing, confidentiality of records, honest reporting of data, and follow-up support if participants were distressed or confused.

Common mistakes

Do not confuse confidentiality (data privacy) with anonymity (no identifiers collected). Do not say deception is never allowed; it is allowed when justified and followed by debriefing. Do not credit Tuskegee or Little Albert to the wrong principle: Tuskegee mainly violated informed consent and justice, while Little Albert shows harm and lack of follow-up.

EXAMPLE 1

A researcher wants to study how bystanders respond to an apparent emergency by having a confederate fake a seizure on a college campus, then interviewing witnesses afterward. Identify two ethical issues and how an IRB might address them.

SOLUTION

Deception: participants do not know the emergency is staged. The IRB must see that no non-deceptive alternative exists.

Distress: witnesses may feel guilt or worry. Risks must be minimal and justified.

Safeguards: debrief immediately, explain the staged nature, offer counseling resources, and allow participants to withdraw their data.

EXAMPLE 2

A school wants to test a new reading program on 8-year-olds. Describe consent requirements.

SOLUTION

Parents or guardians must give informed consent because the children cannot legally do so.

The children give assent, an agreement based on their understanding.

Everyone is told the program's purpose, procedures, and their right to withdraw without penalty.

Records are kept confidential.

Practice

SET A Check Your Understanding

Answer each question in a few sentences.

1. What is the role of an Institutional Review Board?
2. List four elements that informed consent should include.
3. When is deception acceptable in a study, and what must follow it?
4. Name the three Belmont principles and give a one-sentence meaning of each.
5. What ethical violation is most central to the Tuskegee study?
6. State two guidelines for the ethical use of animals in research.

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SET B Exam-Style Multiple Choice

Choose the best answer for each question.

7. After participants complete a study that involved misleading them about its purpose, the researcher explains the real purpose and answers questions. This is:
(A) informed consent (B) confidentiality (C) debriefing
(D) assent (E) random assignment
8. Which study is most associated with participants who obeyed an authority figure while believing they were harming another person?
(A) Zimbardo's Stanford prison study (B) Watson and Rayner's Little Albert study
(C) The Tuskegee syphilis study (D) Asch's line judgment study
(E) Milgram's obedience experiments
9. A researcher publishes data with participants' names removed and stores the records in a locked cabinet. Which ethical principle is she following?
(A) Confidentiality (B) Deception (C) Debriefing
(D) Justice (E) Replication
10. Which Belmont principle was violated when only poor, minority men were selected to be studied in a risky health experiment?
(A) Replication (B) Respect for persons only (C) Informed assent
(D) Justice (E) Validity
11. A graduate student wants to run a study on teenagers. Which step is required?
(A) Obtain permission from the APA
(B) Obtain approval from an IRB and informed consent (with parental permission and student assent)
(C) Avoid debriefing to prevent confusion
(D) Collect data first and seek approval afterward
(E) Use only deception

SET C Apply and Extend

Respond in complete sentences. Model responses list the scoring points.

12. A researcher plans to measure how stress affects performance by telling participants their math test results show low ability (regardless of actual performance) and then observing their mood. Evaluate the ethics using at least three concepts.
13. Explain how Milgram's and Zimbardo's studies influenced modern research ethics, and name one modern safeguard that responds to them.

1.6 Descriptive Statistics

You will summarize data with measures of center and spread, recognize skew, and use z-scores and the normal curve.

Descriptive statistics organize and summarize data. A **frequency distribution** lists how often each score (or range of scores) occurs, and a **histogram** graphs it with bars touching to show the distribution's shape. Two shapes matter most. A **normal distribution** is a symmetrical bell-shaped curve in which most scores cluster near the middle. A **skewed distribution** has a long tail on one side, and it is named for the tail: a long tail to the right is **positively skewed** (a few very high scores, like household income) and a long tail to the left is **negatively skewed** (a few very low scores, like scores on an easy exam).

Measures of central tendency give a typical score. The **mean** is the arithmetic average. The **median** is the middle score when scores are ordered (the average of the two middle scores if n is even). The **mode** is the most frequent score. The mean is sensitive to **outliers**, extreme scores, so in a skewed distribution it is pulled toward the tail. In a positive skew, $\text{mean} > \text{median} > \text{mode}$; in a negative skew, $\text{mean} < \text{median} < \text{mode}$. This is why reports of income typically use the median.

Central tendency in a skewed distribution

Mean is pulled toward the tail (outliers). Median resists outliers.

Positive skew: $\text{mean} > \text{median}$. Negative skew: $\text{mean} < \text{median}$.

Normal curve: $\text{mean} = \text{median} = \text{mode}$.

Measures of variability show how spread out scores are. The **range** is the highest score minus the lowest; it is easy but depends on only two scores and is distorted by outliers. The **standard deviation (SD)** is the typical distance of scores from the mean. To find it: subtract the mean from each score, square the deviations, average the squares (the **variance**), and take the square root. Two groups can have the same mean but very different SDs, so always report both.

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EXAMPLE 1

Five students score 2, 4, 4, 6, and 9 on a quiz. Find the mean, median, mode, range, and standard deviation (treat the five scores as the whole population).

SOLUTION

Mean = $(2 + 4 + 4 + 6 + 9) / 5 = 25 / 5 = 5$.

Median = middle score of 2, 4, 4, 6, 9 = 4. Mode = 4. Range = $9 - 2 = 7$.

Deviations: -3, -1, -1, 1, 4. Squared: 9, 1, 1, 1, 16; sum = 28.

Variance = $28 / 5 = 5.6$. SD = square root of 5.6, about 2.37.

Because the mean (5) exceeds the median (4), the data are slightly positively skewed by the 9.

In a **normal curve**, about **68%** of scores fall within 1 SD of the mean, **95%** within 2 SDs, and **99.7%** within 3 SDs (the 68-95-99.7 rule). A **z-score** says how many SDs a score is from the mean: $z = (\text{score} - \text{mean}) / \text{SD}$. A positive z is above the mean and a negative z is below it. A **percentile rank** is the percentage of scores at or below a given score. On a normal curve, a score at the mean is at the 50th percentile, +1 SD is about the 84th percentile, and +2 SD is about the 97.5th.

Normal curve and z-scores

68-95-99.7 rule within 1, 2, 3 SDs of the mean.

$z = (\text{score} - \text{mean}) / \text{SD}$; positive above the mean, negative below.

z-score	Meaning	Approx. percentile (normal curve)
-2	2 SDs below mean	2.5th
-1	1 SD below mean	16th
0	at the mean	50th
+1	1 SD above mean	84th
+2	2 SDs above mean	97.5th

EXAMPLE 2

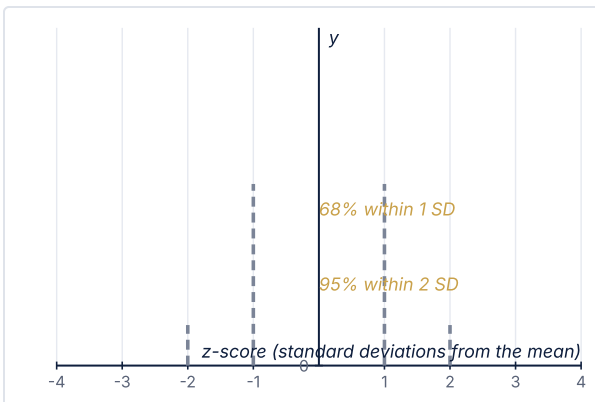
IQ scores are normally distributed with mean 100 and SD 15. (a) What is the z-score for an IQ of 130? (b) About what percent of people score between 85 and 115? (c) What is the z-score for 70?

SOLUTION

(a) $z = (130 - 100) / 15 = +2.0$, about the 97.5th percentile.

(b) 85 and 115 are 1 SD below and above the mean, so about 68% of people.

(c) $z = (70 - 100) / 15 = -2.0$, two SDs below the mean, about the 2.5th percentile.



The normal curve with 1 and 2 SD marked.

When reading a histogram, look at three features: the center (where the peak is), the spread (how wide the bars extend), and the shape (symmetric, skewed, or with two peaks, called bimodal). A bimodal histogram suggests two different groups were mixed together, such as test scores from two very different classes.

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Correlation coefficients (r) are descriptive too. Values near $+1$ or -1 show strong relationships; near 0 show weak ones. The square of r tells the proportion of variability shared by two variables: $r = .50$ means 25% shared. Remember that these numbers describe association, not cause.

Common mistakes

Do not choose the mean for skewed data when asked for the best typical value; the median is better. Do not confuse the standard deviation (spread) with the mean (center). A larger SD means more variability, not a higher average. And never name a skew by where the bulk of scores lie; name it by the direction of the tail. Finally, a z -score of 0 means exactly average, not a failing score.

Practice

SET A Check Your Understanding

Answer each question in a few sentences.

1. Find the mean and median of the scores 3, 7, 7, 8, 15.
2. What does a larger standard deviation tell you about a set of scores?
3. Which measure of central tendency is best for reporting typical home prices in a town with a few mansions, and why?
4. A student scores 78 on a test with mean 70 and SD 4. Calculate the z -score and interpret it.
5. Describe what is meant by a negatively skewed distribution and where mean and median fall.
6. A correlation of $r = -.60$ is found between hours of video games and GPA. Interpret its direction and strength.

SET B Exam-Style Multiple Choice

Choose the best answer for each question.

7. In a positively skewed distribution of salaries, which statement is true?
(A) The mean is less than the median. (B) The mean equals the median.
(C) The mean is greater than the median. (D) The mode is greater than the mean.
(E) The range is zero.
8. Two classes both have a mean exam score of 75. Class X has SD = 3 and Class Y has SD = 12. Which conclusion is correct?
(A) Scores in Class Y are more spread out than in Class X.
(B) Class X has more high scorers than Class Y.
(C) Class Y has a higher median than Class X.
(D) The classes are identical.
(E) Class X must be positively skewed.
9. On a normal distribution, about what percent of scores fall within 2 standard deviations of the mean?
(A) 34% (B) 95% (C) 68% (D) 99.7% (E) 50%
10. A test has mean 50 and SD 10. A score of 35 has a z -score of:
(A) $+1.5$ (B) -15 (C) $+0.5$ (D) -0.5 (E) -1.5
11. Which statistic is most affected by a single extreme outlier?
(A) Median (B) Mode
(C) Percentile rank of a middle score (D) Mean
(E) Frequency of the mode

SET C Apply and Extend

Respond in complete sentences. Model responses list the scoring points.

12. Scores on a quiz: 4, 5, 5, 6, 6, 6, 7, 8, 8, 25. (a) Compute the mean and median. (b) Describe the shape. (c) Which measure should be reported and why?
13. A reading test has a mean of 200 and SD of 25 in a normal distribution. A student scores 250. (a) Calculate the z -score. (b) Estimate the percentile. (c) About what percent of students score between 175 and 225?

1.7 Inferential Statistics and Interpreting Results

You will learn what significance, p -values, and effect size mean, how errors arise, and how to evaluate research reports.

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Descriptive statistics summarize the data you have. **Inferential statistics** use data from a sample to draw conclusions about a population, mainly by asking whether a result could plausibly be explained by chance alone. If a difference between groups is larger than chance variation would likely produce, it is called **statistically significant**.

Significance is judged by the **p-value**, the probability of getting results at least as extreme as those observed if there were really no effect (the null hypothesis is true). By convention, psychologists call a result significant when $p < .05$. In plain terms, there is less than a 5% probability that the difference arose by chance alone. A smaller p means stronger evidence against chance, but a p-value does not tell you the result is important, large, or true in every setting.

Statistical significance

Significant: $p < .05$ (results unlikely to be due to chance alone).

Not significant: $p \geq .05$; the data do not rule out chance.

Significance says the effect is probably real, not that it is large or practically useful.

Three things make a difference more likely to be significant: **larger sample size** (bigger samples give more stable estimates), **larger differences** between group means, and **less variability** within groups. With a huge sample, even a trivial difference can reach significance. That is why researchers also report **effect size**, a measure of how large the effect is (for example Cohen's d, or the size of r). A significant but tiny effect may have little practical value.

Behind every test lies a pair of competing claims. The **null hypothesis** says there is no real difference or relationship in the population, and the **research (alternative) hypothesis** says there is. Researchers never prove the research hypothesis; they decide whether the sample data are too unlikely under the null hypothesis, and if so they reject the null. Failing to reject it does not mean the null is true, only that the evidence was insufficient. Notice also that a small sample may contain a large difference by luck, which is why random selection and adequate size matter for every inference.

Two kinds of error are possible whenever a decision is made from sample data.

Error	What happens	Example
Type I (false positive)	Conclude there is an effect when there really is none	Declaring a useless drug effective
Type II (false negative)	Miss a real effect	Declaring an effective drug useless, often due to a small sample

Setting a stricter cutoff ($p < .01$) reduces Type I errors but raises the risk of Type II errors. Increasing sample size is the usual way to reduce Type II errors. A **confidence interval** gives a range of plausible values for a population value; narrower intervals indicate more precise estimates.

Reading graphs. Check the labels and the axes: truncated y-axes can make small differences look dramatic. Look for error bars, which show variability or confidence intervals; overlapping error bars suggest the difference may not be reliable. In a bar graph of group means, ask what the DV is, which groups were compared, and whether the difference is large relative to the spread.

Meta-analysis statistically combines results from many studies on the same question to estimate an overall effect size, giving a more reliable answer than any single study. The **replication crisis** refers to the discovery that many published findings, especially those with small samples or flexible analyses, failed to replicate. Contributing factors include publication bias (journals favor significant results), small samples, and **p-hacking** (trying many analyses until $p < .05$). Responses include preregistering hypotheses, sharing data, using larger samples, and conducting replications.

Quick decision guide

Large sample + small effect: may be significant but trivial; check effect size.

Small sample + moderate effect: may be non-significant; risk of Type II error.

Many studies agree: meta-analysis raises confidence.

EXAMPLE 1

A study of 40 students finds that those who practiced mindfulness had higher attention scores than those who did not ($p = .03$). Another study of 10,000 students finds a 0.5-point difference ($p = .01$) on a 100-point scale. Interpret each.

SOLUTION

The first result is significant at the .05 level: less than a 5% probability of chance alone, so likely a real difference.

The second is also significant, but a 0.5-point difference on a 100-point scale is trivial; the effect size is small.

Significance reflects the large sample; practical importance is low.

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EXAMPLE 2

Read this summary: 'Participants who slept 8 hours recalled a mean of 14 words; those who slept 4 hours recalled 10 words, $p = .002$, $d = 0.9$.' What can and cannot be concluded?

SOLUTION

$p = .002$ means chance is a very unlikely explanation.

$d = 0.9$ is a large effect, so the difference is meaningful.

If participants were randomly assigned, sleep can be said to cause the difference; if not, only association.

It does not tell us whether the result generalizes beyond the sample.

Common mistakes

Do not say ' $p = .03$ means there is a 3% chance the hypothesis is wrong' or 'proves'; say the results would be unlikely under chance. Do not treat nonsignificant as proof of no effect. Remember that significance depends on sample size and does not equal importance.

Practice**SET A Check Your Understanding**

Answer each question in a few sentences.

1. What does it mean when a result is reported as $p < .05$?
2. Why do researchers report effect sizes in addition to p -values?
3. Distinguish a Type I error from a Type II error.
4. How does a larger sample size affect the likelihood of finding a significant result?
5. What is a meta-analysis and why is it useful?
6. Describe two causes of the replication crisis.

SET B Exam-Style Multiple Choice

Choose the best answer for each question.

7. A researcher reports $p = .20$ for the difference between two therapy groups. The best interpretation is:
(A) The therapies are equally effective.
(B) The difference could plausibly be due to chance.
(C) The null hypothesis has been proven true.
(D) There is a 20% chance the therapy works.
(E) The effect is large but unreliable.
8. A drug company declares a medicine effective, but the effect was due to chance. This is a:
(A) Type II error (B) sampling bias (C) confound
(D) demand characteristic (E) Type I error
9. Which change would most increase the chance of detecting a real effect in a study?
(A) Increasing the sample size (B) Using a convenience sample
(C) Reducing the number of participants (D) Increasing variability within groups
(E) Making the DV less reliable
10. A study with 50,000 participants finds a statistically significant but tiny correlation ($r = .03$). The best conclusion is:
(A) The relationship is strong and important.
(B) The result is certainly due to chance.
(C) The relationship is statistically significant but practically negligible.
(D) The study must contain a confound.
(E) Causation has been demonstrated.
11. Which practice best addresses the replication crisis?
(A) Running multiple analyses until $p < .05$ (B) Publishing only significant findings
(C) Using smaller samples to save cost (D) Preregistering hypotheses and analysis plans
(E) Avoiding replication studies

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SET C Apply and Extend

Respond in complete sentences. Model responses list the scoring points.

12. Researchers compared mean anxiety scores for a treatment group ($M = 18$) and a control group ($M = 22$) with $p = .08$ and 12 participants per group. (a) Is the result statistically significant? (b) Which error is possible? (c) Suggest one improvement.
13. Explain how a meta-analysis and replication address the problem that a single significant study may be a fluke.

1.8 Multiple-Choice Practice: Scientific Foundations and Research Methods

Test yourself on history, methods, validity, ethics, and statistics with exam-style questions.

Choose the best answer for each question. Read stimuli carefully, and check the explanation for every item, including those you got right.

SET A Core Concepts

Choose the best answer for each question.

1. Which early school of psychology used introspection to analyze consciousness into basic elements?
(A) Functionalism (B) Behaviorism (C) Structuralism
(D) Gestalt psychology (E) Humanistic psychology
2. A psychologist explains a child's tantrums by pointing to the parents' habit of giving in whenever the child cries. This explanation is most consistent with the:
(A) behavioral perspective (B) cognitive perspective
(C) evolutionary perspective (D) psychodynamic perspective
(E) biological perspective
3. Which investigation is a true experiment?
(A) A survey of students about study habits and grades
(B) Participants are randomly assigned to read a story with or without a happy ending, then rate their mood.
(C) Students who chose to join a club are compared with those who did not
(D) A researcher watches shoppers in a store
(E) A researcher follows one patient for years
4. A researcher finds $r = -.80$ between hours of TV watched and reading scores. Which statement is most accurate?
(A) TV causes lower reading scores.
(B) Reading scores cause TV time to rise.
(C) The relationship is weak.
(D) The variables are unrelated.
(E) TV time and reading scores have a strong negative relationship.
5. Participants who receive a sugar pill report less pain. This best illustrates:
(A) experimenter bias (B) sampling bias
(C) a confounding variable (D) the placebo effect
(E) demand characteristics only
6. Researchers study 'happiness' by counting how many times a person smiles during a 30-minute conversation. This is an example of:
(A) an operational definition (B) a hypothesis
(C) a theory (D) random assignment
(E) a control group
7. Which ethical safeguard is directly addressed by telling participants after a study that a confederate was part of it?
(A) Informed consent (B) Confidentiality (C) Debriefing
(D) Replication (E) Random sampling

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SET B Applications and Data

Choose the best answer for each question.

8. A survey of a town's registered voters is conducted by calling every 100th person listed. This procedure most resembles:
- (A) stratified sampling
 - (B) convenience sampling
 - (C) random assignment
 - (D) a systematic sampling method approximating random sampling
 - (E) a quasi-experiment
9. Class A and Class B each have a mean of 70 on a test. Class A has SD = 2 and Class B has SD = 15. Which is true?
- (A) Class B students were all lower than Class A.
 - (B) Most students in Class A scored close to 70.
 - (C) Class A has a larger range.
 - (D) Class B has a higher median.
 - (E) Both classes have identical score distributions.
10. A test of 'math ability' produces nearly identical scores when students take it twice, but scores do not predict performance in math courses. The test is:
- (A) valid but not reliable
 - (B) neither reliable nor valid
 - (C) both reliable and valid
 - (D) valid and reliable but biased
 - (E) reliable but not valid
11. Which sample of 5,000 people would most limit generalization to all U.S. adults?
- (A) A random digit dial sample
 - (B) A stratified random sample by age and region
 - (C) Volunteers at a campus recruitment event
 - (D) A national household sample selected at random
 - (E) An address-based sample
12. Researchers want to test whether noise affects reading comprehension. Which design allows a causal conclusion?
- (A) Randomly assign students to a noisy or quiet room and give the same passage and test
 - (B) Compare students who naturally study in noisy places with those who do not
 - (C) Survey students about their study locations
 - (D) Interview a single student about noise
 - (E) Observe students in a library
13. The following data: Group X (new method) mean = 85, SD = 5; Group Y (old method) mean = 80, SD = 5; $p = .01$, $n = 100$ each. Which conclusion is best supported?
- (A) The difference is likely due to chance.
 - (B) The difference is statistically significant, and the new method group scored higher on average.
 - (C) The new method definitely caused the difference regardless of assignment.
 - (D) The groups have different variability.
 - (E) There is no effect.
14. A researcher concludes a treatment works when in reality it does not. This is:
- (A) a Type II error
 - (B) a replication
 - (C) a confound
 - (D) a Type I error
 - (E) an outlier

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SET C Exam-Level Stretch

Choose the best answer for each question.

15. A researcher reads that the Stanford prison study ended early because of guards' abuse of prisoners. Which ethical guideline does this primarily relate to?
(A) Maintaining confidentiality of records
(B) Random assignment of participants
(C) Using control groups
(D) Operational definitions
(E) Protecting participants from harm and honoring the right to withdraw
16. A scatterplot shows points tightly clustered around a line that slopes downward. The correlation is most likely:
(A) $-.90$ (B) $-.10$ (C) $+.10$ (D) $+.90$ (E) 0.00
17. A study finds that people who own pets report lower stress. A critic suggests that wealthier people can afford pets and also have less stress. The critic is pointing to:
(A) experimenter bias (B) attrition (C) a third variable
(D) a placebo effect (E) random assignment
18. A distribution of reaction times has a long tail to the right. Which is the most accurate description?
(A) Negatively skewed, with the mean greater than the median
(B) Positively skewed, with the median greater than the mean
(C) Normal, with the mean equal to the median
(D) Positively skewed, with the mean greater than the median
(E) Bimodal
19. Which statement about a meta-analysis is accurate?
(A) It is a type of experiment with random assignment.
(B) It combines results from many studies to estimate overall effect size.
(C) It can only be done on one study.
(D) It proves a hypothesis.
(E) It eliminates the need for replication.
20. A psychologist wants to study the behavior of dolphins in the wild without influencing them. She should most likely use:
(A) a double-blind experiment (B) a survey
(C) an IRB (D) a stratified sample
(E) naturalistic observation

1.9 Free-Response Practice: Scientific Foundations and Research Methods

Practice writing complete free-response answers using research scenarios and data.

Each question has several parts. Answer every part fully and label each. Scoring points are listed with each model answer; each point earns 1 credit, and definitions earn credit only when applied to the scenario.

QUESTION 1 Article Analysis: Sleep and Memory

Read the summary. A researcher recruited 60 volunteer college students and randomly assigned half to sleep 8 hours and half to sleep 4 hours in a lab. Next morning, participants studied 30 word pairs and were tested on recall. The 8-hour group recalled a mean of 24 words and the 4-hour group a mean of 18 words ($p = .01$). Researchers who scored the tests did not know group membership. The researcher concluded that sleep improves memory in all adults.

1. (a) Identify the independent variable and dependent variable.
2. (b) Explain one way the study controlled for bias, and one threat that remains.
3. (c) Explain what the p -value means and whether the conclusion about all adults is justified.

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QUESTION 2 Evidence-Based: Survey and Correlation

A survey of 500 high school students found a correlation of $r = +.40$ between daily minutes spent on social media and self-reported feelings of loneliness. The researcher states that social media causes loneliness.

4. (a) Describe the strength and direction of the correlation.
5. (b) Explain why the researcher's conclusion is not supported, giving two alternative explanations.
6. (c) Describe an experiment that could test the causal claim, including random assignment.
7. (d) Identify one limitation of self-reported surveys.

QUESTION 3 Ethics in Research

A researcher plans to study conformity. Participants will be told the study is about visual perception, but confederates will intentionally give wrong answers to see whether participants agree. Participants will include 15-year-olds recruited from a school.

8. (a) Identify one ethical concern with the deception.
9. (b) Explain how the researcher can address that concern.
10. (c) Describe the consent required for the 15-year-olds.

QUESTION 4 Evidence-Based: Statistics and Validity

Two classes took the same 100-point psychology test. Class 1 scores: 62, 70, 70, 71, 72, 75. Class 2 scores: 40, 55, 70, 71, 84, 100. A student argues the classes performed the same because the medians are similar.

11. (a) Calculate the mean of Class 1 and the median of Class 2.
12. (b) Explain why the student's claim ignores an important difference, and name the statistic needed.
13. (c) A new test gives students the same score each time but does not predict later grades. Use reliability and validity to explain.

Answers Chapter 1: Answers and Explanations

Answers for every practice problem, numbered to match. Read the explanation even when your answer is correct.

1.1 History and Approaches to Psychology**SET A · CHECK YOUR UNDERSTANDING**

1. Wilhelm Wundt, in Leipzig in 1879. He used introspection, careful reports of immediate sensations and feelings under controlled conditions. His school, structuralism, tried to identify the basic elements of consciousness.
2. Structuralism analyzed the elements of conscious experience (Wundt, Titchener), while functionalism asked how mental processes help an organism adapt (James). The first asks what the mind is made of; the second asks what it is for.
3. Watson and Skinner argued that private mental reports cannot be observed or verified by others, so they are not scientific data. They insisted psychology study observable behavior and how environmental stimuli and consequences shape it.
4. Dissatisfaction with behaviorism's neglect of thinking, together with computer models of information processing and research on memory and language, returned mental processes to psychology. Cognitive psychology studies how people perceive, think, remember, and solve problems.
5. The behavioral perspective. It explains the phobia as learned through conditioning: the bite paired dogs with fear, and avoidance was reinforced by relief.
6. A clinical psychologist usually holds a doctorate in psychology and provides assessment and psychotherapy. A psychiatrist is a medical doctor who can prescribe medication and also treats disorders. Prescribing is the key difference.

SET B · EXAM-STYLE MULTIPLE CHOICE

7. B. Functionalism asks how mental processes help an organism adapt. Structuralism is tempting but it analyzed the elements of experience, not their adaptive purpose.
8. E. The biopsychosocial approach integrates three levels of explanation. The biological-only answer describes one perspective, not the integration.
9. A. Both stressed free will, growth, and self-actualization. Psychodynamic is wrong because it emphasizes unconscious conflict, which humanists downplayed.
10. D. Explaining behavior by past reinforcement is the behavioral approach. The sociocultural choice fails because the explanation points to learning consequences rather than cultural norms.
11. C. Washburn earned the first psychology PhD for a woman. Wundt founded the first lab and structuralism, Watson behaviorism, and Freud psychoanalysis.

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SET C · APPLY AND EXTEND

12. Biological: sleep problems, illness, or hormonal changes in adolescence alter energy and attendance (1 point). Cognitive: students who believe school is pointless or expect to fail think themselves out of attending (1 point). Sociocultural: peer norms, family responsibilities, or community economic pressures discourage attendance (1 point). Each explanation must clearly match its perspective's focus.
13. Behaviorism excluded mental processes because they cannot be observed, so it could not explain language, memory, or problem solving (1 point). The cognitive revolution restored those topics using experiments and information-processing models (1 point). A limitation of behaviorism is that it neglects thinking; a limitation of cognitive psychology is that mental processes are measured only indirectly, through behavior or self-report (1 point).

1.2 Research Methods: Description and Correlation**SET A · CHECK YOUR UNDERSTANDING**

1. A theory is a broad, organized explanation that accounts for many observations and generates predictions. A hypothesis is a specific, testable prediction derived from it, such as 'students who sleep 9 hours will recall more words.'
2. Operational definitions state exactly how a variable is measured so others can replicate the study and judge it. Aggression might be defined as the number of times a child hits or pushes another child during a 20-minute recess.
3. This is naturalistic observation. A weakness is that the researcher cannot control variables, so cause and effect cannot be determined; observer bias is another.
4. A case study examines one person or a small group, who may be unusual. Findings from one individual may not apply to others, so conclusions about all people are unjustified.
5. It is a strong negative correlation: as TV time increases, scores tend to decrease. It does not mean TV causes lower scores; a third variable such as less parental involvement might explain both.
6. A third variable is an unmeasured factor that influences both measured variables and creates a relationship between them. It means a correlation may be spurious or misleading about causation.

SET B · EXAM-STYLE MULTIPLE CHOICE

7. C. A positive correlation supports only an association. Exercise causes mood is tempting but correlational data cannot establish causal direction.
8. E. A case study gives in-depth detail on a single unusual individual. Survey requires many respondents and would not capture a rare case.
9. A. Strength depends on absolute value, and .91 is the largest. +.88 is close but weaker; many students wrongly dismiss a negative sign as weakness.
10. D. Different age groups also differ by generation, so age differences may reflect cohort rather than aging. Attrition applies to longitudinal designs.
11. B. She is analyzing existing records, which is archival research. It is not an experiment because she did not manipulate a variable.

SET C · APPLY AND EXTEND

12. (a) No; a correlation shows association only (1 point). (b) Directionality: higher-achieving, organized students may make time for breakfast; third variable: family income or parental involvement may increase both (1 point each). (c) Conduct an experiment: randomly assign students to eat or skip breakfast and compare GPA or test performance, controlling other factors (1 point).
13. Longitudinal follows the same people, so it shows true change and avoids cohort effects, but it takes decades and loses participants (1 point). Cross-sectional is quick and cheap but confounds age with generation (1 point). A reasonable recommendation is longitudinal for validity or cross-sectional for practicality, supported with the stated tradeoff (1 point).

1.3 Experiments**SET A · CHECK YOUR UNDERSTANDING**

1. The IV is the manipulated factor, such as hours of sleep (4 versus 8). The DV is the measured outcome, such as the number of words recalled the next day. The DV is expected to depend on the IV.
2. Random assignment places participants into conditions by chance, so groups are equivalent at the start and differences in the DV can be attributed to the IV. Random sampling instead helps the sample represent the population.
3. A confound is an uncontrolled variable that differs between conditions and may explain the results. If the sleep group tests in the morning and the no-sleep group in the evening, time of day is confounded with sleep.
4. In single blind only participants are unaware. A double-blind design also hides group membership from researchers and raters, preventing experimenter bias from shaping treatment or the interpretation of outcomes.
5. Believing one is receiving treatment creates expectations that can change perceived symptoms and some physiological responses. This is why a drug must outperform placebo to be considered effective.
6. Participants are not randomly assigned, so pre-existing differences between groups are confounded with the variable of interest. The results show association only.

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SET B · EXAM-STYLE MULTIPLE CHOICE

7. A. The IV is what the researcher manipulates: meditation versus music. Blood pressure is the DV. Duration is held constant, so it is a control, not an IV.
9. C. Cues revealing the hypothesis change behavior to meet perceived expectations. The placebo effect concerns expectations about treatment benefits rather than guessing the purpose.
11. B. Smoking status was not assigned by the researcher, so it is quasi-experimental. It is not a true experiment because of the lack of random assignment.
8. D. Both parties are unaware, which defines double blind. Single blind is tempting but only participants would be unaware.
10. E. Random assignment equates groups so the IV is the likely cause. A large sample improves precision but does not remove confounds.

SET C · APPLY AND EXTEND

12. IV: music (calming music versus no music) (1 point). DV: anxiety, operationally defined as score on a 10-item anxiety questionnaire completed before the procedure (1 point). Random assignment to conditions (1 point). Control: same dentist, room, and procedure type in both conditions (1 point). Bias: have the questionnaire scored by someone blind to condition (1 point).
13. Need to know whether students were randomly assigned to use flashcards or chose them (1 point). If students chose, a confound such as motivation or prior achievement could explain grade differences (1 point). Random assignment to a flashcard or no-flashcard condition with the same course and exams would support causation (1 point).

1.4 Sampling, Bias, Validity, and Reliability**SET A · CHECK YOUR UNDERSTANDING**

1. The population is all students in the district; the sample is the 200 students actually surveyed. Researchers study the sample to infer the population's characteristics.
2. It deliberately includes each subgroup in proportion to its share of the population, such as grade levels or ethnic groups. Convenience sampling uses easily reached people who may differ from the population.
3. WEIRD stands for Western, Educated, Industrialized, Rich, Democratic. Many studies use such participants, so findings may not generalize to other cultures, ages, or social backgrounds.
4. Internal validity concerns whether the IV truly caused the change in the DV; it depends on control of confounds. External validity concerns whether the findings apply to other people, settings, and times.
5. It is reliable because it gives consistent readings. It is not valid because the readings are not accurate. This shows that reliability does not guarantee validity.
6. Test-retest reliability is consistency of scores when the same people take the test twice. Inter-rater reliability is the degree to which different scorers or observers agree on their ratings.

SET B · EXAM-STYLE MULTIPLE CHOICE

7. E. People without listed numbers have no chance of selection, so the sample is not truly random. Random assignment is irrelevant because nothing is being assigned to groups.
9. C. Inconsistent scores over time show low test-retest reliability. Inter-rater reliability concerns agreement between scorers, not repeated testing.
11. D. A narrow, WEIRD sample limits generalizing to other populations. Large size is not a flaw, and the other options concern procedure, not representativeness.
8. A. Stratified sampling matches subgroup proportions. Convenience sampling cannot guarantee proportions.
10. B. Tight control raises internal validity; artificial tasks lower realism. Reversing them is a common error.

SET C · APPLY AND EXTEND

12. (a) Volunteer or convenience sample; self-selection bias because fitness enthusiasts and people who care about exercise respond (1 point each for method and bias). (b) Results cannot be generalized to the general population, including non-exercisers (1 point). (c) Use random or stratified sampling from the population, and measure mood with a validated scale (1 point).
13. Reliability: give it twice to the same people and correlate scores (test-retest), or compare two halves of the test (1 point each for any two correct methods, up to 2 points). Validity: correlate scores with later job performance to test predictive validity (1 point), and check that items sample the key job skills for content or construct validity (1 point).

1.5 Ethics in Psychological Research**SET A · CHECK YOUR UNDERSTANDING**

1. An IRB reviews proposed studies with human participants before they begin. It evaluates risks and benefits, consent procedures, and protections, and it can require changes or reject a study.
2. Participants should be told the purpose of the study, what they will do, the foreseeable risks and benefits, how data will be kept confidential, and that they can withdraw at any time without penalty.
3. Deception is acceptable only when it is necessary to study the question, the risks are minimal, and no alternative exists. Participants must then be debriefed and told the true purpose afterward.
4. Respect for persons means autonomy and informed consent; beneficence means minimizing harm and maximizing benefits; justice means fairly distributing the burdens and benefits of research among groups.

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5. Researchers withheld effective treatment and never gave participants informed consent about the study's purpose. This violated respect for persons, beneficence, and justice and prompted federal reforms.
6. Animals must be treated humanely and housed appropriately, with pain and distress minimized. Research must have a legitimate scientific purpose, use the minimum number of animals, and be reviewed by an animal care committee.

SET B · EXAM-STYLE MULTIPLE CHOICE

7. C. Debriefing happens after the study and reveals deception. Informed consent is obtained before participation, which is the common confusion.
9. A. Protecting identity and records is confidentiality. Justice is about fair distribution of research burdens and benefits.
11. B. IRB approval and informed consent come before data collection. Debriefing is not optional, and approval after the fact defeats the safeguards.
8. E. Milgram's participants believed they were delivering shocks. Zimbardo's study involved role assignments in a mock prison, not obedience to shock commands.
10. D. Selecting a vulnerable group to bear the burdens violates justice. Respect for persons was also violated, but the selection bias points most directly to justice.

SET C · APPLY AND EXTEND

12. Deception: giving false feedback requires justification and that no alternative exists (1 point). Harm: lowering self-esteem or causing distress must be minimal and monitored; the IRB weighs risks and benefits (1 point). Informed consent and withdrawal: participants should be told they may leave at any time (1 point). Debriefing: afterward the researcher must reveal the deception and restore participants' sense of competence (1 point).
13. Both studies caused significant psychological distress, which raised concerns about deception, harm, and the right to withdraw (1 point each, up to 2). Modern safeguards include IRB review of risk, mandatory informed consent with the right to withdraw, and debriefing (1 point for naming one and linking it to a specific problem).

1.6 Descriptive Statistics**SET A · CHECK YOUR UNDERSTANDING**

1. Mean = $40 / 5 = 8$. Median is the middle score, 7. The outlier 15 pulls the mean above the median, indicating positive skew.
3. The median, because the mansions are outliers that inflate the mean in a positively skewed distribution. The median is resistant to extreme values.
5. A negatively skewed distribution has a long tail on the left caused by a few very low scores. The mean is pulled lower than the median.
2. It means scores are spread farther from the mean, so there is greater variability. A smaller SD means scores cluster tightly around the mean.
4. $z = (78 - 70) / 4 = +2.0$. The score is two standard deviations above the mean, near the 97.5th percentile if scores are normal.
6. The negative sign means more video game hours go with lower GPA. A magnitude of .60 is a moderate to strong relationship. It does not show that games cause lower GPA.

SET B · EXAM-STYLE MULTIPLE CHOICE

7. C. Extreme high salaries pull the mean up toward the tail. Choosing the reverse comes from naming skew by the bulk of scores instead of the tail.
9. B. The empirical rule is 68-95-99.7. 68% corresponds to one SD; 99.7% to three SDs.
11. D. Every score contributes to the mean, so one extreme value shifts it. The median depends only on the middle position.
8. A. SD measures spread, and Class Y has the larger SD. The same mean does not mean the same distribution.
10. E. $z = (35 - 50) / 10 = -1.5$. The sign is negative because the score is below the mean.

SET C · APPLY AND EXTEND

12. (a) Sum = 80, mean = 8; median = $(6 + 6) / 2 = 6$ (1 point each). (b) Positively skewed because of the outlier 25 (1 point). (c) Report the median, as it is resistant to the outlier and better represents a typical student (1 point).
13. (a) $z = (250 - 200) / 25 = +2.0$ (1 point). (b) Approximately the 97.5th percentile (1 point). (c) 175 and 225 are one SD below and above the mean, so about 68% (1 point).

1.7 Inferential Statistics and Interpreting Results**SET A · CHECK YOUR UNDERSTANDING**

1. If there were no real effect, results this extreme would occur less than 5% of the time by chance. The result is called statistically significant. It does not prove the hypothesis or show the effect is large.
2. P-values can be significant for trivial differences when samples are large. Effect size shows how big the difference or relationship is, which indicates practical importance.
3. A Type I error is a false positive: concluding an effect exists when it does not. A Type II error is a false negative: failing to detect a real effect.
4. Larger samples reduce random variation and give more stable estimates, so smaller differences can reach significance. This also lowers Type II error risk.
5. It statistically combines results from many studies of the same question into one estimate of effect size. It reduces the impact of any single flawed or small study and provides stronger evidence.

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6. Publication bias leads journals to publish mostly significant results. Small samples and p-hacking, running many analyses until one is significant, produce findings that fail to replicate.

SET B · EXAM-STYLE MULTIPLE CHOICE

7. B. p above .05 means the data do not rule out chance. 'Equally effective' overinterprets a nonsignificant result.
9. A. Larger samples improve precision and statistical power. More variability or less reliability only add noise.
11. D. Preregistration stops flexible analysis after seeing the data. The other options increase false positives.
8. E. Concluding there is an effect when none exists is a false positive, a Type I error. Type II would be missing a real effect.
10. C. With enormous samples even trivial effects reach significance. Effect size shows it is practically negligible.

SET C · APPLY AND EXTEND

12. (a) No, because $p = .08$ is not below .05 (1 point). (b) A Type II error, since a real effect may exist but the small sample lacked power (1 point). (c) Increase the sample size or reduce variability, then replicate (1 point).
13. Replication repeats the study with new participants; a real effect should appear again, while a fluke should not (1 point). Meta-analysis pools many studies to estimate the overall effect size, reducing the influence of chance and of any one sample (1 point). Together they provide stronger evidence than one $p < .05$ result, and they can expose publication bias (1 point).

1.8 Multiple-Choice Practice: Scientific Foundations and Research Methods

SET A · CORE CONCEPTS

1. C. Wundt and Titchener sought the elements of experience through introspection. Functionalism studied the purpose of mental processes instead.
3. B. Manipulation with random assignment defines an experiment. Comparing self-selected club members is quasi-experimental.
5. D. Expectation of treatment can reduce reported pain. Experimenter bias involves researchers' expectations, not participants'.
7. C. Debriefing reveals the deception and answers questions after participation. Informed consent happens beforehand.
2. A. Behavior maintained by consequences is the behavioral view. The psychodynamic view would instead emphasize unconscious conflicts.
4. E. The sign shows direction and .80 shows strength. A causal statement is unsupported by correlational data.
6. A. It states how happiness will be measured. A hypothesis would be a testable prediction.

SET B · APPLICATIONS AND DATA

8. D. Choosing at fixed intervals from a list gives each person a near-equal chance. Stratified requires subgroup proportions.
10. E. Consistency shows reliability, and failure to predict outcomes shows poor validity. A valid test must also be reliable.
12. A. Random assignment with an equal task controls confounds. The comparison of naturally occurring groups is correlational.
14. D. Finding an effect that is not real is a false positive. A Type II error is missing a real effect.
9. B. A small SD means scores cluster near the mean. Same means do not imply the same spread.
11. C. Self-selected students are WEIRD and not representative. Large size does not fix bias.
13. B. p below .05 shows significance. Causation depends on random assignment, which is not stated.

SET C · EXAM-LEVEL STRETCH

15. E. Harm and the ability to stop participating are central. Random assignment was used in the study but is a method, not an ethical safeguard.
17. C. Wealth could cause both pet ownership and low stress. Directionality is a different problem.
19. B. It pools findings quantitatively. It cannot prove a hypothesis, and replication remains important.
16. A. Downward slope means negative; tight clustering means strong. +.90 would slope upward.
18. D. Tail direction names the skew, and the tail pulls the mean toward it. The negative-skew choice misnames the tail.
20. E. Observing behavior in its natural setting without interference is naturalistic observation. Double-blind refers to an experimental procedure.

1.9 Free-Response Practice: Scientific Foundations and Research Methods

QUESTION 1 · ARTICLE ANALYSIS: SLEEP AND MEMORY

1. 1 point: IV is hours of sleep (8 versus 4). 1 point: DV is the number of word pairs recalled, which is also an operational measure of memory.
2. 1 point: scorers were blind to group membership (reducing experimenter bias), or random assignment equated groups. 1 point: remaining threat such as participants knowing their condition (demand characteristics) or the volunteer, college-student sample.
3. 1 point: $p = .01$ means that if sleep had no effect, a difference this large would occur only about 1% of the time, so the result is statistically significant. 1 point: the generalization is not justified because the sample was volunteer college students, limiting external validity.

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QUESTION 2 · EVIDENCE-BASED: SURVEY AND CORRELATION

4. 1 point: positive direction (more minutes go with more loneliness). 1 point: moderate strength.
5. 1 point: correlation does not show causation. 1 point: directionality (lonely students may use social media more). 1 point: a third variable such as anxiety or poor family relationships could cause both.
6. 1 point: randomly assign students to limit social media use or continue normal use. 1 point: measure loneliness with the same scale afterward and compare. 1 point: identify a control such as the same time period or measure for both groups.
7. 1 point: social desirability or inaccurate recall means answers may not reflect true behavior or feelings.

QUESTION 3 · ETHICS IN RESEARCH

8. 1 point: participants cannot give fully informed consent because the real purpose is hidden, and they may experience distress or embarrassment.
9. 1 point: obtain IRB approval after showing no non-deceptive alternative exists. 1 point: debrief participants afterward and offer to remove their data.
10. 1 point: parents or guardians give informed consent. 1 point: students give assent and may withdraw anytime without penalty.

QUESTION 4 · EVIDENCE-BASED: STATISTICS AND VALIDITY

11. 1 point: Class 1 mean = $420 / 6 = 70$. 1 point: Class 2 median = $(70 + 71) / 2 = 70.5$.
12. 1 point: Class 2 scores are far more spread out. 1 point: standard deviation (or range) shows this variability.
13. 1 point: the test is reliable because scores are consistent. 1 point: it lacks validity because it does not measure or predict what it claims.

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Chapter 2: Biological Bases of Behavior.

11 sections with explanations and worked examples, then 153 practice problems. Answers and full explanations are at the end of the chapter.

2.1 Heredity, Environment, and Evolution

Learn how genes, chromosomes, and environment combine to shape behavior, and how research designs and evolutionary theory are used to study that.

Psychologists ask how much of any trait comes from nature (biology) and how much from nurture (experience). The AP answer is almost always "both, interacting." This lesson gives you the vocabulary and the research designs used to tease the two apart.

Chromosomes are threadlike structures in the nucleus of every cell. Humans have 23 pairs (46 total), one set of 23 from each parent. Each chromosome is a long molecule of **DNA** (deoxyribonucleic acid), and a **gene** is a segment of DNA that codes for a protein and so helps build and run the body. The complete set of genetic instructions is the **genome**. The **genotype** is your genetic makeup; the **phenotype** is the observable result of genes plus environment (height, personality, behavior). Some genes are **dominant** (expressed if one copy is present) and some **recessive** (expressed only with two copies). Most psychological traits are **polygenic**, meaning many genes each add a small effect, so no single "intelligence gene" or "anxiety gene" exists.

Key terms

Genotype = genetic code; phenotype = observable traits.

Polygenic = many genes influence one trait.

Behavior genetics = the study of how genes and environment influence individual differences in behavior.

Behavior genetics uses natural experiments in families. **Monozygotic (identical) twins** come from one fertilized egg and share essentially 100 percent of their genes. **Dizygotic (fraternal) twins** come from two eggs and share about 50 percent, like ordinary siblings. If identical twins resemble each other more than fraternal twins on a trait, genes probably matter. **Adoption studies** compare adopted children with their biological relatives (shared genes, different environment) and adoptive relatives (shared environment, different genes). Studies of identical twins raised apart are especially powerful because shared genes are separated from shared home environment.

Design	What is compared	If similarity is higher, it suggests
Twins reared together	Identical vs. fraternal pairs	Genetic influence (identical > fraternal)
Twins reared apart	Identical twins in different homes	Genetic influence despite different environments
Adoption study	Adoptee vs. biological and adoptive family	Genes (bio relatives) or environment (adoptive relatives)

Heritability is a statistic (0 to 1) estimating the proportion of the variation in a trait, within a particular population, that is due to genetic differences. It describes groups, not individuals. A heritability of .50 for a trait does not mean 50 percent of your personality comes from genes. It also is not fixed: it depends on how much the environment varies. If everyone gets identical nutrition, height differences will be mostly genetic, yet nutrition can still change average height. Heritability also says nothing about whether group differences between populations are genetic.

Heritability rule

Heritability applies to variation in a population, not to one person.

High heritability does NOT mean a trait is unchangeable.

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Gene-environment interaction means the effect of a gene depends on the environment, and vice versa. A person with a genetic risk for depression may only develop it after severe stress. **Epigenetics** studies chemical tags (such as methyl groups) attached to DNA that switch genes on or off without changing the DNA sequence itself. Experiences such as stress, diet, or poor early care can change these tags, and some changes can persist across time. Identical twins become less alike in gene expression as they age, which helps explain differences between them. Related ideas include **passive** (parents supply both genes and environment), **evocative** (a child's traits draw out responses), and **active** (people choose environments that fit their genes) gene-environment correlations.

EXAMPLE 1: TWIN DATA

A researcher measures extraversion in 100 pairs of identical twins and 100 pairs of fraternal twins. The correlation is .52 for identical pairs and .25 for fraternal pairs. Interpret the results.

SOLUTION

Step 1: Identical twins share nearly 100 percent of genes and fraternal about 50 percent, and both pairs share a similar home environment.

Step 2: Identical pairs are more alike (.52 > .25), so genes appear to influence extraversion.

Step 3: Identical twins are not perfectly correlated (.52, not 1.0), so environment, unique experiences, and epigenetic differences also matter.

Conclusion: Extraversion is moderately heritable and also environmentally influenced.

Natural selection, proposed by Charles Darwin, states that inherited traits that improve survival and reproduction in a given environment become more common in a population over generations. It requires variation among individuals, heritability of the variation, and differential reproductive success. Mutations and sexual recombination supply new variation. **Evolutionary psychology** applies this logic to the mind, asking how mental traits (fear of snakes, mate preferences, language ability) may have solved survival or reproductive problems of our ancestors. Critics say its explanations can be untestable "just-so stories," that it can overlook culture, and that current behavior may not match ancient conditions.

EXAMPLE 2: EVOLUTIONARY EXPLANATION

Many people develop fear of snakes and heights more easily than fear of flowers or cars. Explain this using evolutionary psychology and name one criticism.

SOLUTION

Step 1: Ancestors who quickly learned to avoid snakes and cliffs were more likely to survive and reproduce.

Step 2: Prepared fear responses were passed on, so they are more common today.

Criticism: The explanation is hard to test directly and may ignore learning and culture; it is explained after the fact.

Concept	Quick meaning	Example
Mutation	Random change in a gene	New variant that may help or harm
Natural selection	Adaptive traits spread	Camouflage in prey
Epigenetics	Gene expression changes, DNA unchanged	Stress-related methylation

Common mistakes

Do not say heritability tells you how much of one person's trait is genetic. Do not say a gene "causes" a complex behavior; genes only influence risk. Do not confuse epigenetics (changes in expression) with mutation (changes in the DNA sequence).

Practice

SET A Check Your Understanding

Answer each question in 1 to 3 sentences.

1. Distinguish genotype from phenotype and give one example of each.
2. Why are identical twins reared apart so valuable to behavior geneticists?
3. Explain why most psychological traits are described as polygenic.
4. A trait has a heritability of .80 in a population. Why can't we conclude that 80 percent of one person's trait is genetic?

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5. Define epigenetics and give an example of an environmental factor that can influence it.
6. List the three conditions necessary for natural selection.

SET B Exam-Style Multiple Choice

Choose the best answer.

7. A study finds that adopted children are more similar in IQ to their biological parents than to their adoptive parents. This best supports the conclusion that
 - (A) parenting style is the only cause of IQ differences
 - (B) IQ is fixed at birth and cannot change
 - (C) genetic factors contribute to individual differences in IQ
 - (D) the home environment has no effect on any trait
 - (E) IQ is determined by a single dominant gene
8. Identical twins correlate .60 on a trait and fraternal twins correlate .30. Which interpretation is best supported?
 - (A) Genes influence the trait, but environment also plays a role
 - (B) The trait is entirely genetic
 - (C) The trait is entirely environmental
 - (D) Fraternal twins share no genes
 - (E) Heritability applies to each twin individually
9. Which statement about heritability is accurate?
 - (A) It states the percentage of an individual's trait caused by genes
 - (B) It shows that a trait cannot be changed by experience
 - (C) It remains constant across all environments
 - (D) It explains the cause of average differences between different groups
 - (E) It estimates the proportion of variation in a trait within a population that is linked to genetic differences
10. A child with a genetic predisposition for shyness is raised by supportive parents and gradually becomes socially confident. This is best described as an example of
 - (A) a mutation
 - (B) gene-environment interaction
 - (C) natural selection acting on the child
 - (D) a recessive trait being dominant
 - (E) a purely genetic outcome
11. Researchers find that rats who receive little maternal licking show chemical tags on a stress-related gene that reduce its activity, with no change in the DNA sequence. This finding illustrates
 - (A) a point mutation
 - (B) genotype determining phenotype with no environmental input
 - (C) polygenic inheritance
 - (D) epigenetic change
 - (E) the all-or-none principle

SET C Apply and Extend

Write a full response; use specific terms from the lesson.

12. A researcher compares depression rates in adopted adults with those of their biological parents and their adoptive parents. (a) Identify the research method. (b) State a result that would support a genetic influence. (c) Explain one limitation of this method.
13. Explain how natural selection could have produced a human tendency to prefer sweet and fatty foods, and then explain one reason this evolutionary explanation might be criticized.

2.2 Neurons and Neural Communication

Trace a message through a neuron and across the synapse, and explain how firing is controlled.

Every thought, movement, and feeling depends on cells that communicate through electrical and chemical signals. This lesson follows a message from one neuron to the next.

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A **neuron** is a nerve cell. Its **dendrites** are branching fibers that receive messages from other neurons. The **cell body (soma)** contains the nucleus and integrates incoming signals. The **axon** is a long fiber that carries the message away, often wrapped in a fatty **myelin sheath** that insulates it and speeds conduction; in myelinated axons the impulse jumps between gaps called nodes of Ranvier. The axon ends in **terminal buttons** (axon terminals) that hold vesicles of neurotransmitters. Multiple sclerosis is a disease in which myelin deteriorates, slowing messages and impairing movement. **Glial cells** support neurons by providing nutrients, removing waste, forming myelin, and guiding neural connections; they outnumber neurons.

By function, **sensory (afferent) neurons** carry information from the senses to the central nervous system, **motor (efferent) neurons** carry commands to muscles and glands, and **interneurons** connect neurons within the brain and spinal cord, making up most of the nervous system. A simple reflex such as pulling away from a hot pan uses a spinal circuit of sensory neuron, interneuron, and motor neuron without waiting for the brain.

Neural firing. A resting neuron is polarized: the inside is about -70 millivolts relative to the outside, called the **resting potential**. Ion channels in the membrane keep more sodium (Na⁺) outside and more potassium (K⁺) inside. When stimulation from other neurons pushes the cell past its **threshold** (the minimum level of stimulation needed to fire), channels open, sodium rushes in, and the inside becomes positive for an instant. This brief electrical charge traveling down the axon is the **action potential**. Afterward potassium flows out, and during the **refractory period** the neuron cannot fire again until it resets.

All-or-none principle

A neuron either fires completely or not at all. Stronger stimulation does not make a bigger action potential. Intensity is coded by how often neurons fire (rate) and by how many neurons fire, not by spike size.

Stage	What happens	Electrical state
Resting potential	Ions positioned, neuron waiting	About -70 mV, polarized
Threshold reached	Sodium channels open	Rapid change
Action potential	Na ⁺ enters, spike travels down axon	Brief positive charge
Refractory period	K ⁺ leaves, cell resets	Cannot fire again yet

Synaptic transmission. Neurons do not touch. A tiny gap, the **synapse** (synaptic cleft), separates the terminal buttons of the sending neuron from the dendrite of the receiving neuron. When the action potential reaches the terminal, vesicles release **neurotransmitters** that cross the gap and bind to **receptor sites** on the next neuron, like a key fitting a lock. A neurotransmitter has an **excitatory** effect if it makes the receiving neuron more likely to fire, or an **inhibitory** effect if it makes firing less likely. The receiving neuron sums all the excitatory and inhibitory inputs it receives; only if the net result crosses threshold does it fire.

After release, leftover neurotransmitter must be cleared. Most is taken back into the sending neuron's terminal in a process called **reuptake**; some is broken down by enzymes or drifts away. Many psychiatric medications work by altering this step. For example, SSRIs (selective serotonin reuptake inhibitors) block reuptake of serotonin so it stays in the synapse longer.

Message pathway

Dendrites receive → soma integrates → axon conducts → terminal buttons release neurotransmitter → across synapse → receptors on next neuron.

Electrical inside the neuron, chemical between neurons.

EXAMPLE 1: READING A SCENARIO

A neuron receives many weak excitatory signals and a few inhibitory signals. The net effect stays below threshold. What happens, and what would change if the excitatory signals became stronger?

SOLUTION

Step 1: The neuron sums excitatory and inhibitory inputs.

Step 2: Net input is below threshold, so no action potential occurs (all-or-none: no partial spike).

Step 3: If stronger input pushes the net effect past threshold, a full-size action potential fires. Greater stimulation would increase firing rate, not spike size.

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EXAMPLE 2: DRUG ACTION

A drug blocks reuptake of a neurotransmitter. Predict the effect on the synapse and on the postsynaptic neuron.

SOLUTION

Step 1: Reuptake normally removes neurotransmitter from the cleft.

Step 2: Blocking it leaves more neurotransmitter in the synapse for longer.

Step 3: The receptors are stimulated more often and longer, so the effect of that neurotransmitter is prolonged (excitatory or inhibitory depending on the transmitter).

Why it matters for behavior. Because neurons fire on an all-or-none basis, the nervous system builds complex information from simple signals. A faint touch recruits a few neurons firing slowly; a hard press recruits many neurons firing rapidly. Speed also varies: thick, myelinated axons conduct at up to about 100 meters per second, while thin unmyelinated fibers are far slower. Neurotransmitter systems add flexibility, because the same transmitter can excite one receiving neuron and inhibit another depending on the receptor. Learning itself strengthens connections, so synapses used often become more efficient, a process called long-term potentiation that supports memory.

Common mistakes

The action potential is not a chemical; it is electrical. Neurotransmitters are chemical and cross the synapse. Do not say a stronger stimulus produces a bigger action potential: it produces more frequent ones. Excitatory does not mean "good" and inhibitory does not mean "bad."

Practice**SET A Check Your Understanding**

Answer each question in 1 to 3 sentences.

1. Name the part of the neuron that receives messages and the part that sends them.
2. What is the function of the myelin sheath, and what happens when it deteriorates?
3. Explain the all-or-none principle.
4. Describe the resting potential and what ions help create it.
5. What role do glial cells play?
6. What happens to a neurotransmitter during reuptake, and why does that matter for medication?

SET B Exam-Style Multiple Choice

Choose the best answer.

7. Which sequence correctly lists the path of a neural message within a single neuron?
(A) terminal buttons, axon, cell body, dendrites
(B) axon, dendrites, cell body, terminal buttons
(C) cell body, dendrites, terminal buttons, axon
(D) dendrites, cell body, axon, terminal buttons
(E) dendrites, axon, terminal buttons, cell body
8. A researcher states that a stronger stimulus produces a larger action potential. This claim is incorrect because
(A) the refractory period lasts forever
(B) action potentials follow the all-or-none principle
(C) myelin changes the size of the spike
(D) glial cells control spike size
(E) neurotransmitters carry the action potential down the axon
9. The gap between the terminal buttons of one neuron and the dendrite of the next is called the
(A) node of Ranvier
(B) myelin sheath
(C) threshold
(D) soma
(E) synapse
10. A neuron receives input that is the sum of strong excitatory and weaker inhibitory signals. The neuron will fire if
(A) inhibitory signals are removed by reuptake only
(B) the myelin sheath is thickened
(C) the net effect reaches threshold
(D) the refractory period is shortened to zero
(E) glial cells release dopamine

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11. Which is the best example of an interneuron's role?
- (A) Linking a sensory neuron to a motor neuron in the spinal cord during a reflex
 - (B) Carrying commands from the brain to a leg muscle
 - (C) Detecting light in the retina and sending it toward the brain
 - (D) Forming the myelin around axons
 - (E) Releasing hormones into the bloodstream

SET C Apply and Extend

Write a full response; use specific terms from the lesson.

12. A student claims, "Neurons communicate only by electricity." Evaluate this claim by describing both the electrical and chemical stages of neural communication.
13. A new medication prevents the reuptake of a neurotransmitter that is mostly inhibitory. (a) Predict the effect on neural firing. (b) Explain why the effect is not an increase in action potential size.

2.3 Neurotransmitters, Hormones, and Drugs

Identify the major neurotransmitters and hormones, what they do, and how drugs change their action.

The nervous system sends fast chemical messages across synapses (neurotransmitters), while the endocrine system sends slower, longer-lasting chemical messages through the bloodstream (hormones). Both systems affect mood, behavior, and the body's response to stress.

Neurotransmitters are chemical messengers released into the synapse. Each fits particular receptors, and the same one can have different effects in different brain regions. The ones tested most often are below.

Neurotransmitter	Main functions	Imbalance linked to
Acetylcholine (ACh)	Muscle contraction, learning and memory	Alzheimer's disease (loss of ACh neurons); curare blocks ACh and causes paralysis
Dopamine	Movement, reward, motivation, attention	Parkinson's disease (too little); schizophrenia (overactivity)
Serotonin	Mood, sleep, hunger, arousal	Depression, anxiety, OCD (low levels)
Norepinephrine	Alertness, arousal, fight-or-flight	Depression (low), anxiety/stress (high)
GABA	Main inhibitory transmitter; calms activity	Anxiety, seizures, tremors when too little
Glutamate	Main excitatory transmitter; learning and memory	Overstimulation can cause migraines and seizures
Endorphins	Natural pain relief and pleasure ("runner's high")	Opioid drugs mimic them

Remember

GABA = main inhibitory; glutamate = main excitatory.

Dopamine too little = Parkinson's; too much activity = schizophrenia symptoms.

ACh loss = Alzheimer's and memory problems.

Drugs and neurotransmitters. Psychoactive drugs and medications change synaptic activity in two main ways. An **agonist** mimics a neurotransmitter or increases its action by binding receptors, increasing release, or blocking reuptake. An **antagonist** blocks receptors or reduces release, so the neurotransmitter has less effect. Morphine and heroin are agonists of the endorphin system. Botulin toxin blocks ACh release (antagonist), causing paralysis. Black widow venom floods the synapse with ACh (agonist), causing violent muscle contractions. When the brain receives an agonist, it may reduce its own production, which is part of why tolerance and withdrawal occur.

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EXAMPLE 1: AGONIST OR ANTAGONIST

A drug binds to dopamine receptors and activates them even when no dopamine is present. Another drug binds to the same receptors but does not activate them and prevents dopamine from attaching. Classify each and predict the effect on dopamine signaling.

SOLUTION

Step 1: The first drug mimics dopamine and activates the receptor: it is an agonist, so dopamine signaling is increased.

Step 2: The second occupies receptors without activating them, blocking dopamine: it is an antagonist, so dopamine signaling is decreased.

Step 3: Many antipsychotic drugs act as dopamine antagonists, which is why they can reduce hallucinations but sometimes cause movement problems resembling Parkinson's disease.

The endocrine system is a set of glands that secrete **hormones** into the bloodstream, where they travel to target tissues. Hormones act more slowly than neurotransmitters but their effects last longer. The nervous and endocrine systems are linked by the hypothalamus, which signals the **pituitary gland** at the base of the brain. The pituitary is called the "master gland" because it releases hormones that regulate other glands, such as growth hormone and hormones that stimulate the thyroid, adrenals, and gonads. It also releases oxytocin (bonding, childbirth, nursing) and antidiuretic hormone.

Gland	Key hormone(s)	Behavioral role
Pituitary	Growth hormone, oxytocin, others	Master gland; growth, bonding
Thyroid	Thyroxine	Metabolism rate
Adrenal glands	Epinephrine (adrenaline), norepinephrine, cortisol	Arousal and stress response
Pancreas	Insulin, glucagon	Blood sugar and hunger
Gonads (ovaries, testes)	Estrogens, testosterone	Sexual development and drive
Pineal	Melatonin	Sleep-wake rhythm

Stress response

Stress activates the sympathetic nervous system; the adrenal medulla releases epinephrine and norepinephrine (quick arousal). Longer stress triggers the hypothalamus and pituitary to signal the adrenal cortex to release cortisol, which raises blood sugar but suppresses the immune system if prolonged.

EXAMPLE 2: TRACING A HORMONAL CHAIN

A student is startled by a loud noise before a test and still feels shaky 20 minutes later. Explain the biological response.

SOLUTION

Step 1: The sympathetic nervous system immediately signals the adrenal glands to release epinephrine and norepinephrine, causing racing heart and sweating.

Step 2: Hormones travel in the blood, so effects persist after the neural signal ends, explaining the lingering shakiness.

Step 3: If the stress continues, cortisol is released, keeping the body mobilized.

Putting the systems together. Neurotransmitters and hormones overlap: norepinephrine works as a neurotransmitter in the brain and as a hormone released by the adrenal glands. Endorphins are released after injury or intense exercise and dull pain, which is why some athletes feel relief only after the event. Oxytocin promotes trust and attachment, which is why it is sometimes called the bonding hormone. Because hormones regulate growth, metabolism, sexual development, and stress, an imbalance can alter behavior over long periods. For instance, an underactive thyroid can produce fatigue and low mood, while an overactive one can produce nervousness and weight loss. Epinephrine, also called adrenaline, speeds the heart and diverts blood to muscles, while cortisol raises blood sugar for sustained effort. Psychologists therefore treat biology and behavior as a two-way street: stress changes hormone levels, and hormone levels change how people think, feel, and act. Keep the two systems straight by remembering that the nervous system is the fast messenger and the endocrine system is the slow, steady one.

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Exam tip

Be able to name the direction of change. Agonists increase a neurotransmitter's effect; antagonists decrease it. Do not describe a drug as agonist or antagonist without saying of which neurotransmitter. Hormones travel in the blood and are slower, while neurotransmitters cross the synapse and are fast.

Practice**SET A Check Your Understanding**

Answer each question in 1 to 3 sentences.

1. Which neurotransmitter is linked to Alzheimer's disease and to muscle contraction?
2. Explain the difference between an agonist and an antagonist.
3. What is the relationship between low serotonin and mood disorders?
4. Why is the pituitary called the "master gland"?
5. Contrast the speed and duration of neurotransmitters and hormones.
6. Name the main excitatory and the main inhibitory neurotransmitters and give a consequence of too little inhibition.

SET B Exam-Style Multiple Choice

Choose the best answer.

7. A person with Parkinson's disease has trouble initiating movement. The disorder is most closely associated with a deficit of
(A) GABA (B) endorphins (C) glutamate
(D) melatonin (E) dopamine
8. A drug similar to morphine reduces pain by binding to endorphin receptors. The drug is best described as
(A) an endorphin agonist (B) an acetylcholine antagonist
(C) a dopamine reuptake blocker only (D) a GABA antagonist
(E) an endorphin antagonist
9. Which hormone gland is most directly controlled by the hypothalamus and regulates other glands?
(A) The pancreas (B) The thyroid gland (C) The pineal gland
(D) The pituitary gland (E) The testes
10. During a prolonged exam period, a student shows high cortisol levels and catches colds frequently. Which explanation is most consistent?
(A) Cortisol boosts white blood cell production during long stress
(B) Chronic stress releases cortisol, which can suppress the immune system
(C) Epinephrine permanently blocks the immune response
(D) Insulin lowers cortisol and lets germs spread
(E) Melatonin is released by the adrenal glands under stress
11. A neurotoxin blocks the release of acetylcholine at the junction between nerves and muscle. The most likely effect is
(A) muscle spasms (B) increased memory (C) paralysis
(D) hallucinations (E) a rush of pleasure

SET C Apply and Extend

Write a full response; use specific terms from the lesson.

12. An experiment gives participants a drug that blocks reuptake of norepinephrine and serotonin. (a) Predict the effect on neurotransmitter levels in the synapse. (b) Name one mood-related behavior that might change. (c) Explain whether the drug is an agonist or antagonist.
13. Compare how the nervous system and the endocrine system respond to a sudden threat and then to prolonged stress. Include at least two named hormones.

2.4 The Nervous System and Brain Structures

Map the divisions of the nervous system and the structures and lobes of the brain, with what each does.

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The nervous system is the body's communication network, and the brain is its command center. This lesson maps the divisions of the nervous system and the major brain structures with their functions, which are among the most frequently tested facts in the course.

The **central nervous system (CNS)** consists of the brain and spinal cord. The **peripheral nervous system (PNS)** consists of all the nerves linking the CNS to the rest of the body. The PNS has two parts. The **somatic nervous system** carries sensory information in and controls voluntary skeletal muscles. The **autonomic nervous system** controls glands and the muscles of internal organs, largely without conscious effort, and has two branches. The **sympathetic division** arouses the body for action (fight or flight): heart rate and breathing rise, pupils dilate, digestion slows. The **parasympathetic division** calms the body and conserves energy (rest and digest): heart rate falls, digestion resumes.

Division	Role	Example
Somatic	Voluntary movement; sensory input	Lifting a cup
Sympathetic	Arouses, mobilizes energy	Racing heart before a speech
Parasympathetic	Calms, restores	Slowing breathing after the speech
Spinal cord	Reflexes and relay to brain	Knee-jerk

Nervous system tree

Nervous system → CNS (brain, spinal cord) and PNS.

PNS → somatic (voluntary) and autonomic (automatic).

Autonomic → sympathetic (arouse) and parasympathetic (calm).

The brain is often described in three layers. The **brainstem**, the oldest part, includes the **medulla** (controls heartbeat and breathing), the **pons** (helps coordinate movement and sleep) and the reticular formation (alertness and arousal). The **thalamus** sits on top of the brainstem and acts as a sensory switchboard, routing signals from all senses except smell to the cortex. The **cerebellum**, at the rear base of the brain, coordinates voluntary movement, balance, and procedural learning; damage causes clumsy, uncoordinated movement.

The **limbic system** is a ring of structures between the brainstem and cortex tied to emotion, memory, and drives. The **hypothalamus**, just below the thalamus, regulates hunger, thirst, body temperature, sexual behavior, and directs the pituitary gland. The **hippocampus** forms new explicit (conscious) memories; damage prevents forming new ones. The **amygdala** processes emotion, especially fear and aggression; its stimulation can produce rage or fear responses.

Structure	Main function	If damaged or overactive
Medulla	Heartbeat, breathing	Life-threatening
Cerebellum	Balance, coordination	Clumsy movement, poor balance
Thalamus	Sensory relay	Sensory processing disruption
Hypothalamus	Hunger, thirst, temperature, hormones	Eating, temperature disruptions
Hippocampus	Forming new explicit memories	Cannot form new memories
Amygdala	Fear, aggression, emotional memory	Reduced or exaggerated fear

The **cerebral cortex** is the thin, wrinkled outer layer of the cerebral hemispheres, the body's ultimate control and information-processing center. Folds (wrinkling) give it large surface area. Each hemisphere has four lobes. The **frontal lobes** handle planning, judgment, decision making, personality, and voluntary movement; the **motor cortex** at the rear of the frontal lobe sends commands to muscles, and **Broca's area** (usually left) controls speech production. The **parietal lobes** include the **somatosensory cortex**, which registers touch, pressure, temperature, and pain, and the **occipital lobes** hold the visual cortex. The **temporal lobes** process hearing, and contain the auditory cortex, and **Wernicke's area** for language comprehension. Body areas with greater sensitivity or fine control, such as the lips and fingers, take up more cortical space.

Lobe memory aid

Frontal = Future/Function (planning, movement, speech production).

Parietal = Pressure (touch).

Occipital = Optical (vision, at the back).

Temporal = Tune (hearing, language comprehension, near the temples).

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Association areas are regions of cortex not directly involved in sensory or motor functions. They integrate information, supporting thinking, memory, language, and attention. Much of the frontal lobe is association cortex; damage can change personality or judgment without causing paralysis or blindness. Larger association areas in humans compared with other animals help explain our advanced reasoning. The spinal cord also matters: it carries messages between the brain and body and handles simple reflexes by itself, which is why you pull your hand from a flame before you feel the pain. Severing the spinal cord blocks messages above and below the injury, producing paralysis and loss of sensation below it.

EXAMPLE 1: LOCALIZING A SYMPTOM

After a car accident, a patient can see objects normally and can feel her arm being touched, and can hear sounds, but she cannot make sense of what people say to her even though her own speech is fluent. Which lobe is most likely involved?

SOLUTION

Step 1: Vision and touch are intact, so occipital and parietal lobes appear unaffected.

Step 2: Difficulty understanding speech points to Wernicke's area.

Step 3: Wernicke's area is in the temporal lobe (usually left), so damage there is most likely.

EXAMPLE 2: AUTONOMIC RESPONSE

A student walks into an exam, hears the instructor call the time, and feels sweaty hands and a pounding heart. Later, after finishing, her breathing slows and she feels relaxed. Identify the systems.

SOLUTION

Step 1: Pounding heart and sweating during stress reflect the sympathetic division of the autonomic nervous system.

Step 2: The return to calm reflects the parasympathetic division.

Step 3: Both are part of the autonomic nervous system in the PNS; consciously raising her hand uses the somatic system.

Common mistakes

The autonomic system is not part of the CNS; it is in the PNS. Do not say the hippocampus stores all memories (it helps form new explicit ones). The thalamus does not relay smell. Do not claim Broca's area understands speech: it produces it.

Practice**SET A Check Your Understanding**

Answer each question in 1 to 3 sentences.

1. Distinguish the CNS from the PNS.
2. Describe how the sympathetic and parasympathetic divisions differ in their effects on heart rate and digestion.
3. What does the cerebellum do, and what would damage to it look like?
4. Why is the hypothalamus important for both behavior and the endocrine system?
5. Identify the functions of the amygdala and the hippocampus.
6. Name the four lobes of the cerebral cortex and one function of each.

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SET B Exam-Style Multiple Choice

Choose the best answer.

7. A patient cannot form new conscious memories of recent events but can recall events from childhood. Which structure is most likely damaged?
 - (A) The cerebellum
 - (B) The hippocampus
 - (C) The medulla
 - (D) The amygdala
 - (E) The occipital lobe
8. A person suddenly sees a bear and her heart pounds while digestion stops. This response is mediated by the
 - (A) somatic nervous system
 - (B) parasympathetic nervous system
 - (C) sympathetic nervous system
 - (D) association areas
 - (E) cerebellum
9. Which structure acts as the brain's sensory switchboard, routing incoming information (except smell) to the cortex?
 - (A) The thalamus
 - (B) The hypothalamus
 - (C) The pons
 - (D) The cerebellum
 - (E) The amygdala
10. A stroke damages the left frontal lobe near the motor cortex, and the person understands speech but speaks in halting, effortful phrases. The damaged region is probably
 - (A) Wernicke's area
 - (B) the visual cortex
 - (C) the somatosensory cortex
 - (D) Broca's area
 - (E) the reticular formation
11. Compared with the brainstem, the association areas of the cortex are primarily involved in
 - (A) regulating heartbeat
 - (B) coordinating balance
 - (C) relaying sensory information to the cortex
 - (D) controlling reflexes
 - (E) integrating information for thinking, planning, and language

SET C Apply and Extend

Write a full response; use specific terms from the lesson.

12. A researcher studies a patient with damage to the right parietal lobe and the left temporal lobe. (a) Predict one sensory problem from each lesion. (b) Explain which lobe would NOT be needed to see an object.
13. A pilot is calm during routine flying but experiences an emergency. Describe the nervous system changes that occur, naming at least three structures or divisions, and explain how the body returns to normal.

2.5 Brain Research, Lateralization, and Plasticity

Compare brain-imaging tools, explain what split-brain and aphasia research reveals, and describe how the brain changes.

Because we cannot simply open a living skull, psychologists rely on tools that record or image the brain, on studies of people with brain damage, and on experiments with the two hemispheres. This lesson covers those tools, what they show, and the brain's remarkable ability to change.

Tools for studying the brain. Some tools record activity and others show structure. An **EEG (electroencephalogram)** uses electrodes on the scalp to record the brain's electrical waves; it has excellent timing and is key for studying sleep, but poor spatial detail. A **CT scan** combines many X-ray images to show brain structure, such as damage or tumors. An **MRI** uses magnetic fields and radio waves to produce detailed images of soft tissue structure. A **PET scan** tracks where a radioactive form of glucose goes in the brain; active areas use more glucose. An **fMRI (functional MRI)** measures blood flow and oxygen use to show which areas are active during a task, combining structure and function. A **lesion** is tissue destruction, whether from accident or deliberate in animal research, used to see what behaviors are lost.

Tool	Shows	Strength	Limit
EEG	Electrical activity (brain waves)	Millisecond timing, sleep	Poor location detail
CT	Structure	Fast, detects damage	Radiation; no activity
MRI	Detailed structure	Clear soft-tissue images	No activity
PET	Metabolic activity (glucose)	Shows function	Injected tracer, slow
fMRI	Blood-flow activity	Function plus structure	Indirect measure; slower than EEG

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Structure vs. function

Structure: CT, MRI. Activity: EEG, PET, fMRI.

fMRI shows which areas are active in a task; correlation, not proof that an area is required.

Language and the left hemisphere. In 1861 Paul Broca studied a patient who could understand speech but could produce only one syllable; damage was in the left frontal lobe, now called **Broca's area**. In 1874 Carl Wernicke linked damage in the left temporal lobe to speech that is fluent but meaningless, with poor comprehension: **Wernicke's area**. **Aphasia** is impairment of language caused by brain damage. Broca's aphasia produces halting, effortful speech with understanding mostly intact. Wernicke's aphasia produces fluent but nonsensical speech and poor comprehension.

The divided brain. The two hemispheres are connected by the **corpus callosum**, a band of fibers carrying messages between them. To reduce severe epileptic seizures, surgeons sometimes cut the corpus callosum, producing **split-brain** patients. Roger Sperry and Michael Gazzaniga then showed information to just one visual field. Because each hemisphere processes the opposite visual field, a word flashed to the right visual field goes to the left hemisphere, which can name it. A picture flashed to the left visual field goes to the right hemisphere, which cannot speak but can direct the left hand to pick out the matching object. The patient may say they saw nothing while the left hand points correctly.

Left hemisphere (most people)	Right hemisphere
Language: speaking, reading, writing	Spatial tasks, face recognition
Logic, detail	Making inferences, holistic perception, visual patterns
Controls right side of body	Controls left side of body

Common mistakes

Do not say people are 'left-brained' or 'right-brained'; both hemispheres work together in normal brains. Do not say fMRI shows the brain 'lighting up' as proof one area causes a behavior. Note which visual field goes to which hemisphere: the right visual field goes to the left hemisphere.

Plasticity and damage. **Neuroplasticity** is the brain's ability to change by forming new neural connections, strengthening or pruning others, and reassigning functions after experience or injury. Plasticity is greatest in childhood, but continues in adults. Experience reshapes the brain: London taxi drivers show an enlarged hippocampus, and blind people use visual cortex for touch such as Braille. A child who loses an entire hemisphere may have the other take over many functions. Adults may recover from a stroke as undamaged areas reorganize and compensate. **Neurogenesis**, formation of new neurons, occurs in some regions such as the hippocampus.

Key facts

Left hemisphere (most people) = language; Broca = speaking, Wernicke = understanding.

Right visual field → left hemisphere; left visual field → right hemisphere.

Neuroplasticity is greatest in childhood but lasts throughout life.

Phineas Gage was a railroad foreman who in 1848 survived an iron rod passing through his left frontal lobe. He recovered physically but was described by acquaintances as impulsive, irritable, and unable to plan, suggesting the frontal lobes regulate judgment and personality. The case is famous but evidence is mostly anecdotal.

EXAMPLE 1: SPLIT-BRAIN PREDICTION

A split-brain patient stares at a dot. The word 'KEY' is flashed to the left of the dot, then the patient is asked to say what was seen and to reach with the left hand into a bag of objects. Predict the results.

SOLUTION

Step 1: Left visual field goes to the right hemisphere.

Step 2: The right hemisphere lacks speech, so the patient will likely say they saw nothing.

Step 3: The right hemisphere controls the left hand, which can select the key from the bag.

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EXAMPLE 2: MATCHING THE TOOL

A researcher wants to know which brain regions become active while participants solve math problems. Another wants to precisely time the brain's response to a sound within milliseconds. Choose a tool for each and justify.

SOLUTION

Step 1: The first needs location of activity, so fMRI (or PET) is best since it shows active regions.

Step 2: The second needs temporal precision, so EEG is best because it records electrical activity in milliseconds.

Step 3: Neither CT nor MRI alone fits because they show structure, not activity.

Practice**SET A Check Your Understanding**

Answer each question in 1 to 3 sentences.

1. What is the main difference between an EEG and an fMRI?
2. Why would a doctor choose an MRI over a CT scan?
3. Contrast Broca's aphasia and Wernicke's aphasia.
4. What does the corpus callosum do, and what happens when it is cut?
5. Define neuroplasticity and give one example.
6. What did the case of Phineas Gage suggest about the frontal lobes?

SET B Exam-Style Multiple Choice

Choose the best answer.

7. A researcher wants to see which areas of the brain are most active while a person reads silently. Which technique is most appropriate?
(A) CT scan (B) Lesioning (C) Standard MRI
(D) fMRI (E) Electrodes on the heart
8. A split-brain patient sees a picture of a spoon flashed in the left visual field only. Which is most likely?
(A) She cannot name it but can pick out a spoon with her left hand
(B) She names it and picks it with her right hand
(C) She names it but cannot find it by touch
(D) She cannot name it or pick it with either hand
(E) She names it only if the picture is repeated
9. Which finding is best explained by neuroplasticity?
(A) A person is born with a larger corpus callosum
(B) People who are right-handed are usually left-hemisphere dominant for language
(C) An EEG shows different waves during sleep
(D) Damage to the cerebellum causes clumsiness
(E) After a stroke damages language areas, a patient gradually regains speech as other regions take over
10. A patient speaks fluently, but her sentences make no sense and she cannot understand others. The damage is most likely in
(A) Broca's area (B) Wernicke's area (C) the corpus callosum
(D) the occipital lobe (E) the cerebellum
11. Which statement about the 'left-brain/right-brain' idea is most accurate?
(A) People are mostly logical if left-brained and creative if right-brained
(B) The right hemisphere is unused in most adults
(C) The hemispheres specialize in some functions but work together in intact brains
(D) Only the left hemisphere processes vision
(E) Hemispheres operate independently in normal brains

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SET C Apply and Extend

Write a full response; use specific terms from the lesson.

12. Researchers lesion the amygdala of rats and observe that the animals no longer avoid a cat. (a) Identify what this suggests about the amygdala. (b) Explain one limitation of drawing conclusions from lesion studies. (c) Name a non-invasive technique to study the human amygdala and what it measures.
13. A split-brain patient is shown the word 'APPLE' in the right visual field and the word 'BANANA' in the left visual field. (a) What does the patient say she saw? (b) What will the left hand select from a tray of fruit? (c) Explain both results.

2.6 Sleep, Dreams, and Consciousness

Describe sleep stages and rhythms, disorders, dream theories, and states like hypnosis and meditation.

Consciousness is our awareness of ourselves and our environment. It shifts across the day, most dramatically in sleep. This lesson covers the biology of sleep, theories of dreams, and other states such as hypnosis and meditation.

Biological rhythms. The **circadian rhythm** is the roughly 24-hour cycle of body temperature, alertness, and hormones. It is regulated by the suprachiasmatic nucleus (SCN) in the hypothalamus, which responds to light. In the dark, the pineal gland releases **melatonin**, which promotes sleepiness. Jet lag, shift work, and late-night screen light disrupt the rhythm. Teens tend to shift later in the day, which makes early school start times hard.

Sleep stages. A full sleep cycle lasts about 90 minutes and repeats four to six times a night. Brain waves are recorded with an EEG. Awake and alert, the brain shows fast, irregular **beta** waves; relaxed with eyes closed, **alpha** waves. Stage N1 (NREM 1) is light sleep with slower **theta** waves, and people may experience hypnagogic sensations such as falling or a muscle jerk. Stage N2 brings sleep spindles (bursts of activity) and K-complexes; most of the night is spent here. Stage N3 is deep, slow-wave sleep with large, slow **delta** waves; it is hardest to wake someone and growth hormone is released. Then **REM sleep** follows: the brain is highly active and the EEG resembles waking, eyes dart, vivid dreams occur, and muscles are paralyzed (REM paralysis). Early in the night deep sleep dominates, and later cycles contain more REM.

Stage	Brain waves	Key features
Awake	Beta, alpha	Alert or relaxed
N1	Theta	Light sleep, hypnagogic jerks
N2	Theta with spindles	Largest share of night
N3	Delta	Deep sleep, hard to wake, growth hormone
REM	Fast, beta-like	Vivid dreams, paralysis, eye movement

REM facts

REM = paradoxical sleep: brain active, body paralyzed.

REM rebound: after REM deprivation, people spend extra time in REM.

REM is linked to memory consolidation and learning.

Why we sleep. Sleep protects (an evolutionary view), restores (repairs tissue, clears waste, supports immune function), consolidates memories, and supports creative thinking and growth. **Sleep deprivation** impairs attention, mood, and memory, weakens the immune system, increases weight gain risk, and raises accident risk. Sleep disorders include **insomnia** (persistent trouble falling or staying asleep), **narcolepsy** (sudden sleep attacks, often directly into REM, linked to low orexin/hypocretin), **sleep apnea** (breathing stops briefly many times, causing fatigue; often in overweight people), **night terrors** (sudden terror in N3, with little memory afterward, mostly in children), and **sleepwalking** (N3). Nightmares occur in REM and are remembered.

Dream theories. Freud's wish-fulfillment theory says dreams are disguised expressions of unconscious wishes, with the **manifest content** (storyline) hiding **latent content** (symbolic meaning). The **information-processing** (memory consolidation) view says dreams sort the day's experiences. The **activation-synthesis theory** (Hobson and McCarley) says the brain creates stories to make sense of random neural firing during REM. The **cognitive** view treats dreams as thinking, with content reflecting waking concerns. The **neurocognitive** view ties dreams to the brain networks used in waking. Most researchers reject Freud's unsupported symbolism.

Dream theories at a glance

Freud: wish fulfillment (manifest vs. latent content).

Activation-synthesis: cortex interprets random REM firing.

Information-processing: dreams help consolidate memories.

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EXAMPLE 1: READING AN EEG DESCRIPTION

A sleeper's EEG shows large, slow waves, and it is very difficult to awaken her. Ten minutes later the EEG looks like that of an alert person, though her eyes move rapidly and her body is limp. Identify the stages.

SOLUTION

Step 1: Large slow waves and difficulty awakening indicate N3, delta-wave deep sleep.

Step 2: A waking-like EEG with rapid eye movement and a limp body indicates REM sleep.

Step 3: REM is called paradoxical because the brain is active while muscles are paralyzed.

Hypnosis and meditation. **Hypnosis** is a social interaction in which a person responds to suggestions that perceptions, thoughts, or behaviors will change. Hypnosis can reduce pain and help with some habits, but it cannot give superhuman strength or reliably recover accurate memories (it can create false memories). The **social-influence theory** says hypnotized people act as they think a good subject should; the **dissociation theory** (Hilgard) proposes a split in awareness, like a hidden observer. **Meditation** trains attention and awareness; regular practice is linked to lower stress, better attention, and changes in brain activity. **Divided attention** is limited: we can attend to one demanding task at a time, so talking on a phone while driving impairs performance (the cocktail party effect shows selective attention, hearing your name in a noisy room). **Inattentional blindness** is failing to notice visible objects when attention is elsewhere.

EXAMPLE 2: DREAM THEORY MATCH

A student argues, 'I dreamed I was falling off a cliff because my brain stem fired randomly during REM and my cortex invented a story.' Which theory is it, and how would Freud differ?

SOLUTION

Step 1: The explanation of random firing plus the cortex creating a story is activation-synthesis.

Step 2: Freud would instead interpret the dream's latent content as a disguised wish or fear.

Step 3: Activation-synthesis is biological and testable; Freud's theory is difficult to test.

Common mistakes

Do not say dreams occur only in REM (they also occur in NREM, but less vivid). Night terrors are not nightmares: night terrors occur in N3, nightmares in REM. Hypnosis is not sleep and does not make people lose control. Melatonin is made by the pineal gland, not the SCN, which is the clock.

Practice**SET A Check Your Understanding**

Answer each question in 1 to 3 sentences.

1. What roles do the suprachiasmatic nucleus and melatonin play in the circadian rhythm?
2. List the order of the stages in one sleep cycle and name the wave type in deep sleep.
3. Why is REM sleep called paradoxical sleep?
4. Distinguish insomnia from narcolepsy.
5. Explain the difference between manifest and latent content in Freud's dream theory.
6. Name two effects of chronic sleep deprivation.

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SET B Exam-Style Multiple Choice

Choose the best answer.

7. During which stage of sleep are delta waves most prominent?
(A) N1 (B) N2 (C) N3
(D) REM (E) Awake and alert
8. Which theory explains dreams as the brain's attempt to make sense of random neural signals during REM?
(A) Freud's wish-fulfillment theory (B) Social-influence theory
(C) Opponent-process theory (D) Information-processing theory only
(E) Activation-synthesis theory
9. A child suddenly screams and sits upright during the first hours of the night, appears terrified, and remembers nothing the next morning. This is most likely
(A) a nightmare (B) narcolepsy (C) sleep apnea
(D) a night terror (E) a REM rebound
10. After several nights of REM deprivation, a person is allowed to sleep freely. The most likely result is
(A) a reduction in total sleep time (B) REM rebound
(C) complete absence of REM (D) an increase in sleep spindles only
(E) insomnia
11. A student claims hypnosis lets people recover perfectly accurate memories of the past. Research suggests
(A) hypnosis can increase confidence but also create false memories
(B) hypnosis improves memory accuracy in most people
(C) hypnosis is only effective during REM sleep
(D) hypnosis works only for pain
(E) hypnosis has no effect on anyone

SET C Apply and Extend

Write a full response; use specific terms from the lesson.

12. A researcher records EEG, eye movement, and muscle tone in volunteers across the night. (a) Name the stage in which delta waves dominate and one other characteristic. (b) Describe how the pattern of stages changes from early to late in the night. (c) Explain one effect of sleep deprivation on daytime behavior.
13. Compare Freud's and the activation-synthesis theory of dreaming. Provide one strength or weakness of each.

2.7 Psychoactive Drugs

Classify psychoactive drugs by how they act on the nervous system and explain tolerance, dependence, and risk factors.

A **psychoactive drug** is a chemical that changes perception, mood, or thinking by altering neurotransmitter activity in the brain. This lesson classifies the major categories, explains how they act on synapses, and describes tolerance, dependence, and risk factors.

Depressants slow central nervous system activity. **Alcohol** is the most widely used; it enhances GABA (inhibitory) and reduces glutamate, slowing reaction time, impairing judgment and memory, and reducing self-control. It is also linked to blackouts and, in heavy use, damage to the brain and liver. **Barbiturates** (sedatives) and **benzodiazepines** (such as Xanax; anti-anxiety medicines) also boost GABA and are dangerous when mixed with alcohol. **Stimulants** speed up neural activity and raise heart rate, energy, and alertness. They include caffeine, nicotine, amphetamines, methamphetamine, cocaine, and ecstasy (MDMA, which also has hallucinogenic effects). Caffeine blocks adenosine receptors. Nicotine activates ACh receptors and boosts dopamine release. Cocaine blocks reuptake of dopamine, norepinephrine, and serotonin, creating a rapid high and a crash. Amphetamines increase release of dopamine and norepinephrine. Methamphetamine also reduces dopamine supply with chronic use.

Opioids (opiates), such as heroin, morphine, oxycodone, and codeine, depress neural activity and relieve pain. They mimic endorphins by acting as agonists at opioid receptors; with repeated use the brain reduces its own endorphin production, so withdrawal after stopping brings pain, agitation, and cravings. **Hallucinogens** (psychedelics) distort perception and create sensory images without sensory input. LSD and psilocybin act on serotonin receptors. **Marijuana** (THC) acts on cannabinoid receptors; effects include relaxed euphoria, impaired memory and coordination, increased appetite, and altered perception of time. Ecstasy damages serotonin neurons.

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Category	Examples	Neurotransmitter action	Typical effects
Depressants	Alcohol, barbiturates, benzodiazepines	Boost GABA	Slowed reactions, relaxation, impaired memory
Stimulants	Caffeine, nicotine, cocaine, amphetamines	Increase dopamine, norepinephrine (cocaine blocks reuptake)	Energy, alertness, then crash
Opioids	Heroin, morphine, oxycodone	Mimic endorphins (agonists)	Pain relief, euphoria, drowsiness
Hallucinogens	LSD, psilocybin, marijuana	Serotonin (LSD); cannabinoid receptors (THC)	Altered perception, mood changes

Tolerance, dependence, withdrawal

Tolerance: with repeated use, the user needs larger doses to get the same effect.

Dependence (physical): the body adapts and needs the drug to function normally; stopping causes withdrawal symptoms.

Addiction: compulsive drug craving and use despite harmful consequences.

Why tolerance develops. Repeated drug use causes the brain to adapt. It may reduce receptors or its own neurotransmitter production, and opposing processes can intensify. Because the brain now relies on the drug, a user feels worse than baseline without it, producing withdrawal and craving. Withdrawal effects are often called the opposite of the drug effect. They usually oppose the drug's effects: stimulant withdrawal causes fatigue and depression, while depressant (alcohol) withdrawal can cause tremors, anxiety, and seizures. Psychological dependence refers to a mental craving for the drug to relieve stress or gain pleasure. Most drugs of abuse act on the brain's reward circuitry by increasing dopamine in the nucleus accumbens, which reinforces repeated use.

Risk factors. Biological factors include genetic vulnerability (twin and adoption studies show a heritable component for alcoholism) and certain brain chemistry. Psychological factors include stress, depression, impulsivity, and using drugs to cope. Social-cultural factors include peer pressure, drug availability, family attitudes, and early use in adolescence, when the brain is still developing. Use also matters in degree: occasional use, abuse (repeated use that harms health, work, or relationships), and substance use disorder form a continuum. Several drugs also have lasting risks for mental health: heavy marijuana use in adolescence is linked to memory and attention problems, and methamphetamine can cause psychosis-like symptoms. Teen brains are especially vulnerable because the frontal lobes, which control judgment and impulse, are still maturing, while the reward system is highly responsive. Because causes are biopsychosocial, effective prevention and treatment combine education, counseling, medical support (medications that reduce withdrawal or craving), and social support.

Drug class shortcuts

Depressants (alcohol, barbiturates, benzodiazepines): slow the CNS, boost GABA.

Stimulants (caffeine, nicotine, cocaine, amphetamines): speed up the CNS.

Opioids (heroin, morphine): endorphin agonists, pain relief.

Hallucinogens (LSD, psilocybin, marijuana): distort perception.

EXAMPLE 1: CLASSIFY AND EXPLAIN

A man who has used heroin for months now needs three times the original dose. When he stops, he sweats, aches, and feels anxious. Identify the drug class, and the two processes shown.

SOLUTION

Step 1: Heroin is an opioid, which acts as an endorphin agonist.

Step 2: Needing a larger dose to get the same effect is tolerance.

Step 3: Sweating, aching, and anxiety after stopping are withdrawal symptoms, showing physical dependence.

EXAMPLE 2: NEUROTRANSMITTER ACTION

Cocaine blocks the reuptake of dopamine. Explain why it produces a high and then a crash.

SOLUTION

Step 1: Blocking reuptake leaves dopamine in the synapse, overstimulating reward pathways and creating euphoria and energy.

Step 2: The neurotransmitter supply is then depleted and receptors adapt, so when the drug wears off, dopamine activity falls below normal.

Step 3: The result is a crash of fatigue and low mood, which can drive the user to take more.

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Common mistakes

Do not label alcohol a stimulant because it makes people talkative; it is a depressant that first lowers inhibition. Tolerance is not the same as dependence. Marijuana is not simply a depressant or hallucinogen; many textbooks classify it with hallucinogens or as its own category. Opioids are not stimulants.

Practice**SET A Check Your Understanding**

Answer each question in 1 to 3 sentences.

1. Why is alcohol classified as a depressant even though people may become louder after drinking?
2. How does cocaine affect neurotransmitters?
3. Explain why opioids relieve pain.
4. Define tolerance and explain why it occurs.
5. Distinguish physical dependence from addiction.
6. List one biological, one psychological, and one social-cultural risk factor for substance abuse.

SET B Exam-Style Multiple Choice

Choose the best answer.

7. A person takes a drug that increases GABA activity. Which effect is most likely?
(A) Increased alertness and heart rate (B) Vivid hallucinations
(C) Increased appetite and dopamine surge (D) Increased pain sensitivity
(E) Slowed reactions and relaxation
8. Which pair correctly matches drug to class?
(A) Heroin, opioid (B) Caffeine, depressant (C) LSD, stimulant
(D) Alcohol, stimulant (E) Morphine, hallucinogen
9. A long-term drinker must now drink much more alcohol to feel the same effects. This is best explained by
(A) withdrawal (B) reuptake (C) sensory adaptation
(D) tolerance (E) REM rebound
10. Which statement about the role of dopamine in addiction is best supported?
(A) Dopamine levels decrease while taking all drugs
(B) Many abused drugs increase dopamine in reward pathways, reinforcing use
(C) Dopamine is irrelevant to drug craving
(D) Only depressants affect dopamine
(E) Dopamine is the only neurotransmitter altered by drugs
11. LSD and psilocybin primarily alter perception through their action on
(A) GABA receptors (B) acetylcholine receptors (C) serotonin receptors
(D) endorphin receptors (E) adenosine receptors

SET C Apply and Extend

Write a full response; use specific terms from the lesson.

12. A patient takes an opioid painkiller for several months. (a) Explain how the drug reduces pain. (b) Describe the changes in the brain that cause the patient to need higher doses. (c) Predict what happens if the patient abruptly stops.
13. Use the biopsychosocial approach to explain why one teenager might be more likely than another to develop a substance use disorder.

2.8 Sensation: Vision and Hearing

Explain thresholds and signal detection, then trace how the eye and ear turn light and sound into neural messages.

Sensation is the process by which sensory receptors detect stimulus energy and send it to the brain; **perception** is the brain's organization and interpretation of that information. This lesson covers how senses detect stimuli, and how the eye and ear turn light and sound into neural messages.

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Transduction is converting physical energy (light, sound waves, chemicals, pressure) into neural signals the brain can use. The **absolute threshold** is the minimum stimulation needed to detect a stimulus 50 percent of the time (for example, a candle flame seen from about 30 miles on a clear, dark night). The **difference threshold** (just noticeable difference, JND) is the minimum difference needed to tell two stimuli apart 50 percent of the time. **Weber's law** says the JND is a constant proportion of the original stimulus, so a heavy weight needs a larger change than a light one. **Signal detection theory** says detection depends on both the stimulus strength and the person's expectations, motivation, and alertness. The outcomes are hit, miss, false alarm, and correct rejection. **Subliminal** stimuli are below the absolute threshold and have only weak, fleeting effects. **Sensory adaptation** is reduced sensitivity to constant stimulation (you stop noticing a smell or the feel of clothing), which frees attention for changes. The eye is an exception to some degree due to constant tiny eye movements.

Signal detection outcome	Stimulus present?	Person says yes?
Hit	Yes	Yes
Miss	Yes	No
False alarm	No	Yes
Correct rejection	No	No

Vision. Light is electromagnetic energy; wavelength determines hue (color) and amplitude determines brightness. Light enters through the **cornea**, passes through the **pupil** (opening controlled by the **iris**, the colored muscle), and is focused by the **lens** onto the **retina**, the light-sensitive inner surface. The lens changes shape (accommodation) to focus. The image on the retina is inverted. In the retina, **rods** (peripheral, about 120 million) detect dim light and black-and-white and are essential for night vision; **cones** (concentrated in the central **fovea**, about 6 million) detect fine detail and color in bright light. Signals pass to **bipolar cells**, then **ganglion cells**, whose axons form the **optic nerve**. Where the optic nerve leaves the eye there are no receptors, creating the **blind spot**. The optic nerve goes to the thalamus and then the visual cortex in the occipital lobe, where feature detectors (Hubel and Wiesel) respond to edges, lines, and movements.

Eye path

Cornea → pupil → lens → retina (rods and cones) → bipolar cells → ganglion cells → optic nerve → thalamus → visual cortex.
Rods: dim light, periphery. Cones: color, detail, fovea.

Color vision. The **trichromatic theory** (Young-Helmholtz) says the retina has three types of cones, sensitive to red, green, and blue (short, medium, long wavelengths); combinations create all colors. The **opponent-process theory** (Hering) says color is processed in pairs of opposing cells: red-green, blue-yellow, black-white. It explains afterimages: stare at red, then look at white and see green. Both are correct: trichromatic works at the receptor level, and opponent processing at the ganglion and thalamic level. **Color blindness** is usually inherited, more common in males because the genes are on the X chromosome, and typically involves red-green difficulty from missing or altered cones; complete color blindness is rare.

Hearing. Sound waves have **frequency** (pitch, in hertz) and **amplitude** (loudness, in decibels). Sound waves are funneled by the outer ear (pinna) to the eardrum (tympanic membrane). Three tiny bones of the middle ear, the **hammer, anvil, and stirrup** (malleus, incus, stapes), amplify the vibrations to the **oval window** of the **cochlea**, a fluid-filled spiral in the inner ear. Fluid waves move the basilar membrane and bend **hair cells**, which transduce movement into neural impulses carried by the auditory nerve to the thalamus and the temporal lobe's auditory cortex. **Place theory** says pitch is determined by where on the basilar membrane the wave peaks (good for high pitches). **Frequency theory** says the rate of neural firing matches the sound's frequency (good for low pitches). The **volley principle** explains up to about 4000 hertz, where groups of neurons fire in alternation. We locate sound by tiny differences in timing and loudness between the two ears.

Hearing loss

Conduction (conductive) hearing loss: damage to the eardrum or middle ear bones; hearing aids can help.

Sensorineural hearing loss: damage to cochlea hair cells or auditory nerve, from age or loud noise; hair cells do not regenerate in humans. Cochlear implants convert sound into electrical signals to the auditory nerve.

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EXAMPLE 1: WEBER'S LAW

A person can just barely tell a 100-gram weight from a 105-gram weight. According to Weber's law, about what difference will they need to notice a change from a 400-gram weight?

SOLUTION

Step 1: The JND proportion is $5/100 = 0.05$.

Step 2: Apply the same proportion to 400 grams: $0.05 \times 400 = 20$ grams.

Step 3: So the weight must differ by about 20 grams (reaching 420 grams).

EXAMPLE 2: SIGNAL DETECTION

A radiologist reads scans. She says 'tumor' on 80 percent of scans that have tumors and 10 percent that do not. Identify the hit rate and false alarm rate, and name which error she is making when she calls a healthy scan 'tumor'.

SOLUTION

Step 1: Hit rate = 80 percent (says yes when stimulus is present).

Step 2: False alarm rate = 10 percent (says yes when it is absent).

Step 3: The error is a false alarm; a missed tumor would be a miss.

Common mistakes

Rods are NOT color receptors; cones are. Trichromatic and opponent-process theories are not rivals: both apply. Do not confuse pitch (frequency) with loudness (amplitude). The blind spot has no receptors; it is not the fovea.

Practice**SET A Check Your Understanding**

Answer each question in 1 to 3 sentences.

1. Define transduction and give an example for vision and for hearing.
2. What is Weber's law?
3. Why does sensory adaptation help us?
4. Contrast rods and cones in location and function.
5. How do the trichromatic and opponent-process theories work together?
6. Distinguish conduction hearing loss from sensorineural hearing loss.

SET B Exam-Style Multiple Choice

Choose the best answer.

7. A person stares at a green square, then looks at a white wall and sees a red afterimage. This is best explained by
(A) place theory (B) opponent-process theory (C) the volley principle
(D) Weber's law (E) signal detection theory
8. Which structure contains the receptors that transduce light?
(A) The cornea (B) The lens (C) The iris
(D) The retina (E) The optic nerve
9. A driver in the dark can see dim objects best by looking slightly to the side of them. This works because
(A) rods are concentrated away from the fovea (B) cones are concentrated in the periphery
(C) the blind spot is at the fovea (D) the iris widens the lens
(E) the fovea has more rods than the periphery
10. A hearing test shows a person cannot hear high-pitched sounds after years of loud concerts. The most likely damage is to
(A) the middle ear bones only (B) the pinna
(C) the optic nerve (D) the semicircular canals
(E) hair cells in the cochlea
11. In a study of smoke alarms, a participant hears a faint beep and reports it. The beep did not occur. This response is a
(A) hit (B) miss (C) false alarm
(D) correct rejection (E) difference threshold

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SET C Apply and Extend

Write a full response; use specific terms from the lesson.

12. A researcher tests how much brighter a light must become for participants to notice a change. (a) Name the threshold being measured. (b) At a baseline of 50 units, the JND is 2 units. Using Weber's law, predict the JND at a baseline of 200 units. (c) Explain why a participant's motivation could change the results according to signal detection theory.
13. Trace the path of light from the cornea to the visual cortex, and explain two ways the retina's design allows both night vision and color vision.

2.9 Chemical, Body, and Other Senses

Explain taste, smell, touch, pain, and body-position senses, and how the senses interact.

Beyond sight and sound, we sense chemicals (taste and smell), touch and pain, and the position and movement of our own bodies. This lesson explains how each system works and how senses interact.

Taste (gustation) detects chemicals in food. Taste buds, located in bumps called papillae on the tongue, contain receptor cells that are replaced about every one to two weeks. The basic tastes are **sweet, sour, salty, bitter, and umami** (savory, from glutamate). Taste has evolutionary value: sweet signals energy, bitter may signal poison. Some people, **supertasters**, have more taste buds and find bitter foods very intense. Taste is also shaped by smell and by expectations, and taste information goes to the thalamus and then the temporal and frontal lobes.

Smell (olfaction) detects airborne molecules. Receptor cells high in the nasal cavity (the olfactory epithelium) have receptors for molecules; signals go to the **olfactory bulb** and then to the brain. Smell is the only sense that bypasses the thalamus, sending signals directly to areas linked to emotion and memory, including the limbic system (amygdala), which is why a scent can trigger vivid memories. Humans have about 350 types of smell receptors that combine to detect thousands of odors. Smell tends to decline with age. Pheromones are chemicals that may influence animal behavior, with weaker evidence for humans.

Chemical senses

Taste and smell are chemical senses.

Smell is the only sense that does not pass through the thalamus first.

Taste = sweet, sour, salty, bitter, umami.

Touch (skin senses) includes pressure, warmth, cold, and pain. Receptors in the skin send signals via the spinal cord and thalamus to the somatosensory cortex in the parietal lobe. Different receptors respond to pressure, vibration, and temperature, and body regions with more receptors (lips, fingertips) are more sensitive and have more cortex devoted to them.

Pain warns of tissue damage. Nociceptors are the pain receptors. The **gate-control theory** (Melzack and Wall) says the spinal cord contains a neurological gate that either blocks pain signals or lets them through to the brain. Small nerve fibers carry pain signals and open the gate; large fibers carrying pressure or touch signals can close it (rubbing a bumped elbow helps). The brain can also close the gate by releasing endorphins, or distraction. Pain is influenced by **biological** factors (nociceptors, endorphins), **psychological** factors (attention, expectations, anxiety), and **social-cultural** factors (the presence of others, cultural norms): the biopsychosocial perspective. Treatments include medication, acupuncture, distraction, hypnosis, and virtual reality. **Phantom limb sensations** show that the brain, not just receptors, generates pain: people who lose a limb still feel it, as cortex reorganizes.

Pain in one line

Gate-control: small fibers open the spinal gate, large touch fibers and brain signals (endorphins, distraction) close it.

Pain = biological + psychological + social-cultural.

Body position senses. Kinesthesia is the sense of position and movement of body parts, based on receptors in the muscles, tendons, and joints; it lets you touch your nose with your eyes closed. The **vestibular sense** is the sense of balance and head position, based on the fluid-filled **semicircular canals** and vestibular sacs in the inner ear. Spinning and then stopping makes the fluid keep moving, causing dizziness. Conflicts between the vestibular sense and vision contribute to motion sickness.

Sense	Receptor / organ	Key idea
Taste	Taste buds on tongue	Five basic tastes, replaced regularly
Smell	Olfactory receptors in nose	Direct route to limbic system
Touch	Skin receptors	Somatosensory cortex mapping
Pain	Nociceptors	Gate-control, biopsychosocial
Kinesthesia	Muscles, joints, tendons	Body position and movement

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Sense	Receptor / organ	Key idea
Vestibular	Semicircular canals	Balance, head position

Sensory interaction means that senses influence each other. Smell strongly affects flavor (food tastes bland with a cold). The McGurk effect shows vision altering what we hear: watching lips form 'ga' while hearing 'ba' leads to hearing 'da'. **Synesthesia** is a condition in which stimulation of one sense triggers another, such as seeing colors when hearing sounds or seeing letters as colors; it shows senses are linked in the brain. **Embodied cognition** shows that physical sensations influence judgments: holding a warm cup can make people judge others as warmer.

EXAMPLE 1: GATE CONTROL

A child stubs her toe and quickly rubs it, and the pain eases. Then her mother distracts her with a funny video. Explain both effects.

SOLUTION

Step 1: Rubbing activates large touch fibers, which close the spinal gate so fewer pain signals pass.

Step 2: Distraction shifts attention, and the brain can reduce pain by signaling the gate to close and releasing endorphins.

Step 3: Both show that pain depends on more than the injury, consistent with gate-control and biopsychosocial views.

EXAMPLE 2: IDENTIFY THE SENSE

A gymnast spins, stops, and feels dizzy and off balance. Later she closes her eyes and still knows where her arms are. Name the senses involved.

SOLUTION

Step 1: Dizziness after spinning involves the vestibular sense, since fluid in the semicircular canals keeps moving.

Step 2: Knowing where her arms are without looking uses kinesthesia.

Step 3: Both are body-position senses and do not depend on vision.

Common mistakes

Do not say smell goes through the thalamus: it is the exception. Vestibular and kinesthetic senses are different: balance versus limb position. Gate-control does not say pain is imaginary; it says signals can be modulated. Taste buds are not only on the tip of the tongue (the 'tongue map' is a myth).

Practice

SET A Check Your Understanding

Answer each question in 1 to 3 sentences.

- List the five basic tastes and explain the evolutionary value of one.
- Why can smells so strongly trigger emotional memories?
- State the gate-control theory of pain in your own words.
- Differentiate the vestibular sense from kinesthesia.
- What is synesthesia?
- Explain how the biopsychosocial perspective applies to pain.

SET B Exam-Style Multiple Choice

Choose the best answer.

- Which sense is unique in sending its signals to the cortex without first passing through the thalamus?
(A) Taste (B) Touch (C) Hearing (D) Vision (E) Smell
- After a bump, rubbing the area reduces pain. This is best explained by
(A) gate-control theory (B) place theory (C) opponent-process theory
(D) sensory adaptation (E) the McGurk effect
- A person with a cold complains that food tastes bland. This best demonstrates
(A) synesthesia (B) sensory interaction (C) kinesthesia
(D) absolute threshold (E) transduction failure

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10. A person with synesthesia sees the color blue whenever she hears a trumpet. This suggests
- (A) her ears are damaged
 - (B) she is experiencing sensory adaptation
 - (C) one sensory stimulus can trigger experiences in another sense
 - (D) her vestibular system is faulty
 - (E) she has color blindness
11. Which structure is most directly responsible for the sense of balance?
- (A) The cochlea
 - (B) The olfactory bulb
 - (C) The somatosensory cortex
 - (D) The semicircular canals
 - (E) The cornea

SET C Apply and Extend

Write a full response; use specific terms from the lesson.

12. A hospital wants to reduce patients' pain during a dressing change without increasing drug dosage. (a) Propose one strategy based on gate-control theory. (b) Propose one psychological strategy. (c) Explain why pain differs between people with the same injury.
13. A chef says that a cold ruins her sense of taste. Explain the mechanism using smell, and then describe how a tasted food could trigger a memory from childhood.

2.10 Multiple-Choice Practice: Biological Bases of Behavior

Twenty AP-style questions covering genetics, neurons, brain structures, research methods, consciousness, drugs, and the senses.

Choose the best answer for each question. Check the explanation after each set, especially for the questions you missed, and note whether the error was a vocabulary slip or a reasoning slip.

SET A Core Concepts

Choose the best answer.

1. Which of the following best defines a polygenic trait?
- (A) A trait influenced by many genes, each with a small effect
 - (B) A trait caused by one dominant gene
 - (C) A trait controlled only by the environment
 - (D) A trait produced by a mutation
 - (E) A trait found only in identical twins
2. A neuron's action potential is the same size whether the stimulus is weak or strong. This illustrates the
- (A) refractory period
 - (B) reuptake process
 - (C) gate-control theory
 - (D) all-or-none principle
 - (E) opponent-process theory
3. A drug blocks the receptors for acetylcholine so the neurotransmitter cannot act. The drug is best described as an
- (A) acetylcholine agonist
 - (B) acetylcholine antagonist
 - (C) reuptake inhibitor
 - (D) dopamine agonist
 - (E) endorphin agonist
4. Which structure is primarily responsible for coordinating balance and voluntary movement?
- (A) The hippocampus
 - (B) The thalamus
 - (C) The amygdala
 - (D) The hypothalamus
 - (E) The cerebellum
5. Which technique provides the most precise measurement of the timing of brain activity?
- (A) MRI
 - (B) CT scan
 - (C) EEG
 - (D) PET scan
 - (E) Lesioning
6. A person has trouble sleeping, and her brain waves show frequent awakenings and little time in N3. Which statement about N3 is accurate?
- (A) It contains large, slow delta waves and is difficult to awaken from
 - (B) It contains sleep spindles and is the lightest stage
 - (C) It resembles waking brain activity
 - (D) It is when most vivid dreams occur
 - (E) It is when the body is paralyzed

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7. Which pair correctly matches a drug and its main action?

- (A) Alcohol, blocks GABA
(C) Caffeine, increases GABA
(E) LSD, mimics acetylcholine

- (B) Heroin, blocks endorphin receptors
(D) Cocaine, blocks dopamine reuptake

SET B Applications and Data

Choose the best answer; some items include data or scenarios.

8. A researcher compares trait correlations among pairs of relatives and finds the following. What is the best interpretation?

Pair	Correlation
Identical twins	0.70
Fraternal twins	0.35
Unrelated adoptive siblings	0.05

- (A) The trait is entirely genetic
(B) The trait is entirely environmental
(C) Genes influence the trait, and environment also contributes
(D) Heritability is 1.0
(E) Adoptive and biological parents are equally similar
9. A patient can see and move normally, but cannot understand spoken language, although she speaks fluently with meaningless content. Which area is most likely damaged?
- (A) Broca's area in the frontal lobe
(B) The occipital lobe
(C) The cerebellum
(D) The motor cortex
(E) Wernicke's area in the temporal lobe
10. In a split-brain study, a word is flashed only in the left visual field. The patient says nothing was seen but her left hand points to the matching object. This occurs because
- (A) the left hemisphere received the word
(B) the right hemisphere received the word but cannot produce speech
(C) the optic nerve is damaged
(D) the patient has Broca's aphasia
(E) the cerebellum controls pointing
11. A sleeper's recording shows the pattern below. Which stage is she most likely in?

Measure	Reading
EEG	Fast, irregular, waking-like
Eye movement	Rapid, darting
Muscle tone	Nearly absent

- (A) N1 sleep
(B) N2 sleep
(C) N3 sleep
(D) REM sleep
(E) Awake relaxed state
12. A person who has taken a drug daily for a year now needs a much larger dose to feel the same effect, and feels shaky and anxious when she misses a dose. Which terms best describe this?
- (A) Tolerance and physical dependence
(B) Sensory adaptation and reuptake
(C) Tolerance only
(D) Withdrawal only
(E) Addiction only
13. A listener hears a tone at different levels, and responds 'yes' when she detects it. Across many trials the quietest level she detects 50 percent of the time is 2 decibels. This value is her
- (A) difference threshold
(B) JND
(C) absolute threshold
(D) false alarm rate
(E) adaptation level

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14. Which statement best explains why people often cover a bump with their hand?

- (A) Touch receptors destroy pain receptors
- (B) The thalamus filters out pain
- (C) Endorphins are made only by the skin
- (D) Rubbing increases adaptation to touch only
- (E) Large-fiber touch signals can close the spinal gate to pain

SET C Exam-Level Stretch

Choose the best answer; these items require analysis.

15. Researchers measure the brain activity of volunteers using blood oxygen levels while they view faces. Which conclusion is most appropriate?

- (A) The active region is the only region needed for face recognition
- (B) Certain regions show greater activity when viewing faces, but this does not prove those regions alone cause face recognition
- (C) fMRI measures electrical activity directly
- (D) The study proves faces are processed only in the right hemisphere
- (E) Regions with no activity are unnecessary for any behavior

16. A medication increases the amount of serotonin in the synapse by preventing its reabsorption. This drug is most similar in action to

- (A) a dopamine antagonist
- (B) a GABA agonist
- (C) an opioid
- (D) an SSRI
- (E) an acetylcholine antagonist

17. A patient with a damaged amygdala is asked to look at images of threatening faces. Which result is most likely?

- (A) Reduced fear response compared with controls
- (B) Greater fear response than controls
- (C) Inability to see the pictures
- (D) Inability to form new memories generally
- (E) Loss of balance

18. Which scenario best demonstrates epigenetics?

- (A) A mutation changes the sequence of a gene
- (B) Two identical twins have the same genotype
- (C) A child inherits eye color from her parents
- (D) Natural selection favors an advantageous trait over generations
- (E) Stress in early life changes chemical tags on DNA and alters gene activity without changing the sequence

19. A researcher finds that rods and cones differ in number and distribution across the retina. A participant with damage only to the fovea would most likely have difficulty with

- (A) seeing at night in the periphery
- (B) detecting motion at the edge of vision
- (C) reading fine print in bright light
- (D) hearing high frequencies
- (E) sensing balance

20. A researcher wants to test whether a new sleep aid works by boosting inhibitory neurotransmission. Which neurotransmitter system would be the most logical target?

- (A) Glutamate
- (B) GABA
- (C) Dopamine
- (D) Norepinephrine
- (E) Acetylcholine

2.11 Free-Response Practice: Biological Bases of Behavior

Four free-response questions in the Article Analysis and Evidence-Based styles.

Each question is scored by parts, typically 1 point for each correct, specific response. Name the term, then connect it to the evidence given. Vague answers that only restate the stimulus earn no credit. Compare your response with the scoring points.

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QUESTION 1 Article Analysis: Sleep and Memory

Read the research summary. Researchers recruited 60 college students and randomly assigned half to sleep 8 hours and half to stay awake all night after learning a list of 40 word pairs. Twelve hours later, all students were tested on the pairs. Students who slept recalled an average of 31 pairs. Students who stayed awake recalled an average of 22 pairs. The researchers concluded that sleep improves memory consolidation. Both groups learned the list at the same time of day, and testers did not know which group each student belonged to.

1. (a) Identify the independent variable and the dependent variable.
2. (b) Explain how random assignment strengthens the researchers' conclusion.
3. (c) Using your knowledge of sleep stages, explain one biological reason sleep might improve recall.
4. (d) Describe one limitation of the study and how it might be addressed.

QUESTION 2 Evidence-Based Question: Nature and Nurture of Aggression

Use the evidence below to write a short argument answering: To what extent do genes and environment influence aggression?

Source 1: Identical twins correlate .50 on aggressive behavior and fraternal twins correlate .22. Source 2: Adopted children in homes with high family conflict showed more aggression than those in low-conflict homes, even when their biological parents had low aggression histories. Source 3: In a study of children with a particular gene variant linked to low activity of an enzyme that breaks down serotonin and norepinephrine, aggression was higher only among those who experienced abuse.

5. (a) State a claim that answers the question.
6. (b) Use Source 1 to explain how it supports a genetic influence, and describe its limit.
7. (c) Use Source 2 to support the role of environment.
8. (d) Use Source 3 to explain a gene-environment interaction and one additional concept, such as epigenetics or polygenic influence, that relates to the claim.

QUESTION 3 Article Analysis: Cortisol and Stress Response

A summary reports that medical students were measured during a stress-free vacation and during final exams. During final exams their saliva cortisol was higher, heart rates were faster, and more students reported catching colds in the following month. The report said that the exam period 'caused' the colds. Students were not randomly assigned to conditions, and each student was compared with himself or herself.

9. (a) Name the hormones released first and then later in the body's stress response, and the gland that produces each.
10. (b) Identify the autonomic division responsible for the faster heart rate and the division that restores calm afterward.
11. (c) Explain why the cortisol finding might connect to more colds.
12. (d) Explain why the claim that exams 'caused' the colds is not fully justified.

QUESTION 4 Evidence-Based Question: Brain Injury and Plasticity

Use the evidence to explain how the brain responds to injury. Source 1: A patient who suffered damage to the left frontal lobe could understand speech but spoke in short, effortful phrases; after months of therapy, speech improved and imaging showed increased activity in the corresponding area of the right hemisphere. Source 2: In 1848 a railroad foreman survived an iron rod through the frontal lobes; he lived but became impulsive and unable to plan. Source 3: Musicians who practice intensively show larger motor cortex areas for the fingers than non-musicians.

13. (a) Identify the language area and the type of aphasia in Source 1.
14. (b) Explain what Source 1 shows about neuroplasticity.
15. (c) Explain what Source 2 suggests about frontal lobe function and one limitation of the evidence.
16. (d) Use Source 3 to show that plasticity is not limited to injury recovery.

Answers Chapter 2: Answers and Explanations

Answers for every practice problem, numbered to match. Read the explanation even when your answer is correct.

2.1 Heredity, Environment, and Evolution

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SET A · CHECK YOUR UNDERSTANDING

1. Genotype is the inherited genetic code (for example, alleles for eye color); phenotype is the observable trait that results from genes and environment (for example, brown eyes, or a person's actual height). Phenotype can differ from genotype because environment such as nutrition also matters.
2. They share nearly 100 percent of their genes but grew up in different homes. Any similarity beyond chance is therefore more likely due to genes than to shared environment.
3. Many genes, each with a small effect, combine with environment to shape traits such as intelligence or temperament. That is why no single gene predicts such a trait.
4. Heritability describes the proportion of variation among individuals in a particular group, not the makeup of one person's trait. It also can change if the range of environments changes.
5. Epigenetics is the study of chemical tags on DNA that turn genes on or off without altering the DNA sequence. Severe early stress or poor diet can change these tags and thus gene expression.
6. There must be variation among individuals, the variation must be heritable, and some variants must lead to greater survival and reproduction than others. Together these cause adaptive traits to become more common.

SET B · EXAM-STYLE MULTIPLE CHOICE

7. C. Greater similarity to biological relatives, who share genes but not the home, suggests a genetic contribution. The tempting claim that IQ is fixed overstates the evidence, since similarity is partial and environment still matters.
8. A. Identical twins are more alike, pointing to genes, but .60 is well below 1.00, so unshared environment matters too. Calling the trait entirely genetic fails because a perfectly genetic trait would give identical twins a correlation near 1.00.
9. E. Heritability is a population-level statistic about variation. The distractor about an individual's percentage is the classic misconception, because the statistic cannot be applied to one person.
10. B. The expression of a genetic tendency depended on the environment, which is gene-environment interaction. Natural selection operates on populations over generations, not within one child.
11. D. Chemical tags that change expression without changing the sequence define epigenetics. A mutation would alter the DNA sequence itself, which the stem rules out.

SET C · APPLY AND EXTEND

12. (a) This is an adoption study. (b) If adoptees' depression rates correlate more strongly with their biological parents' rates than with their adoptive parents' rates, genetic influence is supported. (c) Adoptive homes are often selected to be similar and may be more supportive than average, which restricts environmental variation and can inflate heritability estimates; prenatal environment is also shared with biological mothers. Scoring: 1 point for each of the three parts.
13. Ancestors lived where calories were scarce, so individuals who craved and ate energy-rich foods were more likely to survive and reproduce; the variation was heritable, so the preference spread. Criticism: such explanations are made after the fact and are hard to test, and modern food environments and culture also shape eating, so the ancient adaptation is not the whole story. Scoring: 1 for variation/heritability/reproductive success logic, 1 for linking to ancestral scarcity, 1 for a valid criticism.

2.2 Neurons and Neural Communication**SET A · CHECK YOUR UNDERSTANDING**

1. Dendrites receive incoming messages from other neurons. The axon carries the message away and its terminal buttons release neurotransmitters.
2. Myelin insulates the axon and speeds the conduction of the action potential. If it deteriorates, as in multiple sclerosis, messages slow down and movement and coordination are impaired.
3. A neuron either fires a full action potential or does not fire at all once threshold is reached. Differences in stimulus intensity are coded by firing rate and number of neurons, not by the size of the spike.
4. The resting potential is the neuron's polarized state of about -70 mV inside relative to outside. Sodium is kept mostly outside and potassium mostly inside by the membrane.
5. Glial cells support neurons by nourishing them, clearing waste, forming myelin, and helping guide neural connections. They are not just filler, and they outnumber neurons.
6. The sending neuron reabsorbs it from the synapse, ending its signal. Drugs such as SSRIs block reuptake, leaving more neurotransmitter in the synapse and prolonging its effect.

SET B · EXAM-STYLE MULTIPLE CHOICE

7. D. Messages are received by dendrites, integrated in the soma, conducted along the axon, and released at the terminal buttons. The reverse order is a common error caused by forgetting that dendrites receive.
8. B. A neuron's spike is the same size every time it fires; intensity is encoded by firing frequency. Neurotransmitters work across the synapse and do not carry the spike along the axon.
9. E. The synapse is the junction where chemical transmission occurs. Nodes of Ranvier are gaps in the myelin along the axon, which is a tempting but different structure.
10. C. Firing depends on whether the combined input crosses the threshold. Reuptake removes neurotransmitter but does not by itself determine firing.
11. A. Interneurons connect other neurons within the CNS. Carrying commands to a muscle is the job of motor (efferent) neurons.

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SET C · APPLY AND EXTEND

12. Within a neuron, communication is electrical: the dendrites and soma receive input, and if threshold is reached an action potential travels down the axon (1 point). Between neurons, communication is chemical: neurotransmitters released from terminal buttons cross the synapse and bind receptors (1 point). The claim is therefore incomplete. A strong answer adds that excitatory or inhibitory effects are summed and that reuptake ends the signal (1 point).
13. (a) More inhibitory neurotransmitter remains in the synapse, so receiving neurons are less likely to reach threshold and firing decreases (1 point for prediction, 1 for reasoning about reuptake). (b) Action potentials are all-or-none: when they occur they are always the same size, so changes appear in how often neurons fire (1 point).

2.3 Neurotransmitters, Hormones, and Drugs**SET A · CHECK YOUR UNDERSTANDING**

1. Acetylcholine. Loss of ACh-producing neurons impairs memory in Alzheimer's, and ACh released at neuromuscular junctions makes muscles contract.
2. An agonist mimics or enhances a neurotransmitter's effect, while an antagonist blocks receptors or reduces release so the effect decreases.
3. Low serotonin activity is associated with depression, anxiety, and OCD. Medications such as SSRIs raise serotonin availability by blocking reuptake.
4. It releases hormones that control other endocrine glands such as the thyroid, adrenals, and gonads. It is itself directed by the hypothalamus.
5. Neurotransmitters act within milliseconds across a synapse and their effects are brief. Hormones travel through the blood, act more slowly, and last longer.
6. Glutamate is the main excitatory neurotransmitter and GABA is the main inhibitory one. Too little GABA can lead to anxiety, tremors, or seizures.

SET B · EXAM-STYLE MULTIPLE CHOICE

7. E. Parkinson's disease results from loss of dopamine-producing neurons in the movement pathways. GABA deficits are tied to anxiety and seizures, a tempting but different problem.
8. A. Opiates mimic endorphins and activate their receptors, so they are agonists. An endorphin antagonist would block receptors and would increase pain.
9. D. The hypothalamus signals the pituitary, which then triggers other glands. The thyroid is one of the glands the pituitary regulates, not the regulator.
10. B. Cortisol helps mobilize energy but prolonged high levels suppress immune function. The claim that cortisol boosts immunity reverses the effect.
11. C. ACh is needed for muscle contraction, so blocking its release (antagonism) causes paralysis. Spasms would result from too much ACh, such as from black widow venom.

SET C · APPLY AND EXTEND

12. (a) Levels of both neurotransmitters stay higher in the synapse longer because reuptake removal is blocked (1 point). (b) Mood and energy may improve, as in treatment of depression; arousal or alertness could also rise (1 point). (c) The drug is an agonist because it increases the neurotransmitters' effect without blocking receptors (1 point).
13. Sudden threat: the sympathetic nervous system rapidly activates the adrenal glands, which release epinephrine and norepinephrine, increasing heart rate and alertness (1-2 points). Prolonged stress: the hypothalamus signals the pituitary, which signals the adrenal cortex to release cortisol, sustaining energy but suppressing immunity over time (1-2 points). Comparing speed: neural is quick, hormonal is slower and longer lasting (1 point).

2.4 The Nervous System and Brain Structures**SET A · CHECK YOUR UNDERSTANDING**

1. The CNS is the brain and spinal cord, which process and coordinate information. The PNS consists of the nerves connecting the CNS to the body.
2. The sympathetic division raises heart rate and slows digestion to mobilize energy during stress. The parasympathetic division lowers heart rate and restores digestion to conserve energy.
3. It coordinates voluntary movement, balance, and procedural learning. Damage would produce clumsy, uncoordinated movement and trouble with balance.
4. It regulates hunger, thirst, temperature, and sexual behavior, and it controls the pituitary gland, linking the nervous and endocrine systems.
5. The amygdala processes emotion, especially fear and aggression. The hippocampus helps form new explicit memories.
6. Frontal: planning and voluntary movement. Parietal: touch and body sensation. Occipital: vision. Temporal: hearing and language comprehension.

SET B · EXAM-STYLE MULTIPLE CHOICE

7. B. The hippocampus is required to form new explicit memories while older memories stored in the cortex remain. The amygdala is tied to emotional memory, not to forming new explicit memory in general.
8. C. Sympathetic arousal prepares for fight or flight. The somatic system controls voluntary muscles, so it does not drive these automatic changes.
9. A. The thalamus relays sensory input to the appropriate cortical area. The hypothalamus has a similar name but regulates drives and hormones.
10. D. Broca's area controls speech production; the person's comprehension is intact. Wernicke's area damage would impair understanding instead.
11. E. Association areas integrate information from many sources for higher mental functions. Heartbeat is controlled by the medulla, an older structure.

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SET C · APPLY AND EXTEND

12. (a) Parietal damage can reduce touch or body-position awareness on the body's left side (somatosensory cortex), and temporal damage can impair hearing or comprehension of speech (1 point each). (b) The occipital lobe holds the visual cortex, so it is the lobe needed for sight, and parietal and temporal damage alone would not cause blindness (1 point for naming the occipital lobe as the one for vision).
13. Sympathetic division of the autonomic nervous system activates, the amygdala detects danger, the hypothalamus triggers adrenal responses, heart rate and breathing rise (up to 3 points for three correct named parts with effects). After the emergency, the parasympathetic division restores calm, lowering heart rate and resuming digestion (1 point). The somatic system controls the voluntary muscle movements used to respond (bonus detail).

2.5 Brain Research, Lateralization, and Plasticity**SET A · CHECK YOUR UNDERSTANDING**

1. An EEG records electrical activity with excellent timing but poor location. An fMRI measures blood flow to show where activity occurs but it responds more slowly.
2. An MRI gives more detailed images of soft tissue structure, such as subtle brain abnormalities, and does not use X-rays.
3. Broca's aphasia involves effortful, halting speech with comprehension largely intact. Wernicke's aphasia involves fluent but meaningless speech and poor comprehension.
4. It carries messages between the two hemispheres. Cutting it produces split-brain patients whose hemispheres cannot share information, reducing seizure spread but causing the odd effects seen in experiments.
5. Neuroplasticity is the brain's ability to change and reorganize through experience or injury. For example, blind individuals use visual cortex to process touch, or stroke survivors regain function as other areas take over.
6. His change to impulsive, irritable behavior after frontal lobe injury suggested the frontal lobes help regulate judgment, planning, and personality.

SET B · EXAM-STYLE MULTIPLE CHOICE

7. D. fMRI shows changes in blood flow during a task and so identifies active regions. A standard MRI shows structure but not activity, which is why it is the best distractor.
8. A. The left visual field goes to the right hemisphere, which has no speech but controls the left hand. Naming requires the left hemisphere, which never received the image.
9. E. Reorganization of function after injury is neuroplasticity. The handedness and language lateralization item is lateralization, not change.
10. B. Fluent but meaningless speech with poor comprehension is Wernicke's aphasia. Broca's damage would leave comprehension largely intact but speech halting.
11. C. Specialization exists, such as language usually on the left, but intact brains integrate across the corpus callosum. The popular personality types are myths.

SET C · APPLY AND EXTEND

12. (a) The amygdala is involved in fear responses (1 point). (b) Lesions can damage nearby tissue or fibers, and the rest of the brain may compensate, so the loss may not reflect the amygdala's sole role; animal findings may not generalize to humans (1 point). (c) fMRI measures blood flow showing amygdala activation when people view threatening stimuli (1 point).
13. (a) She says 'apple' because the right visual field projects to the left hemisphere, which controls speech (1 point). (b) The left hand selects a banana because the right hemisphere received 'BANANA' and controls the left hand (1 point). (c) With the corpus callosum cut, the hemispheres cannot share information, and only the left usually produces speech (1 point).

2.6 Sleep, Dreams, and Consciousness**SET A · CHECK YOUR UNDERSTANDING**

1. The SCN in the hypothalamus is the body's clock, responding to light. In darkness, the pineal gland releases melatonin, which increases sleepiness.
2. The cycle passes through N1, N2, N3, and then REM. Deep sleep (N3) is characterized by slow delta waves.
3. The brain is highly active and the EEG looks like wakefulness, yet the body's muscles are essentially paralyzed.
4. Insomnia is persistent difficulty falling or staying asleep. Narcolepsy is sudden, uncontrollable sleep attacks during the day, often into REM.
5. Manifest content is the remembered storyline of the dream. Latent content is its hidden symbolic meaning that Freud believed reflected unconscious wishes.
6. It impairs attention and memory, and increases mood problems and accident risk; it also weakens immunity and is linked to weight gain.

SET B · EXAM-STYLE MULTIPLE CHOICE

7. C. Delta waves are large and slow and dominate N3 deep sleep. Sleep spindles distinguish N2, which is why N2 is tempting but wrong.
8. E. Hobson and McCarley proposed activation-synthesis. Freud's theory emphasizes hidden wishes, not random firing, and does not tie dreams to brain activation.
9. D. Night terrors occur in deep NREM sleep early in the night with little recall. Nightmares occur in REM and are remembered, so they are the usual confusion.
10. B. The body compensates with extra REM, which is called REM rebound. Absence of REM would contradict the need for REM.
11. A. Hypnotized people may confabulate and become very confident in memories that are false. Hypnosis can reduce pain, but the claim of accurate recall is not supported.

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SET C · APPLY AND EXTEND

12. (a) N3 deep sleep; it is hard to wake the sleeper and growth hormone is released (1 point). (b) Early cycles have more N3 deep sleep, and later cycles have more REM (1 point). (c) Sleep deprivation impairs attention and memory, or increases irritability and accident risk (1 point).
13. Freud: dreams express disguised wishes; manifest content hides latent content (1 point); weakness: symbolic interpretation is subjective and hard to test (1 point). Activation-synthesis: dreams are the cortex's story built from random REM neural firing (1 point); strength: ties dreams to measurable brain activity, though it does not fully explain meaningful dream themes (1 point).

2.7 Psychoactive Drugs**SET A · CHECK YOUR UNDERSTANDING**

1. Alcohol enhances GABA and slows neural activity, including the brain regions that inhibit behavior. Reduced inhibition can look like stimulation.
2. It blocks reuptake of dopamine, norepinephrine, and serotonin, leaving more in the synapse and producing a quick high, followed by a crash as supplies and receptors adapt.
3. Opioids mimic endorphins, acting as agonists at opioid receptors that reduce pain and produce pleasure. Repeated use decreases the brain's own endorphin production.
4. Tolerance is needing a larger dose to achieve the same effect. The brain adapts to repeated exposure, for example by reducing receptors or neurotransmitter production.
5. Physical dependence is the body's adaptation, shown by withdrawal when use stops. Addiction is compulsive use and craving despite harmful consequences, which can occur with psychological factors as well.
6. Biological: genetic vulnerability. Psychological: stress or depression leading to self-medication. Social-cultural: peer pressure or drug availability.

SET B · EXAM-STYLE MULTIPLE CHOICE

7. E. GABA is inhibitory, so enhancing it calms the nervous system. Increased heart rate is a stimulant effect, which is the common mix-up.
8. A. Heroin is an opioid that mimics endorphins. Morphine is also an opioid, so calling it a hallucinogen is wrong.
9. D. Needing larger amounts for the same effect is tolerance. Withdrawal refers to symptoms after stopping, so it is the tempting wrong answer.
10. B. Drug-induced increases in dopamine in the reward circuit strengthen the behavior. Other neurotransmitters are also involved, so dopamine is not the only one.
11. C. Classic hallucinogens act on serotonin receptors. Endorphin receptors are targeted by opioids, not hallucinogens.

SET C · APPLY AND EXTEND

12. (a) The drug acts as an agonist at opioid receptors, mimicking endorphins (1 point). (b) The brain adapts by reducing its own endorphin production and receptor sensitivity, producing tolerance (1 point). (c) The patient experiences withdrawal such as pain, anxiety, and cravings, showing dependence (1 point).
13. Biological: genetic vulnerability or a developing adolescent brain that is sensitive to reward (1 point). Psychological: depression, stress, or poor coping skills leading to self-medication (1 point). Social-cultural: friends who use drugs, easy availability, or permissive family norms (1 point). A strong answer notes that these factors interact.

2.8 Sensation: Vision and Hearing**SET A · CHECK YOUR UNDERSTANDING**

1. Transduction converts physical energy into neural signals. In vision, rods and cones convert light into signals; in hearing, hair cells in the cochlea convert fluid vibrations.
2. The just noticeable difference between two stimuli is a constant proportion of the original stimulus intensity, so larger baseline stimuli require larger changes to be noticed.
3. It reduces sensitivity to constant, unchanging stimuli, such as the feel of clothes, so attention is freed to notice changes that may matter.
4. Rods are mostly in the periphery and detect dim light and black-and-white vision. Cones are concentrated in the fovea and detect color and fine detail in bright light.
5. Trichromatic theory explains color detection by three cone types in the retina. Opponent-process theory explains how later cells in ganglion cells and the thalamus code colors in opposing pairs, explaining afterimages.
6. Conduction loss involves the eardrum or middle ear bones failing to transmit vibrations. Sensorineural loss involves damage to cochlear hair cells or the auditory nerve and is permanent.

SET B · EXAM-STYLE MULTIPLE CHOICE

7. B. Afterimages occur because cells paired in opposition (red-green) rebound after fatigue. Weber's law concerns difference thresholds, not color.
8. D. Rods and cones in the retina convert light into neural signals. The optic nerve carries the signals but has no receptors, creating the blind spot.
9. A. Rods function in dim light and are located in the periphery, so looking off-center uses them. The fovea is packed with cones and is poor in low light.
10. E. Noise damages cochlear hair cells, causing sensorineural loss. Middle ear bone problems cause conduction loss, which is not the usual result of noise exposure.
11. C. Reporting a signal when none was present is a false alarm. A correct rejection would be saying no when there was no beep.

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SET C · APPLY AND EXTEND

12. (a) The difference threshold (JND) (1 point). (b) The proportion is $2/50 = 0.04$; $0.04 \times 200 = 8$ units (1 point for method, shown). (c) Signal detection theory says detection depends on not only stimulus intensity but also the observer's expectations and motivation, so a highly motivated person may report more changes, including false alarms (1 point).
13. Path: cornea, pupil, lens, retina (rods and cones), bipolar cells, ganglion cells, optic nerve, thalamus, visual cortex (2 points for a mostly correct sequence). Night vision uses rods, which are sensitive in dim light and located in the periphery (1 point). Color vision uses three types of cones concentrated in the fovea, which work in bright light (1 point).

2.9 Chemical, Body, and Other Senses**SET A · CHECK YOUR UNDERSTANDING**

- Sweet, sour, salty, bitter, and umami. Bitter taste often signals poison, which helped our ancestors avoid harmful plants; sweet signals energy-rich food.
- Olfactory signals travel directly to brain regions such as the amygdala and hippocampus in the limbic system without relaying through the thalamus first.
- A spinal-cord gate can open or close to pain signals: small-fiber input opens it, while large-fiber touch input or brain signals (endorphins, distraction) can close it.
- The vestibular sense, in the inner ear, tracks balance and head movement. Kinesthesia tracks the positions and motion of body parts through receptors in muscles and joints.
- A condition in which stimulation of one sense involuntarily triggers a sensation in another, such as seeing colors when hearing music.
- Biological factors include nociceptors and endorphins; psychological factors include attention and expectations; social-cultural factors include social support and cultural norms about expressing pain.

SET B · EXAM-STYLE MULTIPLE CHOICE

- E. Olfactory signals go from the olfactory bulb directly to limbic and cortical areas. Taste does relay through the thalamus, though it is closely linked to smell.
- B. Smell and taste work together to produce flavor. Synesthesia is a rare crossing of senses within a person, not a normal interaction.
- D. Fluid movement in the semicircular canals signals head rotation. The cochlea is also in the inner ear but is for hearing.
- A. Touch signals from large fibers close the spinal gate to pain signals. Sensory adaptation involves reduced response to constant stimuli, not a relief of pain by pressure.
- C. Synesthesia involves cross-activation between sensory systems. Color blindness would reduce, not add, color experience.

SET C · APPLY AND EXTEND

12. (a) Applying pressure or gentle rubbing near the wound, which activates large fibers that close the gate (1 point). (b) Distraction such as virtual reality, relaxation, or reassurance to alter attention and expectations (1 point). (c) Pain is biopsychosocial: biological differences, psychological factors like anxiety, and social-cultural norms influence the experience (1 point).
13. Smell contributes much of flavor; a cold blocks airborne molecules from reaching olfactory receptors, so flavor perception drops, though the basic tastes still work (2 points). Memory: olfactory signals go directly to the limbic system, including the amygdala and hippocampus, tying odors to emotion and memory (2 points).

2.10 Multiple-Choice Practice: Biological Bases of Behavior**SET A · CORE CONCEPTS**

- A. Most psychological traits depend on many genes plus environment. The one-dominant-gene idea describes only a few simple traits and is the typical misconception.
- B. Blocking receptors reduces a neurotransmitter's effect, which defines an antagonist. A reuptake inhibitor would keep the transmitter in the synapse longer instead.
- C. EEG records electrical activity in milliseconds. PET shows where glucose is used but responds slowly, so it is weaker for timing.
- D. Cocaine blocks reuptake of dopamine and other monoamines. Alcohol enhances rather than blocks GABA, which is the tempting reversed answer.
- D. Once threshold is reached, the neuron fires fully; intensity is coded by rate and number of neurons. The refractory period concerns the short reset time, not spike size.
- E. Damage to the cerebellum causes clumsy, uncoordinated movement. The thalamus routes sensory information and does not coordinate movement.
- A. N3 is deep slow-wave sleep. Vivid dreams and paralysis characterize REM, which has waking-like brain activity.

SET B · APPLICATIONS AND DATA

- C. Correlations decline with genetic similarity but identical twins are not perfectly alike, so both genes and environment matter. Calling it entirely genetic would require identical twins to correlate near 1.0.
- E. Fluent nonsense with poor comprehension signals Wernicke's aphasia. Broca's area damage would produce effortful speech with intact understanding.
- B. The left visual field projects to the right hemisphere, which controls the left hand but usually lacks speech. If the left hemisphere had received the word, she could name it.
- D. Rapid eye movements, a waking-like EEG, and no muscle tone are the signature of REM. N3 shows large slow delta waves instead.

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12. A. Needing more drug is tolerance, and the symptoms when missing a dose are withdrawal, which shows dependence. Choosing tolerance only ignores the withdrawal evidence.
13. C. The minimum stimulus detected half the time is the absolute threshold. The difference threshold compares two stimuli, not detection of one.
14. E. Gate-control theory says touch input from large fibers competes with and inhibits pain signals. The thalamus does relay pain, so it is not responsible for filtering it away.

SET C · EXAM-LEVEL STRETCH

15. B. fMRI is correlational; it shows association, not necessity. The claim that the region is the only one needed overreaches the evidence.
16. D. Blocking reuptake of serotonin is the action of SSRIs. A GABA agonist would reduce neural activity rather than raise serotonin.
17. A. The amygdala processes fear and emotional responses, so damage would blunt them. Inability to form new memories would point to the hippocampus.
18. E. Epigenetics involves modifications of gene expression, not sequence. A mutation changes the DNA sequence and so is the common confusion.
19. C. The fovea is dense with cones that give fine detail and color, so damage impairs sharp central vision. Peripheral night vision depends on rods, which are mostly outside the fovea.
20. B. GABA is the main inhibitory transmitter, and enhancing it promotes sedation. Glutamate is the main excitatory one and would increase arousal instead.

2.11 Free-Response Practice: Biological Bases of Behavior**QUESTION 1 · ARTICLE ANALYSIS: SLEEP AND MEMORY**

1. (a) 1 point: independent variable is the amount of sleep (sleep vs. staying awake). 1 point: dependent variable is the number of word pairs recalled.
2. (b) 1 point: random assignment spreads preexisting differences such as intelligence, motivation, or sleep habits evenly across groups, so the difference in recall can be attributed to sleep (cause and effect).
3. (c) 1 point: during sleep, the brain, especially during REM and deep slow-wave sleep, replays and consolidates new memories, with the hippocampus transferring information to the cortex.
4. (d) 1 point: limitations such as a small, narrow sample of college students, the unusual all-night sleep deprivation (stress or fatigue could impair recall directly), or the short delay. The fix: replicate with a larger, more diverse sample or use a partial-sleep-restriction condition or longer follow-up.

QUESTION 2 · EVIDENCE-BASED QUESTION: NATURE AND NURTURE OF AGGRESSION

5. (a) 1 point: a defensible claim, such as 'Aggression is influenced by both genes and environment, and their interaction matters most.'
6. (b) 1 point: identical twins, who share more genes, are more alike (.50 vs .22), suggesting heritability; limit: .50 is well below 1.0, so environment and unshared experiences also matter.
7. (c) 1 point: adoptees with low genetic risk still showed more aggression in high-conflict homes, showing environment can raise aggression independent of biological parents.
8. (d) 1 point: the gene variant increased aggression only with abuse, so genes and environment interact (genetic risk expressed under certain conditions). 1 point: connecting to epigenetics (abuse may alter gene expression) or to polygenic influence (a single variant cannot explain aggression).

QUESTION 3 · ARTICLE ANALYSIS: CORTISOL AND STRESS RESPONSE

9. (a) 1 point: epinephrine (and norepinephrine) from the adrenal medulla acts first; 1 point: cortisol from the adrenal cortex acts later, in prolonged stress.
10. (b) 1 point: sympathetic division raises heart rate; parasympathetic division restores calm.
11. (c) 1 point: prolonged high cortisol suppresses immune function, increasing susceptibility to infection.
12. (d) 1 point: the design is correlational/quasi-experimental; there was no random assignment and other factors such as poor sleep, diet, or crowded study spaces could explain colds. Only an experiment can establish causation.

QUESTION 4 · EVIDENCE-BASED QUESTION: BRAIN INJURY AND PLASTICITY

13. (a) 1 point: Broca's area; 1 point: Broca's aphasia (nonfluent speech with intact comprehension).
14. (b) 1 point: other brain regions, such as the right hemisphere, can take over functions after injury, showing reorganization.
15. (c) 1 point: the frontal lobes help regulate impulse control, judgment, and planning (personality); 1 point: limitation, such as a single anecdotal case, lack of controlled measurement, or missing preinjury data.
16. (d) 1 point: practice enlarges cortical representation, showing experience reshapes the brain in healthy people too.

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Chapter 3: Cognition.

10 sections with explanations and worked examples, then 139 practice problems. Answers and full explanations are at the end of the chapter.

3.1 Perception: Organizing the World

You will learn how the brain organizes raw sensory input into stable, meaningful perceptions, and why the same input can be interpreted in different ways.

Perception is the process of organizing and interpreting sensory information so that it has meaning. Sensation delivers raw data (light waves, pressure, sound waves); perception decides that the data are a friend walking toward you. Psychologists describe two directions of processing that work together.

Bottom-up vs. top-down processing

Bottom-up processing starts with the stimulus: feature detectors in the sensory system build a perception from small pieces (edges, colors, tones) up to a whole object.

Top-down processing starts with the perceiver: expectations, knowledge, context, and motivation guide how ambiguous input is interpreted.

Reading the word CAT with a smudged middle letter works because top-down knowledge fills in what bottom-up data lack.

Selective attention is the focusing of awareness on one stimulus while filtering out others. At a loud party you can follow one conversation yet notice when someone says your name (the cocktail-party effect). Attention has costs. **Inattention blindness** is failing to notice a visible, unexpected object because attention is directed elsewhere; in a famous demonstration, many viewers counting basketball passes never see a person in a gorilla suit cross the court. Closely related, **change blindness** is failing to notice a change in a scene. These findings explain why texting while driving is dangerous: the eyes may be on the road while attention is not.

Gestalt psychology holds that the whole is different from the sum of its parts: the brain imposes organization on input rather than just adding up pieces. The first act of organization is **figure-ground**, separating a focal object (figure) from its background (ground). The vase-and-faces drawing shows that the same pixels can flip roles. Gestalt grouping principles then bind elements together.

Gestalt principle	We group elements that...	Everyday example
Proximity	are close together	Dots arranged in tight columns look like columns, not rows
Similarity	look alike (color, shape)	Players in the same jersey are seen as one team
Continuity	form smooth, continuous lines	Two crossing wires are seen as two lines, not four pieces
Closure	leave gaps that we fill in	A dashed circle is seen as a full circle
Connectedness	are linked by lines or borders	Two dots joined by a line are one unit

Depth perception is the ability to see the world in three dimensions, even though the retina is a flat surface. Two kinds of cues are used.

- ◆ **Binocular cues** need both eyes. **Retinal disparity**: the two eyes see slightly different images, and the brain reads a bigger difference as a closer object. **Convergence**: the eyes turn inward more for near objects, and the brain senses the muscle tension.
- ◆ **Monocular cues** work with one eye: relative size, interposition (overlap), linear perspective (parallel lines converge), texture gradient (detail fades with distance), relative height (higher in the visual field means farther), light and shadow, and **motion parallax** (nearby objects seem to move faster across your view than distant ones when you travel).

The visual cliff experiment (Gibson and Walk) tested whether depth perception is learned. Most crawling infants refused to cross the apparent drop, suggesting depth perception develops very early, although infants had already had some experience, so the evidence does not fully settle nature versus nurture.

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Perceptual constancy

Perceptual constancy is perceiving an object as unchanging in size, shape, brightness, and color even as the sensory image changes.

Size constancy: a car driving away is not seen as shrinking. Shape constancy: a door swung open still looks rectangular. Color and brightness constancy: a white shirt looks white in shade or sun.

Constancy depends on context and depth cues; when cues are removed, constancy fails.

Illusions reveal the assumptions the brain makes. In the Muller-Lyer illusion, a line with outward-pointing fins looks longer than an identical line with inward fins, partly because we interpret the figures as corners of rooms at different distances (a misapplied size-distance rule). The moon illusion (the moon looks larger near the horizon) is explained similarly by distance cues. Perception is also shaped by **perceptual set**, a mental predisposition to perceive one thing and not another, created by experience, expectations, context, and emotion. Seeing an ambiguous drawing as a rabbit after being shown rabbits first is a perceptual set at work; so is hearing a hidden phrase in a song once someone tells you what to listen for.

Motion perception relies on the brain comparing positions over time. The **phi phenomenon** is the illusion of movement created by lights flashing in sequence, which is how marquee signs and film frames create apparent motion. The visual system also uses cells specialized for movement direction, and the brain normally accounts for your own eye and head motion so the world seems stable.

EXAMPLE 1: IDENTIFY THE PROCESSING

A student is shown the letters 'T_E' on a sign inside a classroom and reads 'THE' instantly. Shown the same ink marks in a list of random symbols, she cannot say what they are. (a) Name the type of processing that explains the first reading. (b) Explain why the second situation produces a different result.

SOLUTION

(a) Top-down processing: her knowledge of English words and the sign's context lead her to supply the missing letter.

(b) In the random-symbol list there is no context or expectation to guide interpretation, so the ambiguous bottom-up data cannot be completed. The identical stimulus is perceived differently because perceptual set and context differ.

EXAMPLE 2: NAME THE DEPTH CUE

A photograph of railroad tracks shows the rails appearing to meet at a point near the horizon, the ties becoming smaller and blurrier in the distance, and a tree partly hiding a barn behind it. Identify one monocular depth cue for each observation.

SOLUTION

Rails appearing to meet: linear perspective.

Ties becoming smaller and less detailed with distance: relative size and texture gradient.

Tree covering part of the barn: interposition (overlap), which tells us the tree is closer.

None of these requires two eyes, so all are monocular cues.

Common mistakes

Do not confuse sensation with perception: sensation is detecting energy, perception is interpreting it. Do not call retinal disparity a monocular cue; it needs two eyes. Gestalt grouping describes how we organize stimuli, not how we judge distance. And inattentional blindness is about attention, not about the eye failing to receive light.

Practice

SET A Check Your Understanding

Answer each question in one to three sentences.

1. Distinguish bottom-up from top-down processing and give one example of each.
2. Explain how inattentional blindness differs from selective attention.
3. Name the Gestalt principle illustrated by seeing a row of separate dashes as one dotted line, and explain why.
4. Explain why retinal disparity is a binocular cue while interposition is monocular.
5. Define size constancy and explain what would happen to your perception of a friend walking away if it failed.
6. Describe how perceptual set could cause two people to interpret the same ambiguous image differently.

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SET B Exam-Style Multiple Choice

Choose the best answer.

7. A driver looks directly at a stopped bicycle at an intersection but later says she never saw it because she was searching for cars. This is best explained by
(A) sensory adaptation (B) inattention blindness (C) retinal disparity
(D) perceptual constancy (E) motion parallax
8. A skater picks out her teammates in a crowded rink because they wear the same color. Which Gestalt principle is most directly at work?
(A) Closure (B) Proximity (C) Similarity
(D) Continuity (E) Figure-ground
9. Which of the following is a binocular depth cue?
(A) Texture gradient (B) Linear perspective (C) Convergence
(D) Relative height (E) Interposition
10. A passenger on a train sees nearby fence posts rush past while distant mountains barely move. This is an example of
(A) motion parallax (B) the phi phenomenon (C) retinal disparity
(D) size constancy (E) closure
11. A person sees a closing door as still rectangular even though its retinal image has become a trapezoid. This illustrates
(A) figure-ground (B) the Muller-Lyer illusion (C) convergence
(D) similarity (E) shape constancy

SET C Apply and Extend

Write a complete response; compare with the model answer and scoring points.

12. A psychologist shows two groups the same ambiguous drawing that can be seen as a young woman or an old woman. Group 1 first saw a clear picture of a young woman; Group 2 first saw a clear picture of an old woman. (a) Predict the results and name the concept. (b) Identify the independent and dependent variables. (c) Explain whether this demonstrates top-down or bottom-up processing.
13. Explain how two monocular depth cues and one binocular depth cue would help an outfielder judge where to catch a fly ball, and explain why perceptual constancy matters for tracking the ball.

3.2 Thinking, Problem Solving, and Creativity

You will learn how we categorize information, solve problems with algorithms and heuristics, fall into predictable thinking errors, and generate creative solutions.

Cognition is all the mental activity involved in acquiring, organizing, and using knowledge. Thinking begins with building blocks. A **concept** is a mental grouping of similar objects, events, or ideas. We often decide whether something belongs by comparing it to a **prototype**, the best or most typical example of a category. A robin is a prototype of bird; a penguin fits less well, so it takes longer to classify. A **schema** is a larger mental framework that organizes knowledge about a topic, such as what happens at a restaurant. Piaget described two ways schemas change: assimilation (fitting new information into an existing schema) and accommodation (changing the schema to fit new information).

Concept, prototype, schema

Concept: a mental category (bird, fairness).

Prototype: the most typical member used to judge category membership.

Schema: an organized knowledge framework that guides expectations and interpretation; schemas help us fill gaps but can also distort memory and perception.

Problem solving strategies differ in reliability and speed. An **algorithm** is a step-by-step procedure that guarantees a correct solution if followed, such as trying every possible combination on a lock or following a math formula. It can be slow. A **heuristic** is a simple rule of thumb that is fast and usually works but can lead to errors. Heuristics are the brain's shortcuts for judging under uncertainty.

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Heuristic or bias	What it is	Typical error
Availability heuristic	Judging likelihood by how easily examples come to mind	Fearing plane crashes more than car crashes because crashes are vivid in the news
Representativeness heuristic	Judging by how closely something matches a prototype, ignoring base rates	Assuming a quiet, bookish person is more likely a librarian than a salesperson, though salespeople are far more numerous
Confirmation bias	Seeking and favoring evidence that supports existing beliefs	Reading only articles that agree with your view
Framing	Decisions change with how options are worded	Choosing a surgery with '90% survive' over one with '10% die'
Belief perseverance	Clinging to a belief after its basis is discredited	Still distrusting someone after the rumor is shown false
Overconfidence	Overestimating the accuracy of one's judgments	Believing a task will take less time than it will

Other obstacles block good solutions. **Mental set** is the tendency to repeat solution strategies that worked before, even when a new strategy would work better. **Functional fixedness** is the inability to see that an object can be used in a nonstandard way, as when someone fails to use a coin as a screwdriver. In the classic candle problem, people struggle because they see the box of tacks only as a container, not as a platform. Failing to see past an unhelpful assumption can be overcome by taking a break, which helps with **incubation**, or by reframing the problem.

Sometimes solutions arrive suddenly. **Insight** is a sudden realization of a solution, often accompanied by an 'aha' feeling. Insight is contrasted with strategy-based solving, in which people move step by step. Brain imaging shows a burst of activity in the right temporal region just before insight reports. Insight learning was also described by Kohler, who saw chimpanzees stack boxes to reach bananas.

Creativity is the ability to produce ideas that are both novel and valuable. Psychologists distinguish **convergent thinking**, narrowing many options to the single best answer (as on a multiple-choice test), from **divergent thinking**, generating many different possible answers (as in listing uses for a brick). Divergent thinking is the cognitive core of creativity. Sternberg's investment theory says creative people buy low on unpopular ideas and sell high. Research suggests creativity involves expertise, imaginative thinking skills, a venturesome personality, intrinsic motivation, and a creative environment. Beyond a certain moderate level, intelligence test scores do not predict creativity well.

Heuristic vs. algorithm

Algorithm: slow, guaranteed, step-by-step.

Heuristic: fast, efficient, fallible.

Availability = ease of recall; representativeness = match to prototype. Both can produce errors when base rates are ignored.

EXAMPLE 1: IDENTIFY THE HEURISTIC

After watching several news reports of shark attacks, a swimmer decides the ocean is too dangerous, although statistics show attacks are extremely rare. A second person, Maria, meets Dev, a shy man who likes poetry, and guesses he is a professor rather than a truck driver without considering how many more truck drivers exist. Name the thinking pattern in each case and explain the error.

SOLUTION

Swimmer: availability heuristic. Vivid, recent news examples come to mind easily, so the swimmer overestimates how common attacks are.

Maria: representativeness heuristic. She judges by how well Dev matches the prototype of a professor and neglects base rates, the much larger number of truck drivers.

In both cases a fast shortcut replaced actual probability information, so the judgment is biased.

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EXAMPLE 2: OBSTACLES TO PROBLEM SOLVING

A mechanic keeps trying to fix a stubborn engine problem with the same procedure that worked on the last five cars. Later, he needs to prop up a hood but does not think of using a tire iron because he considers it only a tool for wheels. Identify the two obstacles and a way to overcome each.

SOLUTION

Repeating the old procedure is mental set. Overcome it by deliberately brainstorming a different approach or consulting someone with a fresh view.

Not using the tire iron as a prop is functional fixedness. Overcome it by describing the object's physical properties (a long, rigid metal bar) instead of its usual label.

Taking a break for incubation can also help both.

Exam tip

Availability depends on how easily examples come to mind; representativeness depends on matching a prototype. If a stem mentions vivid media coverage or recent events, choose availability. If it mentions a description fitting a stereotype or ignoring statistics, choose representativeness. Confirmation bias is about seeking evidence, while belief perseverance is about keeping a belief after evidence is removed.

Practice**SET A Check Your Understanding**

Answer each question in one to three sentences.

1. Differentiate a concept from a prototype and give an example of each.
2. Explain why an algorithm and a heuristic differ in speed and accuracy.
3. A student believes her horoscope is accurate because she remembers the days it seemed right and forgets the days it was wrong. Name the bias and explain.
4. Explain how framing could change a person's choice between two medical treatments with identical outcomes.
5. Distinguish functional fixedness from mental set.
6. Contrast convergent and divergent thinking, and state which is most associated with creativity.

SET B Exam-Style Multiple Choice

Choose the best answer.

7. After a widely reported airline accident, many people choose to drive instead of flying even though driving is statistically more dangerous. This is best explained by
 - (A) the representativeness heuristic
 - (B) functional fixedness
 - (C) the availability heuristic
 - (D) an algorithm
 - (E) belief perseverance
8. A person insists a medicine does not work even after being shown that the study he relied on was fabricated. This is
 - (A) belief perseverance
 - (B) confirmation bias
 - (C) framing
 - (D) insight
 - (E) divergent thinking
9. Which of the following is the best example of an algorithm?
 - (A) Guessing the answer based on past experience
 - (B) Trying a strategy because it worked last time
 - (C) Using a rule of thumb to estimate cost
 - (D) Waiting for a sudden realization
 - (E) Following a recipe step by step to bake a cake
10. Tasha lists as many uses as she can for a brick: doorstop, paperweight, weapon, bookend, garden border. Her task primarily measures
 - (A) convergent thinking
 - (B) functional fixedness
 - (C) representativeness
 - (D) divergent thinking
 - (E) insight

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11. A physician sees a patient with a rare cough and automatically assumes the common cold because it is the most familiar pattern, ignoring unusual symptoms. The best description of this error is

(A) insight (B) mental set (C) incubation
(D) accommodation (E) divergent thinking

SET C Apply and Extend

Write a complete response; compare with the model answer and scoring points.

12. A researcher presents two groups with the same policy. Group 1 reads that a program 'saves 200 of 600 people'. Group 2 reads that under the program '400 of 600 people will die'. Group 1 favors the program more strongly. (a) Name the concept. (b) Explain why the groups differ although the outcomes are identical. (c) Identify the independent and dependent variables.
13. Use the candle problem to explain functional fixedness, state one strategy that reduces it, and explain how divergent thinking relates.

3.3 Language

You will learn the building blocks of language, how children acquire it, the main theories of acquisition, and how language relates to thought and the brain.

Language is a system of symbols and rules for combining them that lets us communicate an unlimited number of ideas. It has a layered structure, from tiny sounds up to whole meanings.

Element	Definition	Example
Phoneme	Smallest distinct sound unit in a language	The /k/, /a/, /t/ sounds in 'cat' (three phonemes)
Morpheme	Smallest unit that carries meaning; may be a word or a prefix or suffix	'Unhappily' has three morphemes: un-, happy, -ly
Grammar	The rules of a language, made up of semantics and syntax	
Semantics	Rules for deriving meaning from words and sentences	'Bank' means different things in 'river bank' and 'bank account'
Syntax	Rules for ordering words into sentences	'The dog bit the man' differs from 'The man bit the dog'

Building blocks of language

Phonemes combine into morphemes, morphemes into words, words into phrases and sentences.

Semantics concerns meaning; **syntax** concerns word order; together with phonology they form grammar.

Language is productive: with a finite set of sounds and rules, we can produce and understand novel sentences.

Stages of language development. Children everywhere pass through the same sequence on a similar schedule, which suggests a biological readiness. Newborns can tell the difference between speech sounds from any language.

Stage	Approximate age	Description
Cooing	2-4 months	Vowel-like sounds such as 'oooh'
Babbling	About 4-10 months	Consonant-vowel combinations like 'ba-ba'; at first includes sounds from many languages, then narrows to those heard at home
One-word (holophrastic)	About 10-12 months to 2 years	Single words that stand for whole thoughts, such as 'milk' meaning 'I want milk'
Two-word (telegraphic)	About 18-24 months	Short sentences that omit small words, like 'want cookie'; word order is generally correct
Complex sentences	After age 2, rapid growth	Grammar develops quickly; vocabulary grows dramatically

Young children also show **overgeneralization** (overregularization), applying a grammar rule to words that are exceptions, such as saying 'goed' or 'mouses'. This is strong evidence that children are not merely repeating what they hear: they are learning rules, because they have never heard adults say 'goed'. Receptive language (understanding) develops before productive language (speaking).

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Theories of acquisition. B. F. Skinner argued that language is learned through operant conditioning: parents reinforce correct speech, shape it step by step, and children imitate what they hear. Noam Chomsky challenged this view, arguing that children learn too much, too fast, and from too little input for learning alone to explain it. He proposed that humans are born with a **language acquisition device**, an innate capacity that gives the child a built-in sense of universal grammar, the structure common to all languages. The interactionist view, now widely held, blends the two: biology provides the capacity, and social interaction and experience supply the specific language.

Skinner vs. Chomsky

Skinner (learning/nurture): reinforcement and imitation produce language.

Chomsky (nativist): an innate language acquisition device and universal grammar; children generate sentences they have never heard and make overgeneralization errors.

Evidence for innateness: the same sequence in all cultures; creation of new sign languages by deaf children; overgeneralization.

Critical (sensitive) period. Language learning is easiest early in life. Children who are deprived of language exposure until later, such as the case of Genie, rarely master grammar. Deaf people who learn sign language late show weaker grammatical skills than those who learned early, and people who learn a second language after about age 7 or so usually retain an accent and have more difficulty with grammar. Early learning is most effective, but later learning is still possible.

Linguistic relativity. The hypothesis proposed by Benjamin Lee Whorf holds that the language we speak influences how we think. The strong version (language determines thought) is not supported; the weak version (language influences thought) has some support. For example, languages with many color terms can speed up color discrimination, and speakers of languages that use compass directions rather than left and right tend to keep track of direction well. Bilingual people, particularly those who learn both languages early, often show advantages in executive control and attention-switching, although the size of this effect is debated.

Brain areas for language. Two regions in the left hemisphere of most people are crucial. **Broca's area** (left frontal lobe) controls the production of speech; damage causes Broca's aphasia, slow, effortful speech with comprehension largely intact. **Wernicke's area** (left temporal lobe) is responsible for language comprehension; damage causes Wernicke's aphasia, fluent but meaningless speech and poor understanding. The arcuate fasciculus connects them. Language is mostly lateralized to the left hemisphere, while the right hemisphere helps with tone, humor, and context.

EXAMPLE 1: APPLY THE STAGES

Two-year-old Leo says 'Daddy go work' and 'two mouses'. His younger sister Ana, aged 11 months, says 'doggie' while pointing and wanting to be picked up to see a dog. Identify each child's stage and explain what Leo's 'two mouses' shows.

SOLUTION

Leo: telegraphic (two-word) speech, because he uses short, content-only phrases with correct word order.

Ana: the one-word (holophrastic) stage, since one word expresses a complete idea.

'Two mouses' is overgeneralization: Leo applied the regular plural -s rule to an irregular noun. He could not have heard this from adults, so it supports Chomsky's claim that children acquire rules rather than copying.

EXAMPLE 2: LOCATE THE DAMAGE

After a stroke, a patient speaks fluently in long, grammatical-sounding sentences that make no sense, and cannot understand what others say. Another patient understands everything but can produce only a few effortful words. Identify the damaged region in each patient.

SOLUTION

The first patient has Wernicke's aphasia: damage to Wernicke's area in the temporal lobe, impairing comprehension.

The second has Broca's aphasia: damage to Broca's area in the frontal lobe, impairing speech production while comprehension stays intact.

Common mistakes

Phonemes are sounds, morphemes are meaning units: 'cats' has four phonemes (/k/ /a/ /t/ /s/) but two morphemes (cat, -s). Do not say Chomsky thought language is not learned at all; he argued that the capacity is innate and the specific language is learned. Linguistic relativity says language influences thought, not that people cannot think without it.

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Practice

SET A Check Your Understanding

Answer each question in one to three sentences.

1. Count the phonemes and morphemes in the word 'dogs' and explain your count.
2. Explain the difference between syntax and semantics, using the sentence 'The mouse chased the cat.'
3. What does babbling reveal about the role of biology in language, and how does it change by about 10 months?
4. State two pieces of evidence for Chomsky's claim that humans have an innate capacity for language.
5. Describe the effect of damage to Broca's area.
6. Explain what the critical period for language suggests about teaching a second language.

SET B Exam-Style Multiple Choice

Choose the best answer.

7. A toddler says 'more juice' and 'go car' but omits words like 'the' and 'to'. This speech is characteristic of the
 (A) telegraphic stage (B) babbling stage (C) cooing stage
 (D) holophrastic stage (E) overgeneralization stage
8. A child says 'I runned to the park.' This error most directly supports the idea that children
 (A) learn only through reinforcement
 (B) cannot distinguish phonemes
 (C) have not yet reached the babbling stage
 (D) learn grammatical rules rather than simply imitating
 (E) have a critical period that has ended
9. Which theorist argued that humans have an innate language acquisition device?
 (A) B. F. Skinner (B) Benjamin Whorf (C) Noam Chomsky
 (D) Jean Piaget (E) Albert Bandura
10. Speakers of a language with no future tense are found to save more money. This finding is most consistent with
 (A) universal grammar (B) linguistic relativity
 (C) the critical period (D) overgeneralization
 (E) the language acquisition device
11. A patient with damage to the left temporal lobe speaks fluently but her sentences are meaningless and she cannot follow instructions. She most likely has damage to
 (A) Broca's area (B) the occipital lobe
 (C) the corpus callosum alone (D) the cerebellum
 (E) Wernicke's area

SET C Apply and Extend

Write a complete response; compare with the model answer and scoring points.

12. Compare Skinner's and Chomsky's explanations of language acquisition. Use one piece of evidence that favors each position, and explain how the interactionist view combines them.
13. A researcher compares adults who learned a second language at age 3 with adults who learned it at age 20, after both groups lived in the country for 20 years. The early group has better grammar scores. (a) State the concept this supports. (b) Identify the independent and dependent variables. (c) Give one limitation of concluding causation.

3.4 Memory: Encoding and Storage

You will learn how memories are formed and kept, the stages and types of memory, and the encoding techniques that make information stick.

Memory is the persistence of learning over time through the storage and retrieval of information. Psychologists describe three basic tasks: **encoding** (getting information in), **storage** (retaining it), and **retrieval** (getting it out). Failure at any step produces forgetting.

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The **Atkinson-Shiffrin model** (the three-stage or information-processing model) pictures memory as a flow through three stores. Information first enters **sensory memory**, a very brief record of sensory input. Attention moves a portion into **short-term memory**, which holds a limited amount for a short time. Rehearsal and meaningful processing then transfer information into **long-term memory**, a relatively permanent store of unlimited capacity.

Store	Duration	Capacity	Key features
Sensory memory	Iconic (visual) about a fraction of a second; echoic (auditory) 3-4 seconds	Large but fleeting	Sperling's partial-report studies showed that people briefly hold more visual information than they can report
Short-term memory	About 20-30 seconds without rehearsal	About 7 items, plus or minus 2 (Miller); newer estimates are closer to 4 chunks	Rehearsal keeps items active; new input displaces old
Long-term memory	Potentially a lifetime	Essentially unlimited	Organized by meaning; includes explicit and implicit memory

Working memory (Baddeley)

Modern researchers prefer **working memory**, an active system for holding and manipulating information, not just storing it. Baddeley's model: a **central executive** directs attention and coordinates; the **phonological loop** holds verbal and auditory information; the **visuospatial sketchpad** holds images and spatial layout; the **episodic buffer** integrates information with long-term memory.

Example: mentally adding 38 and 47 uses the phonological loop and central executive.

Chunking organizes items into familiar units to stretch capacity. The sequence F-B-I-C-I-A-N-F-L is hard to hold as nine letters but easy as the chunks FBI, CIA, NFL. Experts such as chess masters chunk board positions, which is why they remember real game positions much better than random ones.

Long-term memory is divided according to whether recall requires conscious effort.

Type	Meaning	Example	Brain region
Explicit (declarative)	Facts and experiences you consciously recall	Knowing your locker number	Hippocampus and cortex
Episodic	Explicit memory of personal events	Your last birthday party	Hippocampus
Semantic	Explicit memory of general facts and meanings	Paris is the capital of France	Cortex
Implicit (nondeclarative)	Memory shown by performance, without conscious recall	Riding a bike	Cerebellum, basal ganglia, amygdala
Procedural	Implicit memory of skills and how to do things	Typing, tying shoes	
Priming and conditioning	Implicit effects of prior exposure	Recognizing a word faster after seeing it earlier	

Encoding strategies. Encoding can be automatic (for example, remembering where you ate breakfast) or effortful (studying vocabulary). The **levels of processing** model of Craik and Lockhart states that deeper processing leads to stronger memory. Processing can be shallow (the look of a word: structural), intermediate (its sound: phonemic), or deep (its meaning: semantic). Relating information to yourself, called the **self-reference effect**, is especially powerful. Maintenance rehearsal (repeating) is weak, while elaborative rehearsal (connecting to what you know) is strong.

Mnemonics are memory aids that use vivid imagery and organization. The method of loci links items to places on a familiar route; the peg-word system links numbers to rhyming words; acronyms (ROY G. BIV) and acrostics use initial letters; and imagery makes items easier to recall, partly because we encode both verbal and visual codes (dual coding). Hierarchies and mind maps help because organization improves later retrieval.

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Spacing effect

Spacing effect: information studied in several separate sessions is retained longer than the same amount of time spent in one cramming session (massed practice).

Distributed practice beats massed practice for long-term retention, especially when the intervals grow gradually.

Ebbinghaus's forgetting curve showed that forgetting is fastest right after learning and slows later; spaced review interrupts the curve.

EXAMPLE 1: CLASSIFY THE MEMORY

Identify the type of long-term memory in each case: (a) Maya remembers that her grandmother's kitchen smelled of cinnamon on a particular holiday. (b) Maya knows that a triangle has three sides. (c) Maya, without thinking, can still ride a bicycle after years away.

SOLUTION

(a) Episodic memory, because it is a personal event with time and place.

(b) Semantic memory, a general fact not tied to a personal episode.

(c) Procedural memory, an implicit skill. Both (a) and (b) are explicit; (c) is implicit.

EXAMPLE 2: PREDICT AND EXPLAIN AN EXPERIMENT

Group 1 studies a word list by judging whether each word is in capital letters. Group 2 judges whether each word fits a sentence meaning. A later surprise recall test shows Group 2 remembered far more. Explain the result and identify the variables.

SOLUTION

Independent variable: type of processing task (shallow structural vs. deep semantic). Dependent variable: number of words recalled.

Explanation: levels of processing predicts that deep, meaning-based encoding creates richer connections to existing knowledge, which makes retrieval easier.

The finding does not depend on how long each group studied, because the key difference was depth, not repetition.

Common mistakes

Do not treat short-term and working memory as identical: working memory emphasizes active manipulation. Do not say implicit memory is 'not stored'; it is stored but retrieved without awareness. 'Rehearsal' is not always effective; elaborative, meaning-based rehearsal beats repetition. Chunking increases how much information fits in each slot; it does not enlarge the number of slots.

Practice

SET A Check Your Understanding

Answer each question in one to three sentences.

1. Describe the three stores in the Atkinson-Shiffrin model and what moves information between them.
2. State the typical capacity and duration of short-term memory and one way to extend each.
3. Name and describe two components of Baddeley's working memory model.
4. Distinguish episodic from semantic memory using one example each.
5. Why is the phrase 'I know how to ride a bike' an example of implicit memory?
6. Explain why distributed practice produces better retention than cramming.

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SET B Exam-Style Multiple Choice

Choose the best answer.

7. A student remembers a 10-digit phone number by grouping it as 555, 123, 4567. This technique is called
(A) maintenance rehearsal (B) chunking (C) priming
(D) the spacing effect (E) iconic memory
8. According to the levels of processing model, which task leads to the best memory for a word?
(A) Thinking about what the word means (B) Counting the letters in the word
(C) Deciding whether it rhymes with 'tree' (D) Reading it silently once
(E) Copying it three times
9. A man with damage to the hippocampus cannot form new memories of events, but he can learn to solve a puzzle faster across days without remembering practicing. This shows that
(A) procedural memory depends on the hippocampus
(B) semantic memory is lost first
(C) implicit memory can operate independent of explicit memory
(D) working memory is intact
(E) sensory memory has failed
10. A speaker repeats a word to herself as she searches for a pen, then writes it down. The system holding the sounds is the
(A) visuospatial sketchpad (B) central executive (C) episodic memory
(D) phonological loop (E) iconic memory
11. A student studies for two hours one night; a classmate studies 30 minutes a night for four nights. If tested a month later, the classmate will most likely perform better because of
(A) the serial position effect (B) state-dependent memory
(C) proactive interference (D) the self-reference effect
(E) the spacing effect

SET C Apply and Extend

Write a complete response; compare with the model answer and scoring points.

12. A researcher asks participants to memorize 20 words. Group A repeats each word aloud five times; Group B creates a sentence linking each word to a personal experience. (a) Predict which group recalls more and why. (b) Name the concept demonstrated. (c) Identify the independent and dependent variables.
13. Explain how a student could use chunking, a mnemonic, and spacing to learn the 12 cranial nerves, and state which memory systems benefit from each.

3.5 Memory: Retrieval, Forgetting, and Reconstruction

You will learn how stored memories are retrieved, why we forget, and why memories are often reconstructions that can be distorted.

Retrieval is the process of getting information out of storage. Psychologists measure it in three ways, which differ in how much help the person receives.

Measure	What the person does	Example	Difficulty
Recall	Produces information with few or no cues	A fill-in-the-blank or essay test	Hardest
Recognition	Identifies the correct item among options	A multiple-choice test or a police lineup	Easier
Relearning	Learns material again; measures time or effort saved	Relearning high school French faster than a new learner	Most sensitive; shows hidden memory

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Retrieval depends on **retrieval cues**, stimuli linked to a memory when it was encoded. **Priming** is activating associations, often unconsciously, so that a cue makes a memory easier to access. Context matters: **context-dependent memory** means recall is better when the setting at retrieval matches the setting at encoding. A classic study found divers who learned words underwater recalled them better underwater than on land. **State-dependent memory** is better recall when your internal state (mood or physiological state) matches the state during encoding. The related **mood-congruent memory** is recalling experiences that match your current mood. The **tip-of-the-tongue** experience shows that retrieval can be partial.

The **serial position effect** is our tendency to recall the first and last items in a list best. The **primacy effect** (better memory for early items) arises because early items had more rehearsal and were transferred to long-term memory. The **recency effect** (better memory for the last items) arises because they remain in short-term memory. Middle items are weakest. Delaying recall or distracting the person removes the recency effect but not primacy.

Retrieval cue rules

Context-dependent: matching external setting helps recall.

State-dependent: matching internal state (mood, physiology) helps recall.

Primacy = early items (long-term memory); recency = last items (short-term memory).

Why we forget

Encoding failure: information never entered long-term memory because it was not attended to or processed (most people cannot draw the front of a penny accurately).

Storage decay: memory traces fade with disuse over time, as shown by Ebbinghaus's forgetting curve.

Retrieval failure: information is stored but cannot be accessed because cues are missing or **interference** blocks it.

- ◆ **Proactive interference:** old learning disrupts new learning (your previous phone number gets in the way of remembering the new one). Mnemonic: pro = forward in time.
- ◆ **Retroactive interference:** new learning disrupts old learning (learning Spanish makes it harder to recall French). Mnemonic: retro = backward.
- ◆ **Motivated forgetting:** people forget unwanted memories. **Repression**, in Freud's view, is pushing anxiety-provoking memories into the unconscious. Most modern researchers doubt that traumatic events are commonly repressed and later accurately recovered, and see more support for suppression and ordinary forgetting.

Memory is reconstructive. Memories are not recordings; we rebuild them each time from fragments, schemas, and current information. Elizabeth Loftus demonstrated the **misinformation effect**: after witnessing an event, people exposed to misleading information incorporate it into their memory. In her car-crash studies, participants asked how fast cars were going when they 'smashed' into each other estimated higher speeds and were more likely to report broken glass than those asked about cars that 'hit'. In other work Loftus helped show that false memories, such as being lost in a mall as a child, can be implanted by suggestion. **Source amnesia** (source misattribution) occurs when we remember information but forget where it came from, and **imagination inflation** occurs when imagining an event makes people more confident it happened.

Eyewitness testimony is therefore less reliable than juries assume. Confidence does not reliably predict accuracy. Accuracy is reduced by leading questions, the presence of a weapon (weapon focus), stress, cross-race identification, and delay. Recommended procedures include double-blind lineups, instructing witnesses the culprit may not be present, and recording confidence at the time of first identification.

Flashbulb memories are vivid, emotionally intense memories of surprising events, such as where you were on a major national event. People feel highly confident in them, but research shows they contain errors and fade like ordinary memories, although confidence stays high. The amygdala enhances emotional memory.

Amnesia is loss of memory. **Retrograde amnesia** is loss of memories from before an injury; **anterograde amnesia** is inability to form new explicit memories after an injury (the case of Henry Molaison, called H.M., whose hippocampus was removed, who kept old memories and implicit learning but could not form new episodic memories). Infantile amnesia refers to the difficulty adults have recalling events from before about age 3.

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EXAMPLE 1: INTERFERENCE OR OTHER FAILURE?

Carlos studies Spanish vocabulary Monday and French vocabulary Tuesday. On Wednesday, he struggles to recall Spanish words, and mistakenly says French words instead. Another student, Dani, has memorized a new locker combination but keeps entering last year's numbers. Name the type of interference in each case.

SOLUTION

Carlos: retroactive interference. The newer learning (French) interferes with recall of older learning (Spanish).

Dani: proactive interference. The older learning (last year's combination) interferes with remembering the new one.

Both are retrieval failures, because the information is stored but blocked by competing memories.

EXAMPLE 2: ANALYZE A STUDY

Participants watch a video of a car accident. Half are asked 'How fast were the cars going when they hit each other?' and half 'when they smashed into each other?' A week later all are asked, 'Did you see broken glass?' (There was none.) Predict the result and explain.

SOLUTION

Independent variable: the verb in the question. Dependent variables: speed estimates and reports of broken glass.

Prediction: the 'smashed' group will give higher speeds and report more nonexistent broken glass.

Explanation: the leading word introduced misleading post-event information that was integrated into the memory (misinformation effect), showing that memory is reconstructive.

Exam tip

Proactive means old interferes with new; retroactive means new interferes with old. Encoding failure means the memory was never stored, so it cannot be fixed with cues. If a stem says 'a hint helps', it is a retrieval failure, not decay or encoding failure.

Practice**SET A Check Your Understanding**

Answer each question in one to three sentences.

1. Rank recall, recognition, and relearning from most to least sensitive in revealing stored memory, and justify.
2. Explain context-dependent memory with an example.
3. Explain why the serial position effect produces both primacy and recency effects.
4. Differentiate proactive from retroactive interference.
5. Describe the misinformation effect and name the researcher best known for it.
6. Contrast retrograde and anterograde amnesia.

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SET B Exam-Style Multiple Choice

Choose the best answer.

7. A witness is shown a photograph of a suspect and later confidently identifies him in a lineup, though she had actually seen him earlier in a news story. This is best explained by
 - (A) encoding failure
 - (B) retroactive interference
 - (C) anterograde amnesia
 - (D) source amnesia
 - (E) state-dependent memory
8. A student can recognize the correct answer on a multiple-choice test but cannot write it as an essay response. This demonstrates that
 - (A) the memory was never encoded
 - (B) recognition is typically easier than recall
 - (C) recall is a form of implicit memory
 - (D) the memory has decayed completely
 - (E) relearning is impossible
9. After spending 20 years remembering one street address, Ming moves and finds herself writing the old address on forms for the new home. This is
 - (A) retroactive interference
 - (B) repression
 - (C) proactive interference
 - (D) anterograde amnesia
 - (E) the recency effect
10. People who were drinking caffeine while learning a list recall it better when they have caffeine again than when they do not. This illustrates
 - (A) state-dependent memory
 - (B) context-dependent memory
 - (C) the misinformation effect
 - (D) mood-congruent memory
 - (E) flashbulb memory
11. Which statement about flashbulb memories is best supported by research?
 - (A) They are stored without distortion
 - (B) They are held in implicit memory only
 - (C) They are less confident than ordinary memories
 - (D) They are always inaccurate
 - (E) They are vivid and confidently held but can contain errors

SET C Apply and Extend

Write a complete response; compare with the model answer and scoring points.

12. A defense attorney argues that a convenience-store clerk's identification of the robber is unreliable. The robber carried a gun, the event lasted seconds, and police asked, 'Was the man with the mask tall?' before the lineup. Explain two factors from memory research that support the attorney's argument.
13. Design a simple experiment to test whether context-dependent memory exists. Identify the independent variable, the dependent variable, and the conditions.

3.6 Biology of Memory and Improving Memory

You will learn which brain structures and cellular changes underlie memory, what goes wrong in Alzheimer's disease, and which study strategies research supports.

Memory is not stored in one place. Different structures contribute to forming, consolidating, and storing different kinds of memory, and learning physically changes the nervous system.

Structure	Role in memory	Damage or effect
Hippocampus	Forms new explicit memories (episodic and semantic) and helps consolidate them; also supports spatial memory	Anterograde amnesia (H.M.); early shrinkage in Alzheimer's disease
Amygdala	Attaches emotional significance, strengthening emotional memories, as in fear conditioning and flashbulb memories	Reduced emotional memory; stress hormones intensify it
Cerebellum	Stores implicit memories, including classically conditioned reflexes and motor timing	Impaired conditioned responses and skill learning
Basal ganglia	Supports procedural memory and habits	Trouble learning motor skills (as in Parkinson's disease)

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Structure	Role in memory	Damage or effect
Frontal lobes	Working memory, planning, and retrieving; encode memories and keep them organized	Poor organization and retrieval
Cerebral cortex	Long-term storage of consolidated explicit memories, spread across regions	Memory loss specific to the region damaged

Long-term potentiation and consolidation

Long-term potentiation (LTP) is a long-lasting strengthening of synaptic connections after repeated stimulation: the receiving neuron becomes more responsive, and the sending neuron releases more neurotransmitter. It is the leading cellular model of learning. Drugs that block LTP interfere with learning; drugs that enhance it improve learning in animals.

Memory consolidation is the gradual process that stabilizes a new memory in long-term storage. The hippocampus helps bind features of an experience, and over time the memory becomes less dependent on it and is stored across the cortex.

Sleep, especially deep slow-wave sleep, promotes consolidation by replaying the day's learning.

Because consolidation takes time, interrupting it can erase recent memories. A concussion or electroconvulsive therapy can wipe out memories of events just before the incident (retrograde amnesia for the recent past) without destroying older ones. Stress hormones released at emotional moments (epinephrine and cortisol) signal the amygdala to boost consolidation, which is why emotional events are remembered well. Chronic stress and very high cortisol, however, can impair the hippocampus and hurt memory. Neurotransmitters matter too: acetylcholine is crucial for forming new memories, and glutamate is a key neurotransmitter involved in LTP.

Alzheimer's disease is a progressive neurodegenerative disorder and the most common cause of dementia in older adults. It begins with difficulty forming new memories (hippocampal damage) and then spreads, causing loss of language, judgment, and personality, and finally the ability to perform daily activities. Brains show amyloid plaques and tangles of tau protein, and neurons that make acetylcholine die. Genetics and age are risk factors, and treatments can ease symptoms but do not cure the disease. Physical exercise, mental activity, and social engagement are linked to reduced risk. Alzheimer's is different from normal aging, in which some retrieval slows but the ability to learn and function remains.

Improving memory. Cognitive research has identified techniques that outperform common habits such as highlighting and re-reading.

Strategy	How it works	Why it helps
Testing effect (retrieval practice)	Quiz yourself with flashcards or practice questions	Retrieval strengthens memory more than rereading; also shows what you do not know
Spacing (distributed practice)	Several short sessions with gaps	Repeated re-encoding slows forgetting
Interleaving	Mix different topics or problem types within a session	Improves discrimination and transfer
Elaboration and self-explanation	Explain ideas in your own words and connect to what you know	Deep processing creates more retrieval cues
Mnemonics and imagery	Method of loci, acronyms, vivid images	Organizes information and adds cues
Sleep and rest	Adequate sleep after studying	Supports consolidation
Matching conditions	Practice in conditions like the test	Context- and state-dependent cues are available

Evidence-based study plan

Replace rereading with self-testing (the testing effect).

Space sessions over days rather than cramming; use interleaving.

Process for meaning and relate to yourself; get sleep.

Avoid illusions of knowing: feeling familiar with notes is not the same as being able to recall.

Students often rely on **overconfidence** and the illusion of competence: material feels familiar when rereading, but familiarity is recognition, not recall. Judge your learning by trying to retrieve without notes. Also avoid multitasking, which splits attention and impairs encoding.

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EXAMPLE 1: BRAIN STRUCTURE OR PROCESS?

A patient with damage to the hippocampus has intact childhood memories and can learn to mirror-trace faster over several days, but cannot recall meeting the researcher an hour earlier. Another patient has an intact hippocampus but, due to damage to the amygdala, shows little fear response when shown a picture of a snake. Explain each case.

SOLUTION

First patient: anterograde amnesia. The hippocampus is needed to form new explicit memories, but old memories are stored in the cortex and implicit procedural learning depends on other structures such as the cerebellum and basal ganglia.

Second patient: the amygdala adds emotional significance to memories and drives fear learning, so damage reduces emotional responses and the emotional memory of threats.

The cases show that memory involves multiple systems.

EXAMPLE 2: COMPARE STUDY PLANS

Priya rereads her notes for four hours the night before the exam. Jon spends 30 minutes a day for eight days answering practice questions from memory, mixing topics. Predict who scores higher on a test given one week later, and name three principles.

SOLUTION

Jon should score higher.

Principles: the testing effect (retrieval practice), spacing (distributed practice), and interleaving (mixing topics).

Priya used massed practice and rereading, which produce a sense of familiarity but weak long-term retention. Jon's strategy also provides feedback about what he does not know.

Common mistakes

The hippocampus is not where all memories are stored permanently; it helps create and consolidate explicit memories. Do not assign classical conditioning of reflexes to the hippocampus; the cerebellum handles that. And LTP is a strengthening of synapses, not growth of new neurons.

Practice**SET A Check Your Understanding**

Answer each question in one to three sentences.

1. Explain the role of the hippocampus in memory and the effect of its removal.
2. Describe how the amygdala influences memory.
3. Define long-term potentiation and explain why it is important.
4. Why can a blow to the head erase memory of the minutes before the injury but not memory of last year?
5. List two ways Alzheimer's disease changes the brain and one early symptom.
6. Explain why the testing effect makes self-quizzing more effective than rereading.

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SET B Exam-Style Multiple Choice

Choose the best answer.

7. The cerebellum is most directly involved in storing
 - (A) classically conditioned responses and motor skills
 - (B) new episodic memories
 - (C) semantic facts
 - (D) emotional associations only
 - (E) short-term verbal rehearsal
8. During sleep, the brain replays recent experiences, which most directly aids
 - (A) sensory adaptation
 - (B) encoding failure
 - (C) memory consolidation
 - (D) retroactive interference
 - (E) priming
9. Which research finding is the best evidence that long-term potentiation underlies learning?
 - (A) Neurons stop firing during sleep
 - (B) The hippocampus is larger in older adults
 - (C) Rewards increase dopamine release
 - (D) Blocking LTP in animals impairs their ability to learn
 - (E) Newborns have more neurons than adults
10. A student wants to remember material for a test next month. According to research, which plan is best?
 - (A) Highlight the textbook and reread it the night before
 - (B) Copy the notes word for word once
 - (C) Study with the television on to stay relaxed
 - (D) Cram in a single long session
 - (E) Practice recalling the material from memory in several sessions across weeks
11. A grandfather can no longer recall his grandchildren's names, forgets how to dress himself, and has amyloid plaques in his brain. This is most consistent with
 - (A) normal aging
 - (B) Alzheimer's disease
 - (C) Parkinson's disease
 - (D) anterograde amnesia from a stroke
 - (E) Broca's aphasia

SET C Apply and Extend

Write a complete response; compare with the model answer and scoring points.

12. A researcher randomly assigns students to study a passage by (1) rereading it four times or (2) reading it once and taking three practice tests. One week later, all take a final test. (a) Predict the results. (b) Name the principle. (c) Identify one confound the researcher should control and explain why.
13. Explain how the hippocampus, amygdala, and cerebellum each contribute to memory of a car accident the person later fears driving after.

3.7 Intelligence

You will learn the major theories of intelligence, how nature and nurture shape it, the Flynn effect, and why group-difference claims must be interpreted carefully.

Intelligence is commonly defined as the ability to learn from experience, solve problems, and use knowledge to adapt to new situations. It is a **construct**: not a thing we can directly see, but an idea defined by how we measure it. Psychologists debate whether intelligence is one general ability or several.

Theorist	Theory	Key idea
Charles Spearman	General intelligence (g)	Performance across different mental tasks is positively correlated, suggesting one underlying general factor; specific abilities (s) add to it. Identified using factor analysis.
L. L. Thurstone	Primary mental abilities	Intelligence has about seven independent abilities, such as verbal comprehension, word fluency, and spatial visualization.
Raymond Cattell (and Horn)	Fluid and crystallized	Fluid intelligence is reasoning with new problems and declines with age; crystallized intelligence is accumulated knowledge and verbal skills and holds steady or rises.

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Theorist	Theory	Key idea
Howard Gardner	Multiple intelligences	At least eight relatively independent intelligences: linguistic, logical-mathematical, spatial, musical, bodily-kinesthetic, interpersonal, intrapersonal, naturalist. Evidence includes savant syndrome and brain damage that spares one ability.
Robert Sternberg	Triarchic theory	Three intelligences: analytical (book smarts), creative, and practical (street smarts).
Salovey and Mayer; Goleman	Emotional intelligence	Ability to perceive, understand, manage, and use emotions.

Support and criticism

For one general factor (g): scores on diverse tests correlate positively, and g predicts school achievement and job performance.

For multiple abilities: savant syndrome (an exceptional skill alongside limited mental ability) and brain damage that affects one skill only.

Criticism of Gardner and Sternberg: critics say the 'intelligences' such as musical or bodily-kinesthetic are talents, and that tests of g still predict outcomes; evidence for independence is limited.

Key definitions

Intelligence: ability to learn from experience, solve problems, and adapt.

g: general intelligence underlying all mental tasks (Spearman).

Fluid = novel reasoning; **crystallized** = accumulated knowledge.

Flynn effect: rising average scores over generations.

Brain and intelligence. Intelligence scores correlate modestly with brain size (about 0.3 to 0.4), with the speed of neural processing (people with higher scores have faster reaction times and more efficient information processing), and with the efficiency of brain networks, especially in the frontal and parietal lobes, rather than with the amount of activity. Higher intelligence is also correlated with faster processing in perceptual tasks such as inspection time.

Nature and nurture. Heritability is a statistic describing the proportion of the variation in a trait within a population that is due to genetic differences. It does not tell us how much of an individual's intelligence is genetic. Twin and adoption studies show that identical twins reared apart have highly similar scores, correlated near 0.7 to 0.8 in adults, while adopted children's scores come to resemble their biological parents' more as they age. Heritability estimates for intelligence in adults are about 50 to 80 percent. Environment matters too: severe deprivation lowers scores, and enriched settings, nutrition, and good schooling raise them. In poor environments, environmental differences explain more of the variation; heritability rises as environments become more equal. Heritability also does not imply a trait cannot be changed.

The Flynn effect is the steady rise in average intelligence test scores across generations in many countries, roughly 3 points per decade throughout the twentieth century. Because genes cannot change this quickly, the effect points to environmental causes such as better nutrition, more schooling, smaller families, and more exposure to abstract thinking. Tests have to be renormed periodically.

Group differences. Average test scores differ among some groups. Average scores of men and women are similar, although the spread of male scores is slightly wider and some specific abilities differ (on average, females do slightly better on verbal and males on some spatial tasks). Differences in average scores among racial and ethnic groups have been documented, but differences in test scores do not demonstrate genetic differences. Within-group heritability does not explain between-group differences: if seeds from the same bag are planted in two different soils, the difference between the fields is due to the soils even though differences within each field may be genetic. Environmental explanations include poverty, school quality, health care, test bias, and stereotype threat. Scores of groups have also shifted as opportunities changed, and the gap in the US has narrowed over time.

EXAMPLE 1: MATCH THE THEORY

(a) A teenager is a gifted musician but struggles in most school subjects. (b) An older adult solves fewer novel puzzles but has an excellent vocabulary. (c) A manager is not especially strong in tests but resolves everyday workplace problems cleverly. Match each to Gardner, Cattell, or Sternberg and explain.

SOLUTION

(a) Gardner: musical intelligence independent of other abilities (could also hint at savant-like skill). Spearman would predict a g that links abilities more strongly.

(b) Cattell: crystallized intelligence (vocabulary, knowledge) is maintained while fluid intelligence (novel puzzles) declines.

(c) Sternberg: practical intelligence, or street smarts, differs from analytical intelligence measured by tests.

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EXAMPLE 2: INTERPRET HERITABILITY

A study finds that the heritability of intelligence among middle-class adults is 0.60. A reporter writes that 60 percent of each person's intelligence is determined by genes. Evaluate this claim.

SOLUTION

Heritability describes variation in a population, not the proportion of any single person's intelligence caused by genes.

It applies to the population studied and its range of environments; with different environments the value can change.

A high heritability does not mean the trait is unchangeable; for example, height is highly heritable yet rose across generations with better nutrition. So the reporter's claim is incorrect.

Common mistakes

Do not use heritability to explain differences between groups; it describes variation within a group. Do not say the Flynn effect shows people are genetically smarter. And remember that *g* (Spearman) is a single factor while Gardner and Sternberg propose several; Cattell's fluid and crystallized types are two kinds of general intelligence.

Practice**SET A Check Your Understanding**

Answer each question in one to three sentences.

1. Explain what Spearman's *g* factor is and the evidence for it.
2. Contrast fluid and crystallized intelligence and state how each changes with age.
3. List Sternberg's three intelligences and give an example of one.
4. Why do critics of Gardner argue that some of his 'intelligences' are really talents?
5. Define the Flynn effect and give a plausible cause.
6. Explain why heritability within a group cannot explain differences between groups.

SET B Exam-Style Multiple Choice

Choose the best answer.

7. A researcher finds that scores on vocabulary, arithmetic, and spatial tasks are all positively correlated. This finding is most consistent with the idea of
 - (A) multiple independent intelligences
 - (B) emotional intelligence
 - (C) a general intelligence factor (*g*)
 - (D) savant syndrome
 - (E) the Flynn effect
8. A person with limited abilities in most areas who can instantly calculate the day of the week for any date is best described as having
 - (A) crystallized intelligence
 - (B) practical intelligence
 - (C) a high *g* factor
 - (D) savant syndrome
 - (E) a high heritability
9. The steady increase in average IQ test scores over the past century is called the
 - (A) Flynn effect
 - (B) Barnum effect
 - (C) halo effect
 - (D) Mozart effect
 - (E) heritability effect
10. Identical twins raised apart have highly correlated intelligence scores. This finding most strongly suggests that
 - (A) environment has no effect on intelligence
 - (B) intelligence is fixed at birth
 - (C) intelligence tests are unbiased
 - (D) twins have higher *g*
 - (E) genes contribute to differences in intelligence

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11. Which statement about heritability is correct?
- (A) It measures how much of an individual's intelligence is genetic
 - (B) It describes variation in a population, not any one person
 - (C) It shows that a trait cannot change
 - (D) It explains average group differences
 - (E) It is the same in every environment

SET C Apply and Extend

Write a complete response; compare with the model answer and scoring points.

12. A news article claims that because intelligence is 70 percent heritable, differences in average test scores between two schools in different neighborhoods must be genetic. Evaluate the claim using two concepts from the lesson.
13. Compare Spearman's and Gardner's views, and identify one piece of evidence that supports Gardner and one that supports Spearman.

3.8 Testing and Psychometrics

You will learn how intelligence tests developed, what makes a test standardized, reliable, and valid, and how to interpret scores on the normal curve.

Psychometrics is the scientific study of the measurement of mental abilities, traits, and attitudes. Intelligence testing began in France: in 1905, **Alfred Binet** and Theodore Simon were asked to identify children who needed special help in school. Their test measured a child's **mental age**, the age level at which the child performs. Binet thought intelligence was complex and could change with teaching, and he warned against using scores to label children permanently.

Lewis Terman at Stanford revised Binet's test for American use in 1916, calling it the **Stanford-Binet**. Using a suggestion by William Stern, the test reported an **intelligence quotient (IQ)**.

Ratio IQ and deviation IQ

Original ratio IQ = (mental age / chronological age) x 100. A child with mental age 10 and chronological age 8 has IQ = (10/8) x 100 = 125.

This formula works poorly for adults, because mental age stops increasing. Modern tests use a **deviation IQ**: the score shows how far a person's performance is from the average of same-age peers, with a mean of 100 and a standard deviation of 15 (Wechsler).

David Wechsler developed the WAIS (adults) and WISC (children); they give verbal and performance (nonverbal) subscores and a full-scale score.

Early American uses of intelligence tests were misused: some military and immigration screening applied tests without regard to language or culture, and tests were used to support discrimination and eugenics policies. This history is why test validity and fairness are important.

A good test must be standardized, reliable, and valid.

Requirement	Meaning	How it is checked
Standardization	Uniform procedures for giving and scoring the test, and interpretation of scores relative to a norm group (a representative sample)	Pretesting a large representative sample to set norms; scores form a roughly normal distribution
Reliability	Consistency of results	Test-retest (same test, two times), split-half (two halves of the same test), alternate forms; measured with a correlation coefficient
Validity	The test measures or predicts what it is supposed to	Content validity (covers the subject), predictive validity (predicts later performance, such as grades), criterion and construct validity

Exam tip

Reliability can exist without validity (a scale that is always five pounds off is reliable but not valid), but validity requires reliability. If a question says 'consistent', think reliability; if it says 'measures what it claims' or 'predicts', think validity.

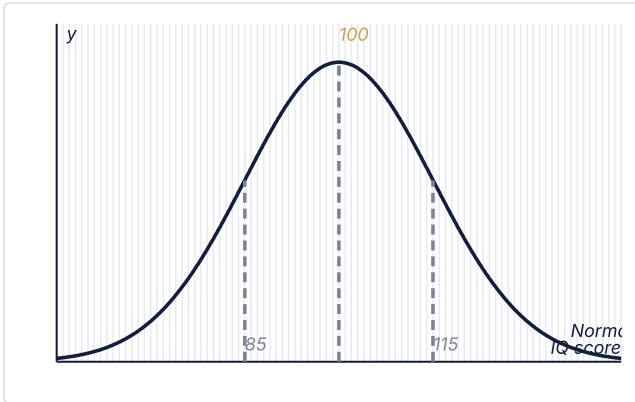
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Achievement tests assess what a person has already learned (a final exam or the AP exam). **Aptitude tests** predict a person's ability to learn a new skill or future performance (the SAT and ACT are sometimes treated as aptitude tests, though they overlap with achievement tests). Intelligence tests are a type of aptitude test. Predictive validity of such tests is moderate and is lower within a narrow range of scores, such as among students already admitted to a selective college (restricted range). Scores from very early in life are less stable than later scores.

The normal curve. Test scores are distributed in a bell-shaped **normal distribution**, with most scores near the average and fewer at the extremes. For IQ, with mean 100 and SD 15, about 68 percent of people score between 85 and 115, about 95 percent between 70 and 130, and about 99.7 percent between 55 and 145. A score of 130 or higher is about 2 percent of people (the 98th percentile); intellectual disability diagnosis requires an IQ roughly 70 or below along with difficulty in adaptive behavior, evidenced before adulthood. Extremes are often described as intellectual giftedness at the high end.



IQ scores: mean 100, SD 15. About 68 percent fall between 85 and 115.

Normal curve rule

68 percent of scores fall within 1 SD of the mean, 95 percent within 2 SD, and 99.7 percent within 3 SD.

For IQ (mean 100, SD 15): 85-115, 70-130, 55-145.

Standard deviation distance = (score - mean) / SD.

Test bias and stereotype threat. A test is **biased** if it predicts differently or less accurately for some groups; cultural bias can include language, background knowledge, and testing conditions. Not all group differences reflect bias: a test can predict equally well for different groups even if averages differ. **Stereotype threat** (Claude Steele and Joshua Aronson) is a self-confirming concern that one will be evaluated based on a negative stereotype. In experiments, Black students performed worse on a test described as measuring intellectual ability than on the same test described as a problem-solving exercise, and women reminded of the stereotype about math often scored lower. Stereotype threat can reduce performance by anxiety and distraction, and interventions that reaffirm values reduce it.

Ethics of testing. Principles include informed consent, confidentiality of results, qualified administrators, appropriate use of scores (not as the only basis for important decisions), attention to cultural fairness, and avoiding labels that become self-fulfilling prophecies. Tests with strong validity can help schools and employers, but misuse can harm.

EXAMPLE 1: IQ CALCULATIONS

(a) A 6-year-old has a mental age of 9. Compute the ratio IQ. (b) On a Wechsler scale (mean 100, SD 15), Sofia scores 130 and Ben scores 85. Describe each score's position.

SOLUTION

(a) $IQ = (9 / 6) \times 100 = 150$.

(b) Sofia's 130 is two standard deviations above the mean ($100 + 2 \times 15$), around the 98th percentile.

Ben's 85 is one standard deviation below the mean ($100 - 15$), around the 16th percentile; about 68 percent of people score between 85 and 115.

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EXAMPLE 2: RELIABILITY OR VALIDITY?

A new test of 'math anxiety' gives nearly identical scores when students take it twice two weeks apart, but its scores have no relationship to measures of anxiety or to students' behaviors in math class. Evaluate the test.

SOLUTION

Consistent results across time show high test-retest reliability.

Scores unrelated to other measures of anxiety indicate poor validity: the test does not measure what it claims.

So the test is reliable but not valid, and should not be used to make decisions about students.

Practice**SET A Check Your Understanding**

Answer each question in one to three sentences.

1. Why did Binet develop his test, and what did he caution against?
2. Compute the ratio IQ for a child with mental age 12 and chronological age 10, and explain why this formula does not work well for adults.
3. What does it mean for a test to be standardized?
4. Differentiate reliability and validity and give a way to measure each.
5. Distinguish achievement and aptitude tests with an example of each.
6. Describe stereotype threat.

SET B Exam-Style Multiple Choice

Choose the best answer.

7. On a test with a mean of 100 and standard deviation of 15, approximately what percent of people score between 70 and 130?
(A) 34 percent (B) 50 percent (C) 68 percent
(D) 95 percent (E) 99.7 percent
8. A bathroom scale shows the same weight each time a person steps on it, but the weight is always 5 pounds too high. The scale is
(A) valid but not reliable (B) reliable but not valid
(C) both reliable and valid (D) neither reliable nor valid
(E) standardized but biased
9. A college uses a test given in the spring of senior year to predict freshman grades. The best evidence of its validity would be
(A) the correlation between test scores and students' later grades
(B) the score is the same when retaken
(C) the test has a large number of questions
(D) the test items were written by experts
(E) the average score is exactly 100
10. Which person is most closely associated with the original adaptation of the Binet test in the United States?
(A) David Wechsler (B) Charles Spearman (C) Lewis Terman
(D) Claude Steele (E) Howard Gardner
11. A girl's test performance drops when, before a math test, she is told that girls tend to do poorly in math. This is best explained by
(A) the Flynn effect (B) regression to the mean (C) low test reliability
(D) the halo effect (E) stereotype threat

SET C Apply and Extend

Write a complete response; compare with the model answer and scoring points.

12. A district plans to use a single intelligence test score to decide which 8-year-olds enter a gifted program. Using at least two principles of psychometrics and ethics, evaluate the plan and propose an improvement.
13. Mia's score on a standardized test is 115 (mean 100, SD 15). Her friend Lee's score is 145 on a different test (mean 100, SD 15). (a) Compute each score's number of standard deviations from the mean. (b) State approximately what percent of people score above Lee. (c) Explain why standardization makes these scores comparable.

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3.9 Multiple-Choice Practice: Cognition

Test yourself on perception, thinking, language, memory, intelligence, and testing with 20 AP-style questions.

Choose the best answer for each question. Check your work against the explanation, which also tells you why the most tempting wrong choice fails.

SET A Core Concepts

Choose the best answer.

1. A hiker notices that a distant mountain looks smaller than a nearby hill, yet she correctly judges the mountain to be far larger. Which concept best explains this?
(A) Retinal disparity (B) Size constancy (C) Closure
(D) Phi phenomenon (E) Convergence
2. A news story features dramatic coverage of a rare tornado. Afterward, viewers overestimate the chance of a tornado hitting their town. This is an example of
(A) the representativeness heuristic (B) functional fixedness
(C) belief perseverance (D) the availability heuristic
(E) an algorithm
3. A child says 'We goed to the zoo.' This error is most useful as evidence that
(A) children apply grammatical rules they have learned
(B) language is acquired by imitation only
(C) children are in the babbling stage
(D) the critical period has ended
(E) phonemes are learned after morphemes
4. A student repeats a list of items silently until she can write them down, then forgets them within a minute of a distraction. Which statement best explains this?
(A) The items were never in sensory memory
(B) Her hippocampus was damaged
(C) Long-term memory has limited capacity
(D) Retroactive interference changed her state-dependent memory
(E) Maintenance rehearsal kept the items in short-term memory without encoding them deeply
5. Which of the following best illustrates the Gestalt principle of proximity?
(A) Seeing a broken circle as a complete circle
(B) Seeing a tree as the same size as it gets farther away
(C) Seeing three rows of dots because the dots in each row are closer together than the rows are
(D) Seeing objects of the same color as a group
(E) Seeing a vase and then two faces in the same picture
6. A psychologist reports that scores on a new test are consistent from one week to the next but do not predict job performance. The test
(A) has high reliability but low validity (B) has low reliability but high validity
(C) has high reliability and high validity (D) is biased but standardized
(E) is an achievement test
7. An older adult remembers many facts and large vocabulary words but has more trouble than before solving unfamiliar puzzles. According to Cattell, this reflects
(A) declining crystallized and stable fluid intelligence
(B) a decline in g only
(C) increased emotional intelligence
(D) stable crystallized intelligence and declining fluid intelligence
(E) savant syndrome

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SET B Applications and Data

Choose the best answer.

8. The table below shows how many of 20 words participants recalled after each encoding task.
Task: Judge if word is in capital letters = 6; Judge if word rhymes with 'chair' = 9; Judge whether word fits a sentence = 15.
These data best support
- (A) the spacing effect (B) the serial position effect
(C) the levels of processing model (D) state-dependent memory
(E) the testing effect
9. In a study, students who read a word list recalled the first and last words best. When a 30-second counting task was inserted before recall, which result is most likely?
- (A) Primacy decreased while recency remained (B) Both effects disappeared
(C) Both effects increased (D) The middle words became best recalled
(E) Recency decreased while primacy remained
10. Participants who saw a staged car accident were asked how fast the cars were going when they 'smashed' or 'hit'. The 'smashed' group reported higher speeds. This study most directly demonstrates
- (A) proactive interference (B) the misinformation effect
(C) flashbulb memory (D) encoding failure
(E) source amnesia
11. A patient who suffered head trauma can recall his childhood but cannot remember anything that happened after the accident. He has
- (A) anterograde amnesia (B) retrograde amnesia (C) infantile amnesia
(D) proactive interference (E) source amnesia
12. Researchers randomly assign students to restudy a text or to take a practice test on it. One week later the practice-test group scores higher. The independent variable and the principle illustrated are
- (A) test score; spacing effect (B) study method; priming
(C) test score; testing effect (D) study method; testing effect
(E) time between sessions; interference
13. A researcher claims that because intelligence is highly heritable, group differences in average scores must be genetic. The best criticism is that
- (A) heritability can never exceed 0.5
(B) heritability applies within groups and does not explain differences between groups
(C) twin studies are always invalid
(D) IQ scores are not normally distributed
(E) the Flynn effect shows IQ is entirely environmental
14. A graph of test scores forms a bell shape with a mean of 100 and standard deviation of 15. A student's score of 70 is
- (A) one standard deviation below the mean (B) two standard deviations above the mean
(C) at the 50th percentile (D) three standard deviations below the mean
(E) two standard deviations below the mean

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SET C Exam-Level Stretch

Choose the best answer.

15. A psychology student reads about the symptoms of a rare disorder and begins to believe she has them, but she has only noticed symptoms that match her expectations. Which two concepts best explain her interpretation?
- (A) Confirmation bias and perceptual set (B) Retroactive interference and priming
(C) Functional fixedness and mental set (D) Algorithm and heuristic
(E) Closure and figure-ground
16. A teacher notes that a student, after learning a new chemistry formula, cannot recall the formula for another similar compound studied earlier. Which kind of interference is this?
- (A) Proactive interference (B) Encoding failure
(C) Retroactive interference (D) Decay
(E) State-dependent forgetting
17. Which of the following findings would most challenge Spearman's view that there is a single general intelligence?
- (A) Vocabulary and arithmetic scores are positively correlated
(B) Intelligence test scores predict school success
(C) Scores rise over generations
(D) Scores on verbal and spatial tests are uncorrelated in a large sample
(E) Identical twins have similar scores
18. A patient with Broca's aphasia would most likely
- (A) speak fluently but without meaning
(B) understand speech but speak slowly with great effort
(C) be unable to form new memories
(D) be unable to recognize faces
(E) lose all sensory memory
19. A researcher tests whether women who read a statement that women are worse at math perform worse on a math test than women who do not read it. The most likely explanation for a difference is
- (A) the Flynn effect (B) reliability of the test (C) chunking
(D) functional fixedness (E) stereotype threat
20. In a famous problem, people struggle to attach a candle to a wall using a box of tacks because they see the box only as a container. After seeing the box emptied beside the tacks, more people solve it. This shows that
- (A) algorithms are always slower
(B) insight is impossible without incubation
(C) functional fixedness can be reduced by changing how objects are presented
(D) creativity depends on g
(E) divergent thinking is unrelated to problem solving

3.10 Free-Response Practice: Cognition

Practice writing complete responses in the formats used on the AP Psychology exam.

Each question is worth several points. A point is earned only when the idea is stated accurately and applied to the data given, so always refer to specific numbers or details from the stimulus. Compare your answers to the scoring points listed.

QUESTION 1 Article Analysis: Testing Effect

Read the summary. Researchers recruited 120 undergraduates and randomly assigned them to two groups. Both groups studied the same science passage for 20 minutes. Group 1 spent a second 10-minute session rereading the passage. Group 2 spent the second 10-minute session writing down everything they could remember without notes. All participants returned one week later and took a 20-question test. Group 1 averaged 9.5 correct (SD 3.1) and Group 2 averaged 13.8 correct (SD 3.4).

1. (a) Identify the independent variable and the dependent variable in the study.
2. (b) Explain how random assignment strengthens the researchers' conclusions.
3. (c) State the conclusion supported by the results and name the memory principle involved.
4. (d) Describe one limitation of generalizing from this study and one recommendation for studying for a final exam.

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QUESTION 2 Evidence-Based: Memory Distortion

Eyewitness reliability data. In a lab study, 200 participants watched a video of a robbery. One week later, half were asked, 'Did you see the man's mask?' and half were asked, 'Did you see the man's gun?' (There was a mask and no gun.) Results: In the mask-question group, 12 percent said they saw a gun. In the gun-question group, 41 percent said they saw a gun. Participants who said they saw a gun rated their confidence at an average of 8.1 out of 10.

5. (a) Use the data to state a claim about how question wording affects eyewitness reports.
6. (b) Name and define the memory phenomenon demonstrated.
7. (c) Explain what the confidence ratings imply for the way courts treat eyewitness confidence.
8. (d) Suggest one procedure that would reduce the problem.

QUESTION 3 Article Analysis: Stereotype Threat

Read the summary. Researchers recruited 80 female college students with strong math backgrounds. Half were randomly told that the 15-question test they would take 'usually shows gender differences'. The other half were told it 'shows no gender differences'. The first group averaged 7.2 correct and the second averaged 10.1. A comparison group of men averaged 9.9 in either condition.

9. (a) Identify the independent variable and the dependent variable.
10. (b) Name the phenomenon the results illustrate and explain how it might lower performance.
11. (c) Explain one way in which the findings are relevant to the validity of standardized tests.
12. (d) Propose one way a school could reduce the effect.

QUESTION 4 Evidence-Based: Intelligence and Environment

Data set. Average scores on a nationally normed test in a country were 100 in 1980, 105 in 1990, 110 in 2000, and 115 in 2010. Researchers also found that during this period, adult heritability estimates for the test stayed near 0.6. Separately, in a study of adopted children, scores averaged 110 when adoptive families were wealthy and 98 when adoptive families were very poor, while the biological parents' average was 100 in both cases.

13. (a) Name the trend in the first data set and state a claim about its cause using the data.
14. (b) Explain how the heritability value of 0.6 can be consistent with a large rise in average scores.
15. (c) Use the adoption data to explain what they show about nature and nurture.

Answers Chapter 3: Answers and Explanations

Answers for every practice problem, numbered to match. Read the explanation even when your answer is correct.

3.1 Perception: Organizing the World**SET A • CHECK YOUR UNDERSTANDING**

1. Bottom-up processing builds perception from the raw features of the stimulus, such as detecting edges and then assembling an object. Top-down processing uses expectations and knowledge to interpret input, such as reading a smudged word from context. The two operate together in everyday perception.
2. Selective attention is the normal process of focusing on one stimulus and filtering out others, such as following one voice at a party. Inattention blindness is a consequence: an unexpected but visible stimulus goes unnoticed because attention is occupied elsewhere. It shows that attention, not just the eye, determines what we perceive.
3. This is continuity (with proximity helping): we group elements that form a smooth, continuous path, so the dashes are linked into a single line. The brain organizes separate elements into a whole instead of seeing independent parts, which is the central Gestalt idea.
4. Retinal disparity depends on the slightly different images each eye receives, so it cannot work with one eye closed. Interposition only requires seeing that one object overlaps another, which a single eye can detect. That difference defines binocular versus monocular cues.
5. Size constancy is perceiving an object as the same size even when its retinal image changes. Without it, a friend walking away would seem to shrink into a tiny person as the retinal image got smaller. We avoid this because the brain uses distance cues to correct perceived size.
6. Perceptual set is a mental predisposition shaped by experience, expectation, and context. If one person was just shown animal pictures and another face pictures, the same ambiguous drawing will be organized as an animal for the first and a face for the second. The stimulus is identical; the prior set differs.

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SET B • EXAM-STYLE MULTIPLE CHOICE

7. B. Attention was focused on cars, so a visible but unexpected object went unnoticed. Sensory adaptation (A) is reduced response to constant stimulation, not a failure to attend.
8. C. Elements that look alike are grouped. Proximity (B) concerns nearness, and the teammates may be spread across the rink.
9. C. Convergence is the inward turning of the two eyes, felt as muscle tension, and it is binocular. Texture gradient (A), linear perspective, relative height, and interposition all work with one eye.
10. A. Motion parallax is the monocular cue in which nearer objects appear to move faster than far ones as you travel. Retinal disparity (C) compares the two eyes' images and does not depend on movement.
11. E. The brain maintains the door's true shape despite the changing image. Figure-ground (A) is separating an object from its background, not preserving its shape.

SET C • APPLY AND EXTEND

12. (a) 1 point: Group 1 will mostly report the young woman and Group 2 the old woman. 1 point: the concept is perceptual set, a predisposition created by prior experience. (b) 1 point: the independent variable is which clear picture was shown first. 1 point: the dependent variable is which interpretation of the ambiguous drawing each participant reports. (c) 1 point: top-down processing, because prior expectations, not differences in the stimulus, guided the interpretation of identical input.
13. 1 point each for two valid monocular cues applied: for example relative size (a ball that looks larger is closer) and relative height or linear perspective of the field lines relating the ball's position to the ground. 1 point: a binocular cue applied, such as retinal disparity or convergence, which is most useful when the ball is near. 1 point: size constancy lets the fielder perceive the ball as the same real ball even though its retinal image changes as it moves, so it is not seen as growing or shrinking in reality. Full credit requires linking each cue to judging distance.

3.2 Thinking, Problem Solving, and Creativity**SET A • CHECK YOUR UNDERSTANDING**

1. A concept is a mental category, such as 'furniture'. A prototype is the most typical example of the category, such as a chair for furniture. We often decide whether new items belong by comparing them to the prototype, so a beanbag takes longer to classify.
2. An algorithm is a step-by-step procedure that guarantees the right answer but may take a long time, such as testing every lock combination. A heuristic is a quick rule of thumb that is efficient but can produce errors. The trade-off is reliability versus speed.
3. This is confirmation bias. She seeks and remembers evidence that supports her belief while ignoring contradicting evidence. As a result, the belief seems stronger than the data warrant.
4. Framing is how information is worded. Describing a treatment as having a 90 percent survival rate leads to more acceptance than describing it as a 10 percent death rate, though the facts are identical. The emotional wording changes the decision.
5. Functional fixedness is seeing an object only in its usual function. Mental set is persisting with a problem-solving strategy that worked before. The first concerns objects, the second concerns strategies.
6. Convergent thinking narrows possibilities to one correct answer, like solving a math problem. Divergent thinking generates many possible answers, like listing uses for a paperclip. Divergent thinking is most associated with creativity.

SET B • EXAM-STYLE MULTIPLE CHOICE

7. C. Vivid media coverage makes plane crashes easy to recall, inflating perceived risk. Representativeness (A) would involve matching a prototype, which the scenario does not describe.
8. A. Belief perseverance is clinging to a belief after its basis has been discredited. Confirmation bias (B) is seeking supporting evidence, not holding on after evidence is removed.
9. E. A recipe is a set procedure that reliably yields the result if followed. Option C describes a heuristic and option B describes mental set.
10. D. Generating many varied responses to an open-ended prompt is divergent thinking. Convergent thinking (A) would be choosing the single best answer.
11. B. Mental set leads people to apply familiar strategies even when they are not the best. Accommodation (D) is a change in a schema, which is the opposite of what happened.

SET C • APPLY AND EXTEND

12. (a) 1 point: framing. (b) 1 point: wording in terms of gains (saved) triggers more positive reactions than wording in terms of losses (die), so judgment is influenced by presentation rather than facts. 1 point: the information is mathematically identical, which shows decisions are not purely rational. (c) 1 point: independent variable is the wording of the information; 1 point: dependent variable is the degree of support for the program.
13. 1 point: functional fixedness is seeing the tack box only as a container, so people fail to use it as a candle platform. 1 point: strategy such as redescribing objects by their parts and properties, presenting the tacks outside the box, or taking a break to incubate. 1 point: divergent thinking involves generating multiple uses for objects, which counters functional fixedness and increases the chance of finding the solution. Full credit requires correct linkage between the concept and the problem.

3.3 Language

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SET A · CHECK YOUR UNDERSTANDING

1. 'Dogs' has four phonemes (/d/, /o/, /g/, /z/) because phonemes are individual sounds. It has two morphemes, dog and the plural -s, because morphemes are the smallest units of meaning.
2. Syntax is word order: in this sentence, the order tells us the mouse is doing the chasing. Semantics is meaning: the word 'chased' and the nouns have meanings that let us understand the event. Changing the order changes the meaning even though the words are the same.
3. Babbling appears at about the same time in all children, including deaf infants exposed to sign, which suggests biological readiness. Early babbling includes sounds from many languages, but by about 10 months it narrows toward the sounds of the language the baby hears.
4. Children everywhere follow the same sequence of stages. They produce overgeneralizations like 'goed' that they never heard. Children also learn complex grammar very quickly from limited input, and deaf children in communities without a formal sign language have created new ones.
5. Damage to Broca's area in the left frontal lobe causes Broca's aphasia. The person can understand speech but speaks with difficulty, in slow, halting, telegraphic phrases.
6. The critical period suggests that the ability to master grammar and pronunciation is greatest in early childhood and declines with age. Teaching a second language earlier therefore tends to produce more native-like results, though adults can still become fluent.

SET B · EXAM-STYLE MULTIPLE CHOICE

7. A. Telegraphic speech consists of short two-word sentences that contain mainly the key content words. Holophrastic speech uses only a single word at a time.
8. D. Children never hear adults say 'runned', so the error shows that they are applying a rule they have learned. A pure reinforcement account (learn only through reinforcement) would not predict the error.
9. C. Chomsky proposed the language acquisition device and universal grammar. Skinner argued the opposite, that language comes from operant conditioning.
10. B. Linguistic relativity holds that the structure of one's language influences thinking and behavior. Universal grammar concerns innate structure shared by all languages, not differences between them.
11. E. Wernicke's area is responsible for language comprehension, and damage produces fluent but meaningless speech. Broca's area damage produces halting speech with comprehension intact.

SET C · APPLY AND EXTEND

12. 1 point: Skinner says language is learned by reinforcement, shaping, and imitation. 1 point: Chomsky says an innate language acquisition device and universal grammar underlie acquisition. 1 point: evidence for Skinner or learning, such as children raised in an environment with more language exposure having larger vocabularies, or the fact that a child learns the specific language of the home. 1 point: evidence for Chomsky, such as overgeneralization errors or the universal sequence of stages. 1 point: the interactionist view says innate readiness and social experience work together, with biology supplying the capacity and environment supplying content.
13. (a) 1 point: a critical or sensitive period for language acquisition. (b) 1 point: independent variable is age at which the second language was learned; 1 point: dependent variable is grammar score. (c) 1 point: the groups were not randomly assigned, so confounds such as amount of schooling, motivation, or exposure to the language could explain the difference; this is a quasi-experimental comparison, not proof of causation.

3.4 Memory: Encoding and Storage**SET A · CHECK YOUR UNDERSTANDING**

1. Information enters sensory memory, a brief copy of input. Attention moves some of it into short-term memory, which is limited in capacity and duration. Rehearsal and meaningful encoding move information into long-term memory, which is nearly unlimited.
2. Short-term memory holds about seven items (plus or minus two, or about four chunks in newer estimates) for roughly 20 to 30 seconds. Chunking extends the capacity by grouping items into meaningful units, and rehearsal extends the duration.
3. The central executive directs attention and coordinates the other parts. The phonological loop holds verbal and sound information, as when you repeat a phone number. The visuospatial sketchpad and episodic buffer are also correct choices.
4. Episodic memory is memory of personal events, such as your first day of high school. Semantic memory is general knowledge of facts, such as the number of days in a week. Both are explicit memories.
5. Riding a bike is a skill expressed through performance, not conscious recall of facts. It is procedural memory, which is typically unconscious and retained over long periods.
6. Spacing study sessions forces repeated retrieval and re-encoding after partial forgetting, which strengthens memory traces. Cramming gives a short-term feeling of familiarity but weak long-term retention.

SET B · EXAM-STYLE MULTIPLE CHOICE

7. B. Chunking groups items into larger meaningful units. Maintenance rehearsal repeats information without reorganizing it.
8. A. Semantic (meaning-based) processing is deepest. Rhyme judgment is phonemic and letter counting is structural, both shallow.
9. C. Improving at the puzzle reflects implicit procedural learning, spared by hippocampal damage that impairs explicit memory. Option 'procedural memory depends on the hippocampus' is wrong because the task would then have failed too.
10. D. The phonological loop maintains verbal and auditory information through subvocal rehearsal. The visuospatial sketchpad handles images.
11. E. Distributed practice produces more durable learning than a single massed session. The serial position effect concerns where items fall in a list, not scheduling.

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SET C • APPLY AND EXTEND

12. (a) 1 point: Group B will recall more. 1 point: personal, meaning-based elaboration creates deeper processing and more retrieval cues than rote repetition. (b) 1 point: levels of processing (the self-reference effect is also acceptable). (c) 1 point: independent variable is the encoding strategy (rote repetition vs. personal elaboration); 1 point: dependent variable is the number of words recalled.
13. 1 point: chunking by grouping nerves into categories (sensory, motor, mixed) expands what working memory can hold. 1 point: a mnemonic such as an acrostic or a method-of-loci route ties items to vivid images or ordered cues, improving encoding into long-term memory. 1 point: spacing review across days strengthens long-term storage and retrieval. 1 point: links each technique to the right system, noting that chunking mainly helps short-term or working memory while the others strengthen long-term memory.

3.5 Memory: Retrieval, Forgetting, and Reconstruction**SET A • CHECK YOUR UNDERSTANDING**

1. Relearning is the most sensitive because it can show savings even when recall and recognition fail. Recognition is next because it provides the answer among options. Recall is the least sensitive because it provides the fewest cues.
2. Context-dependent memory means recall is better when the retrieval environment matches the encoding environment. A student who studies in a quiet library may remember better when tested in a similar room. Returning to a place often triggers memories encoded there.
3. Early items get more rehearsal and transfer to long-term memory, producing the primacy effect. The last items are still in short-term memory when recalled, producing recency. Middle items get less rehearsal and are displaced, so they are recalled worst.
4. Proactive interference occurs when older learning disrupts the ability to learn or recall newer information. Retroactive interference occurs when newer learning disrupts memory for older information. The prefix tells you which direction the interference travels.
5. The misinformation effect is the incorporation of misleading information after an event into one's memory of that event. Elizabeth Loftus is best known for demonstrating it. It shows that memory is reconstructive and that eyewitness reports can be distorted by suggestion.
6. Retrograde amnesia is loss of memories formed before the injury or onset. Anterograde amnesia is the inability to form new explicit memories after it. H.M. is a classic case of anterograde amnesia.

SET B • EXAM-STYLE MULTIPLE CHOICE

7. D. She remembers the face but forgot the source of that familiarity. Encoding failure would mean she never stored the face.
8. B. Recognition provides cues, so it detects memories that recall cannot. If the memory had decayed completely or never been encoded, recognition would also fail.
9. C. The older address interferes with recalling the newer one, which is proactive. In retroactive interference, new learning would be blocking an old memory.
10. A. The internal physiological state at retrieval matched the state at encoding. Context-dependent memory concerns the external environment.
11. E. Confidence is high but accuracy declines like any other memory. The claim that they are always inaccurate overstates, since many details remain correct.

SET C • APPLY AND EXTEND

12. 1 point each (up to 2) for correct factor linked to the facts: weapon focus (attention to the gun reduces encoding of the face); stress and the short exposure reducing encoding; the suggestive question exposing the clerk to misinformation that can be incorporated (Loftus). 1 point: stating that confidence is not a reliable indicator of accuracy. Full credit requires explaining why each factor reduces reliability.
13. 1 point: participants learn the same word list in one setting. 1 point: independent variable is whether the recall setting matches or differs from the learning setting (random assignment to same-room vs. different-room). 1 point: dependent variable is the number of words correctly recalled. 1 point: prediction that the matching group recalls more, supporting context-dependent memory; controls such as equal study time and the same test.

3.6 Biology of Memory and Improving Memory**SET A • CHECK YOUR UNDERSTANDING**

1. The hippocampus helps form and consolidate new explicit memories. When it is removed, as in the case of H.M., a person cannot form new episodic or semantic memories (anterograde amnesia), though old memories and implicit skill learning remain.
2. The amygdala links emotion to memory. Stress hormones signal it to strengthen consolidation, so emotional events are remembered more vividly and strongly than neutral ones.
3. Long-term potentiation is a lasting increase in the strength of synaptic connections after repeated stimulation. It is considered a cellular basis of learning and memory because it makes neurons that fire together respond more strongly.
4. Recent memories are still being consolidated and have not yet been stabilized in long-term storage, so an interruption can prevent them from being stored. Older memories are consolidated and stored widely in the cortex.
5. The brain develops amyloid plaques and tau tangles, and neurons that produce acetylcholine die. An early symptom is trouble forming new memories, such as repeating questions.
6. Trying to retrieve information strengthens the memory pathways and cues for retrieving it later, and it reveals gaps in knowledge. Rereading creates familiarity, which feels like learning but does not practice retrieval.

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SET B · EXAM-STYLE MULTIPLE CHOICE

7. A. The cerebellum supports implicit memory, including conditioned reflexes and motor timing. New episodic memories depend on the hippocampus.
8. C. Sleep, especially slow-wave sleep, strengthens and stabilizes new memories. Priming is an implicit effect of prior exposure, not a sleep process.
9. D. If preventing LTP disrupts learning, LTP is likely necessary for it. The other findings are not directly about synaptic strengthening.
10. E. Retrieval practice spread over time makes use of the testing effect and spacing. Rereading and highlighting create familiarity but little durable memory.
11. B. Progressive memory and functional decline with plaques is characteristic of Alzheimer's. Normal aging does not erase familiar names and daily skills.

SET C · APPLY AND EXTEND

12. (a) 1 point: the practice-test group scores higher on the final test. (b) 1 point: testing effect (retrieval practice). (c) 1 point: control total study time (or the amount of exposure to the material) so differences are not due to time; 1 point: explaining that otherwise time on task could explain the difference in scores rather than retrieval.
13. 1 point: the hippocampus encodes and consolidates the explicit memory of what happened (episodic memory). 1 point: the amygdala attaches emotion and strengthens the fear memory, aided by stress hormones. 1 point: the cerebellum participates in implicit, conditioned fear and motor responses, such as tensing when braking. Full credit requires pairing each structure with its type of memory.

3.7 Intelligence**SET A · CHECK YOUR UNDERSTANDING**

1. The g factor is a general intelligence that underlies performance on all mental tasks. The evidence is that scores on different tests tend to correlate positively, which factor analysis summarizes as one common factor.
2. Fluid intelligence is the ability to reason with novel problems and tends to decline in later adulthood. Crystallized intelligence is accumulated knowledge and vocabulary, and it holds steady or increases with age.
3. They are analytical, creative, and practical intelligence. Practical intelligence, for example, is knowing how to navigate a problem at work, such as handling a difficult client, even without a high test score.
4. Critics say abilities such as musical or bodily-kinesthetic skill are talents and do not meet the standard of intelligence, because they do not correlate with other abilities in the same way and tests of them are lacking. Gardner replies that narrow definitions of intelligence are too limited.
5. The Flynn effect is the rise in average test scores over generations. Plausible causes are better nutrition, increased schooling, and more cognitively demanding environments. A genetic cause is unlikely because the change is too fast.
6. Heritability applies to the variation within a population in a given environment. Two groups may live in very different environments, so the difference between their averages can be completely environmental even if the trait is highly heritable within each group.

SET B · EXAM-STYLE MULTIPLE CHOICE

7. C. Positive correlations across diverse tasks are the basis of Spearman's g. Gardner's theory predicts weakly related abilities.
8. D. Savant syndrome pairs an extraordinary skill with limited mental ability, and it supports views of separate abilities. A high g factor would predict strong performance across tasks.
9. A. The Flynn effect describes the rise in scores across generations. The Mozart effect refers to claims about music and spatial reasoning.
10. E. Shared genes with different environments still lead to similar scores, supporting genetic influence. It does not show that environment has no effect, since correlations are not perfect.
11. B. Heritability is a population statistic that can change with the range of environments. Treating it as an individual-level fraction is a common misunderstanding.

SET C · APPLY AND EXTEND

12. 1 point: heritability is about variation within a population, not between groups. 1 point: the seeds-and-soil analogy or the idea that between-group differences can come from different environments (nutrition, school quality, poverty). 1 point: the Flynn effect shows that environmental change can raise average scores substantially in a few decades. 1 point: concluding that the claim is unsupported.
13. 1 point: Spearman proposes a single general factor g; 1 point: Gardner proposes several relatively independent intelligences. 1 point: evidence for Spearman is positive correlation among scores on diverse tests or g predicting academic and job success. 1 point: evidence for Gardner includes savant syndrome or brain damage that impairs one ability but spares others. Full credit requires an accurate contrast.

3.8 Testing and Psychometrics**SET A · CHECK YOUR UNDERSTANDING**

1. Binet was asked to identify children in Paris who needed extra help in school. He cautioned against treating the scores as a fixed measure of intelligence or using them to label children, because he believed intelligence could be improved by education.
2. $IQ = (12 / 10) \times 100 = 120$. The formula fails for adults because mental age stops rising while chronological age keeps increasing, so the ratio would decline artificially. Modern tests use deviation IQ instead.
3. Standardized means the test is given and scored in a uniform way, and a representative norm group has been tested so that an individual's score can be interpreted relative to others. This allows fair comparison.
4. Reliability is consistency, measured by test-retest or split-half correlations. Validity is whether the test measures or predicts what it is intended to, evaluated by comparing scores with an outside criterion such as later grades.

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5. An achievement test measures learned knowledge, such as a unit exam. An aptitude test predicts future ability to learn or perform, such as a test used to predict success in college.
6. Stereotype threat is the anxiety people feel about confirming a negative stereotype about their group, which can lower their performance. Steele and Aronson found Black students performed worse when a test was framed as diagnosing ability than when it was framed as a problem-solving task.

SET B • EXAM-STYLE MULTIPLE CHOICE

7. D. 70 and 130 are two standard deviations from the mean, and about 95 percent of scores fall within two standard deviations. The 68 percent figure applies to one standard deviation (85 to 115).
8. B. Consistency makes it reliable, but it does not measure true weight, so it is not valid. A test cannot be valid without being reliable, but the reverse is possible.
9. A. Predictive validity is shown by correlation with the later criterion. Retest consistency shows reliability, not validity.
10. C. Terman revised Binet's test as the Stanford-Binet. Wechsler later developed separate adult and children's scales.
11. E. Being reminded of a negative group stereotype can raise anxiety and reduce performance. A reliability problem would not be triggered by the reminder.

SET C • APPLY AND EXTEND

12. 1 point: a single score has measurement error and imperfect reliability, so decisions should not hinge on it alone. 1 point: validity depends on whether the test predicts success in the gifted program; the test may be culturally biased for some groups or affected by stereotype threat. 1 point: ethical use requires multiple measures and qualified administrators. 1 point: an improvement such as combining teacher recommendations, work samples, and multiple tests; reconsidering scores over time.
13. (a) 1 point: Mia is $(115 - 100)/15 = 1$ SD above the mean; 1 point: Lee is $(145 - 100)/15 = 3$ SD above the mean. (b) 1 point: about 0.15 percent (roughly 0.1 to 0.2 percent), since 99.7 percent fall within 3 SD and half of the remainder is above. (c) 1 point: both tests are normed on representative samples and scaled to the same mean and SD, so scores indicate position relative to the norm group.

3.9 Multiple-Choice Practice: Cognition**SET A • CORE CONCEPTS**

1. B. The brain uses distance cues to maintain the perceived size of an object despite a smaller retinal image. Retinal disparity is a binocular depth cue and does not preserve size.
2. D. Vivid, easily recalled examples make events seem more common. Representativeness would require matching a prototype, which is not described.
3. A. Adults do not say 'goed', so the child is generating it from a rule (overgeneralization). Imitation alone cannot explain an utterance the child never heard.
4. E. Simple repetition holds information temporarily but does not create the meaningful connections needed for long-term storage. Long-term memory capacity is considered essentially unlimited, so capacity is not the problem.
5. C. Elements near each other are grouped. Seeing a broken circle as complete is closure.
6. A. Consistency shows reliability; failing to predict performance shows poor predictive validity. A test cannot be valid if it is unreliable, so the second option is impossible.
7. D. Accumulated knowledge (crystallized) holds up with age while novel reasoning (fluid) declines. The reverse pattern is the opposite of what is typically found.

SET B • APPLICATIONS AND DATA

8. C. Recall increased as processing moved from structural to phonemic to semantic, which is the levels-of-processing prediction. No spacing or retrieval practice variable was manipulated.
9. E. Distraction displaces the last items from short-term memory, while early items already stored in long-term memory persist. Primacy depends on long-term storage, so it is not eliminated.
10. B. Leading wording after the event altered the reconstructed memory (Loftus). Source amnesia would require forgetting the origin of a memory.
11. A. Inability to form new memories after the injury is anterograde amnesia. Retrograde amnesia would be loss of memories from before the injury.
12. D. The researchers manipulated study method, and the benefit of practice retrieval is the testing effect. The test score is the dependent variable.
13. B. Different environments can produce group differences even when within-group variation is largely genetic. The Flynn effect shows environment matters but not that intelligence is entirely environmental.
14. E. $(70 - 100)/15 = -2$. One standard deviation below the mean would be 85.

SET C • EXAM-LEVEL STRETCH

15. A. She seeks evidence for her belief (confirmation bias) and interprets ambiguous sensations through expectation (perceptual set). Functional fixedness concerns object use.
16. C. New learning disrupted recall of older learning. Proactive interference would be older learning disrupting recall of the new.
17. D. Spearman's g predicts positive correlations among different tests, so uncorrelated abilities would challenge it. Predicting school success supports g .
18. B. Broca's area damage impairs speech production while comprehension remains largely intact. Fluent nonsense is characteristic of Wernicke's aphasia.
19. E. Reminding people of a negative stereotype can induce anxiety that lowers performance. The Flynn effect concerns generational changes in scores.
20. C. Presenting the box as separate reduces the fixed view of its function. Divergent thinking is in fact helpful for such problems.

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3.10 Free-Response Practice: Cognition**QUESTION 1 · ARTICLE ANALYSIS: TESTING EFFECT**

1. 1 point: independent variable is the second study activity (rereading vs. free recall/self-testing). 1 point: dependent variable is the score on the one-week test.
2. 1 point: random assignment spreads preexisting differences such as motivation or prior knowledge evenly across groups, so the groups are equivalent at the start. 1 point: this supports a cause-and-effect conclusion about the study activity rather than differences among participants.
3. 1 point: Group 2 scored about 4.3 points higher, so retrieval practice led to better retention than rereading. 1 point: the principle is the testing effect (retrieval practice).
4. 1 point: limitation such as a sample of undergraduates only, one passage, or a one-week delay. 1 point: recommendation such as spacing self-testing sessions across days instead of rereading.

QUESTION 2 · EVIDENCE-BASED: MEMORY DISTORTION

5. 1 point: A claim supported by the data, such as: asking about a nonexistent object leads many witnesses to report it. 1 point: cites evidence, such as 41 percent versus 12 percent said they saw a gun.
6. 1 point: the misinformation effect. 1 point: definition: incorporation of misleading information presented after an event into memory of the event, because memory is reconstructive.
7. 1 point: witnesses were highly confident even when wrong, so confidence is not a dependable sign of accuracy. 1 point: courts should not treat confident testimony as proof and should seek corroborating evidence.
8. 1 point: for example, using neutral, nonleading questions, interviewing witnesses soon after the event, recording first confidence, or using double-blind lineups.

QUESTION 3 · ARTICLE ANALYSIS: STEREOTYPE THREAT

9. 1 point: independent variable is the description of the test (gender differences vs. no differences). 1 point: dependent variable is the number of math questions answered correctly.
10. 1 point: stereotype threat. 1 point: concern about confirming a negative stereotype creates anxiety and distraction that use up working memory.
11. 1 point: test scores may reflect situational anxiety and stereotype threat in addition to ability, so scores can underestimate the ability of some groups. 1 point: this threatens the validity (and fairness) of interpretations made from the scores.
12. 1 point: for example, framing tests as challenges, offering role models, teaching that abilities can grow, or values affirmation exercises.

QUESTION 4 · EVIDENCE-BASED: INTELLIGENCE AND ENVIRONMENT

13. 1 point: Flynn effect. 1 point: because scores rose 15 points in 30 years while genes cannot change that quickly, the cause is likely environmental (such as nutrition, schooling, or abstract-thinking demands).
14. 1 point: heritability describes variation within a population at a time, not the cause of average level. 1 point: environmental changes can shift the average for everyone while differences among individuals remain partly genetic.
15. 1 point: biological parents' scores were the same but adopted children's scores differed by 12 points depending on the family environment, so environment influences intelligence. 1 point: genes still matter, because children's scores are shaped by both, so the answer is interaction rather than one or the other.

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Chapter 4: Development and Learning.

10 sections with explanations and worked examples, then 140 practice problems. Answers and full explanations are at the end of the chapter.

4.1 Developmental Psychology: Research and Prenatal Development

You will learn the major debates in developmental psychology, the research designs used, the stages of prenatal development, and early reflexes, maturation, and temperament.

Developmental psychology studies how people change physically, cognitively, and socially from conception through old age. Three big questions organize the field, and the AP exam asks about all of them.

Debate	One side	Other side	Modern view
Nature vs. nurture	Nature: genes and biological maturation	Nurture: environment, parenting, culture	Both interact; genes set a range, experience shapes where in the range a person ends up
Continuity vs. stages	Continuity: gradual, smooth change	Stages: distinct periods in a fixed order (Piaget, Erikson)	Depends on the trait; stage theories describe broad patterns, not rigid steps
Stability vs. change	Traits stay consistent (temperament)	Personality shifts with life events	Some traits are stable, many change across the lifespan

Key idea: Nature and nurture interact

Heredity provides potential; environment determines how it is expressed.

Example: a child may inherit a tendency toward height, but nutrition decides whether that height is reached.

Twin and adoption studies are the main tools for separating the two influences.

Research designs

Because age is the key variable, developmental researchers use two special designs. A **cross-sectional study** compares people of different ages at one time. It is fast and cheap, but differences might come from the **cohort effect**: people born in different eras grew up with different experiences (for example, technology or schooling), so an age difference may really be a generation difference. A **longitudinal study** follows the same people over years. It avoids cohort effects and shows true change within individuals, but it is slow, expensive, and loses participants (attrition), which can bias the final sample.

Feature	Cross-sectional	Longitudinal
Participants	Different people at different ages	Same people retested over time
Time needed	Short	Years or decades
Main weakness	Cohort effects	Attrition, cost, time
Shows	Age differences	Individual change

A **sequential design** combines both by following several age groups over a shorter time.

Prenatal development

Life begins at conception, when a sperm fertilizes an egg to form a **zygote**. The zygote divides and implants in the uterine wall, a phase called the **germinal stage** (about the first two weeks). In the **embryonic stage** (weeks 2 through 8) the major organs, heart, and spinal cord form; this is the most vulnerable period for structural damage. In the **fetal stage** (week 9 to birth) the organism grows, organs mature, and the brain develops rapidly. The **placenta** passes nutrients and oxygen to the fetus and filters some, but not all, harmful substances.

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Teratogens are agents such as drugs, viruses, or chemicals that cross the placenta and can harm the embryo or fetus. Heavy drinking during pregnancy can cause **fetal alcohol syndrome (FAS)**, marked by distinctive facial features, a small head, and lifelong learning and behavior problems. Tobacco raises the risk of low birth weight and premature birth, and maternal illnesses such as rubella and the Zika virus can also damage development. Timing matters: the same exposure does more structural harm in the embryonic stage than late in pregnancy.

Key idea: Prenatal stages in order

Germinal (zygote, implantation) → Embryonic (organs form, most teratogen-sensitive) → Fetal (growth and brain development).
Teratogen = any environmental agent that causes harm to the developing child (alcohol is the classic example).

The newborn, maturation, and motor development

Newborns arrive with **reflexes**, automatic responses that aid survival. The **rooting reflex** turns the head toward a touch on the cheek, the **sucking reflex** supports feeding, the **grasping (palmar) reflex** closes the hand on an object, and the **Moro (startle) reflex** throws out the arms in response to a loud noise or loss of support. Newborns also prefer human faces, their mother's voice and smell, and sweet tastes. **Habituation**, a decrease in response to a repeated stimulus, lets researchers test infants: if a baby looks longer at a new stimulus than an old one, the baby can tell them apart.

Maturation is the sequence of biological growth processes that unfold in a fairly fixed order, largely independent of practice. Motor skills illustrate it: babies roll over, sit with support, crawl, stand holding on, walk, and then walk alone, with the order nearly universal even though timing varies. Extra training barely speeds these skills before the nervous system is ready. Brain development also shows a surge of synapse formation after birth followed by **pruning** of unused connections, which is one way experience shapes the brain. Infants cannot form lasting explicit memories of events early on, a phenomenon called infantile amnesia.

Temperament

Temperament is a person's characteristic emotional reactivity and intensity, evident from early infancy and strongly influenced by heredity. Thomas and Chess described three types: **easy** babies (about 40 percent) are cheerful, regular, and adaptable; **difficult** babies (about 10 percent) are irritable, irregular, and resist change; **slow-to-warm-up** babies (about 15 percent) are initially hesitant but adapt with time. Temperament tends to be fairly stable, yet the fit between a child's temperament and caregiver responses shapes later outcomes.

EXAMPLE 1: CHOOSING A DESIGN

A researcher wants to know whether short-term memory declines with age. She tests 100 twenty-year-olds, 100 fifty-year-olds, and 100 eighty-year-olds on the same day. (a) Identify the design. (b) Identify one limitation. (c) Suggest an alternative.

SOLUTION

- (a) Cross-sectional design, because different age groups are compared at one point in time.
- (b) Cohort effect: the eighty-year-olds may differ in education or health history, not because of aging itself, so the age difference could be a generational difference.
- (c) A longitudinal design following the same 100 people for sixty years would show true change within individuals, though it would take far longer and risk attrition.

EXAMPLE 2: TIMING OF TERATOGENS

A mother drank heavily only during the fifth week of pregnancy, and the child shows facial abnormalities. Explain why the timing is important.

SOLUTION

Week 5 falls in the embryonic stage, when organs and facial structures are forming.
Alcohol is a teratogen that crosses the placenta, so exposure during this sensitive period can disrupt structure formation, producing the physical features of fetal alcohol syndrome.
Exposure in the late fetal stage more often affects growth and brain function than basic structure.

Common mistakes

Do not say a cross-sectional study 'follows' people; it compares groups. Do not call the placenta a complete barrier; many teratogens pass through. Do not confuse maturation (biological readiness) with learning (change from experience), and do not equate temperament with personality: temperament is the inborn emotional style that personality builds on.

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Practice

SET A Check Your Understanding

Answer each question in one to three sentences.

1. Define nature and nurture and explain what 'interaction' means.
2. Why is a longitudinal study better than a cross-sectional study for studying change within individuals?
3. Name the three prenatal stages in order and state one major event of each.
4. What is a teratogen? Give an example and one effect.
5. Describe the rooting and Moro reflexes and explain why newborns have reflexes.
6. Distinguish an easy baby from a slow-to-warm-up baby using temperament.

SET B Exam-Style Multiple Choice

Choose the best answer.

7. A researcher compares reading speed in groups of 8-, 12-, and 16-year-olds tested in the same month. The greatest threat to concluding that reading improves with age is
 (A) a cohort effect (B) participant attrition
 (C) practice effects from repeated testing (D) the placebo effect
 (E) experimenter bias in a double-blind design
8. During which prenatal stage are the major organs and body structures formed?
 (A) Germinal (B) Fetal (C) Embryonic (D) Zygotic (E) Neonatal
9. A baby turns her head and opens her mouth when her cheek is stroked. This reflex is
 (A) Moro (B) palmar grasp (C) habituation
 (D) rooting (E) accommodation
10. Researchers find that most infants sit, crawl, and walk in the same order regardless of practice. This best illustrates
 (A) classical conditioning (B) maturation (C) the cohort effect
 (D) scaffolding (E) teratogenic influence
11. A newborn who cries often, sleeps irregularly, and is upset by new routines would be classified by Thomas and Chess as
 (A) easy (B) slow-to-warm-up (C) securely attached
 (D) avoidant (E) difficult

SET C Apply and Extend

Respond in complete sentences; answers show scoring points.

12. A psychologist hypothesizes that childhood TV violence increases adult aggression. (a) Explain how a longitudinal study could test this. (b) Identify one weakness of that design. (c) Explain why nature and nurture would both matter for aggression.
13. Explain how timing and type of exposure determine the effects of a teratogen, using alcohol as an example, and state one other prenatal risk.

4.2 Attachment and Social Development in Childhood

You will learn how attachment forms and is measured, how parenting styles and Erikson's stages affect children, and how gender and peers shape social development.

Social development in childhood begins with the bond between infant and caregiver. Early relationships shape emotion, trust, and later relationships, and the AP exam expects you to link each researcher to a specific finding.

Attachment: Harlow, Bowlby, Ainsworth

Attachment is an emotional tie to a caregiver that shows in seeking closeness and distress at separation. Behaviorists once assumed infants love whoever feeds them. Harry Harlow tested this with infant rhesus monkeys raised with two surrogate mothers: a wire one that held a bottle and a cloth-covered one that did not. The monkeys spent most of their time clinging to the cloth mother and went to the wire one only to feed, so **contact comfort** matters more than food. Monkeys raised in isolation later showed fear, abnormal social behavior, and poor parenting. Human infants likewise show **stranger anxiety** at about 8 months, and **critical period** research (Konrad Lorenz's imprinting in geese) shows that some attachments form best during a sensitive window.

John Bowlby proposed that attachment is an evolved survival system: infants are biologically prepared to bond, and the caregiver acts as a **secure base** for exploration. Bowlby also argued that early bonds create an internal working model of relationships.

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Mary Ainsworth measured attachment with the **Strange Situation**, a laboratory procedure in which a 12-18 month-old is observed as a caregiver and a stranger come and go. Researchers watch the child's exploration, distress at separation, and reaction at reunion.

Style	Behavior in Strange Situation	Caregiving pattern
Secure (about 60-65%)	Explores with caregiver present, upset at departure, quickly comforted at return	Responsive and sensitive
Insecure-avoidant	Little distress at separation, ignores or avoids caregiver at reunion	Rejecting, unavailable
Insecure-anxious/ambivalent	Very distressed at separation, clingy yet angry and hard to soothe at reunion	Inconsistent
Disorganized (added later)	Confused, contradictory behavior	Often abusive or frightening

Key idea: Secure attachment

Children who are securely attached tend to show better peer relationships, self-confidence, and emotional regulation later. Temperament matters too: critics argue that a child's inborn reactivity partly shapes how caregivers respond, so attachment is not solely caused by parenting.

Parenting styles (Baumrind)

Style	Demands/control	Warmth/responsiveness	Typical child outcome
Authoritative	High, with explained rules	High	Self-reliant, high self-esteem, social competence
Authoritarian	High, strict, 'because I said so'	Low	Lower self-esteem, anxiety, poorer social skills
Permissive	Low	High	Impulsive, lower self-control
Neglectful (added by later researchers)	Low	Low	Poor outcomes, aggression, difficulties in school

These findings are correlational. Children's temperament also influences parents, and culture matters: strict parenting does not carry the same meaning in every community.

Erikson's psychosocial stages

Erik Erikson proposed that each stage of life poses a social crisis whose resolution shapes personality. The first four are most tested in childhood.

Approximate age	Crisis	Successful resolution
Infancy (0-1)	Trust vs. mistrust	Consistent care builds trust in the world
Toddler (1-3)	Autonomy vs. shame and doubt	Doing things independently builds will
Preschool (3-6)	Initiative vs. guilt	Planning and starting activities
School age (6-12)	Industry vs. inferiority	Competence in schoolwork and skills
Adolescence	Identity vs. role confusion	Coherent sense of self
Young adulthood	Intimacy vs. isolation	Close committed relationships
Middle adulthood	Generativity vs. stagnation	Contributing to the next generation
Late adulthood	Integrity vs. despair	Accepting one's life

Memory aid

Trust, Autonomy, Initiative, Industry, Identity, Intimacy, Generativity, Integrity: 'T-A-I-I-I-G-I'; the infancy crisis (trust) is the foundation for the rest.

Gender and peer influences

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Gender identity is a person's sense of being male, female, or another gender, and **gender roles** are the behaviors a culture expects. Albert Bandura's **social learning theory** says children acquire gender-typed behavior by observing and imitating models and by being reinforced for it. Another view, **gender schema theory**, holds that children organize information about gender into mental schemas that guide what they notice. Biological factors such as prenatal hormones also play a role, and both views interact. Gender typing is reinforced by parents, media, and peers.

By middle childhood, **peers** increasingly shape behavior. Peer acceptance affects self-esteem and adjustment, and in adolescence peers influence music, clothing, risk taking, and substance use. Judith Rich Harris argued that peers influence development as much as parents. Children also learn aggression and prosocial behavior through observing others, linking back to Bandura.

EXAMPLE 1: CLASSIFY AN ATTACHMENT STYLE

In a Strange Situation, a 14-month-old plays happily until the mother leaves, cries, and clings and hits her when she returns, staying upset for several minutes. Classify the attachment and describe a likely caregiving pattern.

SOLUTION

Intense distress at separation plus angry, clingy, hard-to-soothe behavior at reunion indicates insecure anxious/ambivalent attachment.

This pattern is associated with inconsistent caregiving: sometimes responsive, sometimes not, so the child cannot predict comfort. It is not avoidant (avoidant children show little distress and ignore the caregiver).

EXAMPLE 2: IDENTIFY PARENTING STYLE

A father says, 'You are home by 10 because I said so; do not argue.' He rarely praises his son. Identify the style and predict one outcome.

SOLUTION

High demands with low warmth and no explanation is authoritarian parenting.

Likely outcomes include lower self-esteem, more anxiety, and weaker social skills.

The authoritative style would instead pair the curfew with an explanation and affection.

Common mistakes

Harlow showed that comfort, not food, drives attachment; do not credit him with the Strange Situation (that is Ainsworth). Authoritative is not the same as authoritarian. Parenting-style outcomes are correlations, not proof that parenting causes them. Erikson's 'identity' crisis belongs to adolescence, not childhood.

Practice

SET A Check Your Understanding

Answer each question in one to three sentences.

1. Describe Harlow's monkey experiment and its main conclusion.
2. How did Ainsworth measure attachment, and what behaviors distinguish secure from avoidant infants?
3. What did Bowlby mean by a 'secure base'?
4. Match each Baumrind style to its warmth and control levels: authoritative, authoritarian, permissive.
5. Which Erikson stage is a six-year-old entering school facing, and what is the positive outcome?
6. Compare social learning theory and gender schema theory of gender development.

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SET B Exam-Style Multiple Choice

Choose the best answer.

7. Harlow's findings with infant monkeys most directly challenged the view that attachment is based on
 - (A) critical periods for imprinting
 - (B) observational learning
 - (C) maturation of motor skills
 - (D) feeding and reward by the caregiver
 - (E) parental sensitivity
8. A toddler shows almost no reaction when her mother leaves and looks away when she returns. This is best classified as
 - (A) insecure avoidant attachment
 - (B) secure attachment
 - (C) anxious/ambivalent attachment
 - (D) authoritarian parenting
 - (E) stranger anxiety
9. Parents who set clear rules, explain the reasons, and respond warmly to their children are using which style?
 - (A) Authoritarian
 - (B) Permissive
 - (C) Authoritative
 - (D) Neglectful
 - (E) Disorganized
10. According to Erikson, a preschooler praised for planning a game and leading others is resolving which crisis in a positive way?
 - (A) Trust vs. mistrust
 - (B) Autonomy vs. shame and doubt
 - (C) Industry vs. inferiority
 - (D) Identity vs. role confusion
 - (E) Initiative vs. guilt
11. A boy copies his older brother's way of playing with trucks because the brother is praised for it. This best illustrates
 - (A) gender schema theory
 - (B) social learning theory
 - (C) Erikson's trust stage
 - (D) the Strange Situation
 - (E) maturation

SET C Apply and Extend

Respond in complete sentences; answers show scoring points.

12. A researcher uses the Strange Situation with 60 infants and finds 38 secure, 12 avoidant, and 10 anxious/ambivalent. (a) What percent were secure? (b) Describe the reunion behavior of an avoidant infant. (c) Offer one criticism of concluding that caregiving alone caused these styles.
13. Erikson's theory and Baumrind's parenting styles both claim parents influence development. Explain how an authoritative parent might support a child's resolution of two Erikson crises of childhood.

4.3 Cognitive Development: Piaget and Vygotsky

You will learn Piaget's stages and key concepts, theory of mind, and Vygotsky's ideas of the zone of proximal development and scaffolding.

Jean Piaget saw children as active scientists who build knowledge by interacting with the world. Lev Vygotsky emphasized that thinking grows out of social interaction. Together they explain how children's reasoning changes with age.

Piaget's core concepts

A **schema** is a mental framework that organizes knowledge, such as 'dog' or 'grasping.' Children handle new experiences in two ways. **Assimilation** interprets new information using existing schemas: a toddler calls a horse 'doggy.' **Accommodation** changes schemas to fit new information: after being corrected, the child forms a separate schema for horses. Cognitive development is driven by the balancing of these processes, which Piaget called equilibrium.

Key idea: Assimilation vs. accommodation

Assimilation = fit the new thing into an old schema.

Accommodation = change the schema to fit the new thing.

Stage (age)	Key abilities and limits	Landmarks
Sensorimotor (birth-2)	Learns through senses and actions; no symbols at first	Object permanence (understanding hidden objects still exist, emerging around 8 months); stranger anxiety
Preoperational (2-7)	Uses words and images, but lacks logical operations	Egocentrism, animism, pretend play, lack of conservation, centration
Concrete operational (7-11)	Logical thought about concrete objects	Conservation, reversibility, classification, seriation

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Stage (age)	Key abilities and limits	Landmarks
Formal operational (12+)	Abstract, hypothetical, and systematic reasoning	Hypothetico-deductive reasoning, idealism, moral reasoning

In the sensorimotor stage, infants coordinate senses with actions, and by the end of the stage they use mental representation. **Object permanence** is tested with the hidden-toy task: a young infant who loses interest when a toy is covered lacks it. In the preoperational stage, **egocentrism** is difficulty seeing another's viewpoint, shown by the three-mountains task where a child picks a picture showing her own view. Children also show **centration**, focusing on one feature at a time. Because of this, they fail **conservation** tasks: they believe a tall thin glass holds more liquid than a short wide one even after seeing the same amount poured. Concrete operational children succeed because they can mentally reverse the pouring and consider height and width together. Formal operational thinkers handle abstractions such as proportions and 'what if' hypotheses.

Modern research suggests Piaget underestimated infants (they show some object knowledge earlier when tested with looking-time measures), and that development is more continuous than discrete stages imply. Not everyone reaches formal operations in all domains, and culture and education matter.

Theory of mind

Theory of mind is understanding that other people have thoughts, beliefs, and feelings different from one's own. It develops around ages 3–5. The **false-belief task** tests it: a child watches Sally hide a marble in a basket, and while she is away it is moved to a box. Asked where Sally will look, a three-year-old says the box, but a five-year-old correctly says the basket. Autism spectrum disorder is often linked to delays in theory of mind, and language and pretend play support its growth.

Vygotsky's sociocultural theory

Vygotsky argued that cognitive growth is rooted in culture and language. Children learn from more skilled partners. The **zone of proximal development (ZPD)** is the gap between what a learner can do alone and what he or she can do with guidance. **Scaffolding** is the temporary support that a parent, teacher, or peer gives within the ZPD, reduced as competence grows. He also stressed private speech, children talking to themselves to guide behavior, which later becomes inner thought.

Feature	Piaget	Vygotsky
Main engine of development	Child's own exploration and schemas	Social interaction and culture
Role of language	Reflects thought	Shapes thought
Stages?	Yes, universal	No fixed stages
Role of teacher	Provide materials; wait for readiness	Guide within ZPD

Key idea: Piaget's stage order

Sensorimotor → Preoperational → Concrete operational → Formal operational. Order is fixed; ages are approximate.

Quick cues: object permanence (sensorimotor), egocentrism and no conservation (preoperational), conservation and reversibility (concrete), abstract hypotheses (formal).

Piaget believed that children cannot simply be taught to skip a stage; they must be cognitively ready. This led to the educational idea of discovery learning, in which teachers offer hands-on materials that create small puzzles for the child to resolve through assimilation and accommodation. Vygotsky, by contrast, would have the teacher interact closely with the learner, using conversation and demonstration, so classroom structures such as peer tutoring and cooperative learning reflect his influence. Both thinkers agree that children are active participants in their own learning rather than passive recipients of information, which is why both remain influential in modern teaching practice.

EXAMPLE 1: PIAGET SCENARIO

Four-year-old Maya sees her mother pour juice from a wide glass into a tall narrow one. She says the tall glass has more juice. (a) Name the stage. (b) Explain her answer. (c) At what stage would she answer correctly?

SOLUTION

(a) Preoperational stage.

(b) She lacks conservation and shows centration: she focuses on height alone and cannot mentally reverse the pour.

(c) Concrete operational, about age 7 or later, when she can decenter and use reversibility.

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EXAMPLE 2: ZPD AND SCAFFOLDING

A child cannot solve a puzzle alone. Her teacher first shows the corner pieces, then lets her try, then steps back. Explain with Vygotsky's terms.

SOLUTION

The puzzle lies in the child's ZPD: too hard alone but possible with help.

The teacher's hints and gradual withdrawal are scaffolding.

As skill grows, support is removed and the child can do the task independently.

Common mistakes

Do not confuse assimilation with accommodation (accommodation = the schema changes). Egocentrism is not selfishness; it is an inability to take another's viewpoint. Object permanence is a sensorimotor milestone, conservation is concrete operational. Vygotsky's ZPD refers to what a child can do with help, not what the child already knows.

Practice**SET A Check Your Understanding**

Answer each question in one to three sentences.

1. Explain the difference between assimilation and accommodation with an original example.
2. What is object permanence and in which stage does it emerge?
3. Describe one limitation of preoperational thinking and a task that reveals it.
4. What cognitive skill separates concrete operational from formal operational thinking?
5. What does the false-belief task measure and what answer shows success?
6. Define zone of proximal development and scaffolding.

SET B Exam-Style Multiple Choice

Choose the best answer.

7. A child sees a dog and says 'doggy' but then calls a cat 'doggy,' too. When told 'no, that is a kitty,' she forms a new category. The change to a new category is
 - (A) assimilation
 - (B) conservation
 - (C) egocentrism
 - (D) object permanence
 - (E) accommodation
8. A 5-year-old thinks a ball of clay flattened into a pancake contains more clay. Which concept is the child lacking?
 - (A) theory of mind
 - (B) object permanence
 - (C) conservation
 - (D) scaffolding
 - (E) abstract reasoning
9. A 3-year-old says Sally will look in the box where the marble actually is, even though Sally never saw it moved. This suggests the child lacks
 - (A) theory of mind
 - (B) conservation
 - (C) object permanence
 - (D) formal operations
 - (E) a zone of proximal development
10. A teacher gives a student hints on a hard math problem and gradually removes them. This most clearly illustrates
 - (A) assimilation
 - (B) scaffolding
 - (C) centration
 - (D) accommodation
 - (E) maturation
11. Which statement best contrasts Vygotsky with Piaget?
 - (A) Vygotsky proposed four universal stages; Piaget rejected stages.
 - (B) Vygotsky believed development is solely genetic; Piaget believed it is solely environmental.
 - (C) Vygotsky studied only infants; Piaget studied only adults.
 - (D) Vygotsky emphasized social and cultural influences on thinking, while Piaget emphasized the child's independent exploration.
 - (E) Vygotsky focused on moral reasoning; Piaget on attachment.

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SET C Apply and Extend

Respond in complete sentences; answers show scoring points.

12. A 9-year-old correctly says the same amount of water is in two different containers, and explains 'you could just pour it back.' (a) Identify the stage and the cognitive operation shown. (b) Name one task she would likely still find difficult at this stage. (c) Explain how Vygotsky would suggest helping her learn that task.
13. Describe one criticism of Piaget's stage theory and give evidence supporting it.

4.4 Moral Development, Adolescence, and Adulthood

You will learn Kohlberg's and Gilligan's views of moral reasoning, the changes of adolescence, and the physical, cognitive, and social changes of adulthood and aging.

Development does not stop in childhood. This lesson covers moral reasoning, the changes of adolescence, and the long span of adult life through aging and death.

Moral development

Lawrence Kohlberg studied moral reasoning by giving people dilemmas, such as the Heinz dilemma (should a man steal a drug he cannot afford to save his dying wife?). What matters is the reasoning given, not whether the person says yes or no.

Level	Stage focus	Typical reasoning
Preconventional (childhood)	Punishment and reward	'He should not steal or he will go to jail' or 'What benefits me?'
Conventional (adolescence)	Social approval, laws, and duty	'Good people follow rules' and 'Laws keep society running'
Postconventional (some adults)	Social contracts and universal principles	'Life outweighs property; unjust laws may be broken'

Key idea: Kohlberg's levels

Preconventional = self-interest (rewards, punishment).

Conventional = conform to social order and laws.

Postconventional = abstract principles of justice, even against the law.

Critics: the theory reflects Western, male samples and confuses moral thinking with moral action.

Carol Gilligan, a critic, argued that Kohlberg's research mainly used male participants and emphasized justice. She proposed that many women also reason from an **ethic of care**, focusing on relationships and responsibility. Later studies found only small gender differences. Moral intuition (quick emotional judgments) and culture also shape moral behavior, and thinking and acting are not always linked.

Adolescence

Adolescence spans puberty to independence. **Puberty** is the period of sexual maturation, triggered by hormones: girls typically begin earlier than boys. **Primary sex characteristics** are the reproductive organs, and **secondary sex characteristics** are nonreproductive traits such as breast development, body hair, and voice change. **Menarche** is the first menstrual period. Early-maturing girls and late-maturing boys can face more social difficulties.

The **adolescent brain** is still developing. The limbic system, which handles emotion and reward, matures earlier than the prefrontal cortex, which handles planning, impulse control, and judgment. This mismatch helps explain risk taking and emotional intensity, and the brain continues pruning and myelination into the mid-twenties. Sleep patterns also shift later in adolescence.

Erikson called the central task **identity vs. role confusion**. James Marcia expanded this using two dimensions: whether the person has explored alternatives (crisis) and whether the person has made a commitment.

Marcia status	Exploration?	Commitment?
Identity diffusion	No	No
Foreclosure	No	Yes (adopted others' choices)
Moratorium	Yes	Not yet
Identity achievement	Yes	Yes

Jeffrey Arnett proposed **emerging adulthood** (about ages 18-25) as a distinct period in industrialized cultures, marked by identity exploration, instability, and feeling in-between.

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Adulthood and aging

Developmental psychologists take a **lifespan view**: change continues from conception to death, involves both gains and losses, and is shaped by biology, psychology, and social context together. Aging is therefore not only decline; many older adults report greater emotional stability and positive outlook.

Physical peak occurs in the twenties. Adults gradually lose sensory sharpness, muscle strength, and reaction time. Women experience **menopause** (end of menstruation, typically around 50), and men see more gradual testosterone declines. **Midlife** is not necessarily a crisis; most people report high satisfaction, and a 'midlife crisis' is less common than popular culture suggests. Erikson's midlife task is generativity, and late adulthood brings integrity vs. despair. Life events (marriage, parenthood, job) matter more than age for many social changes, and a person's social clock is the culturally preferred timing for them.

Cognition changes in different ways. **Fluid intelligence** (processing speed, reasoning with new information) tends to decline after about age 30, whereas **crystallized intelligence** (accumulated knowledge and vocabulary) holds steady or grows. Recall is harder than recognition for older adults, and recalling words and names is a common complaint. Serious declines, such as **dementia** and Alzheimer's disease, are not normal aging; Alzheimer's involves loss of acetylcholine, plaques, and tangles. Staying active, social, and mentally engaged is associated with healthier aging, and the long-lasting studies on aging often show a gap between cross-sectional and longitudinal results because of cohort effects.

Elisabeth Kubler-Ross proposed five stages in response to death: **denial, anger, bargaining, depression, acceptance**. Research shows people do not always pass through them in order or at all, so they describe common reactions, not a rigid sequence.

Memory aid

Kubler-Ross: DABDA (Denial, Anger, Bargaining, Depression, Acceptance).

Lifespan view: development is lifelong, multidimensional, and shaped by both gains and losses.

EXAMPLE 1: KOHLBERG SCORING

Three students respond to the Heinz dilemma. Ana: 'He should not steal, he might get arrested.' Ben: 'He should steal; a good husband takes care of his wife and society expects that.' Cara: 'Human life is a basic right and outweighs property, even if the law forbids it.' Identify each level.

SOLUTION

Ana: preconventional, avoiding punishment.

Ben: conventional, concerned with social roles and approval.

Cara: postconventional, reasoning from universal principles. Notice the levels depend on reasoning, not on the choice.

EXAMPLE 2: MARCIA STATUS

Jordan has never considered other careers and plans to become a lawyer because his parents are lawyers. Which status is this?

SOLUTION

Jordan has made a commitment without exploration.

That is foreclosure.

If he had explored options and was still undecided, that would be moratorium.

Common mistakes

Kohlberg classifies reasoning, not decisions. Do not treat Kubler-Ross's stages as a fixed order. Fluid intelligence declines but crystallized intelligence does not. Normal aging is not dementia, and midlife crisis is not universal.

Practice

SET A Check Your Understanding

Answer each question in one to three sentences.

1. Why does Kohlberg care about a person's reasoning rather than the decision in a dilemma?
2. State one criticism of Kohlberg made by Gilligan.
3. Explain how the timing of limbic and prefrontal development relates to adolescent risk taking.
4. Distinguish primary and secondary sex characteristics.
5. Name and describe Marcia's identity status for a teen who has tried several clubs and jobs but has not decided on a direction.

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6. How do fluid and crystallized intelligence change in late adulthood?

SET B Exam-Style Multiple Choice

Choose the best answer.

7. A person says the Heinz dilemma should be answered by stealing because 'it is the duty of a husband and people would respect him.' This reasoning is
(A) preconventional (B) postconventional (C) conventional
(D) egocentric (E) formal operational
8. Which finding best supports the claim that adolescent risk taking has a biological basis?
(A) The prefrontal cortex matures later than the limbic system.
(B) Teens have more fluid intelligence than adults.
(C) Teens lack object permanence.
(D) The hippocampus is absent until age 20.
(E) Peers never influence behavior.
9. A 19-year-old accepts the religion and career chosen by her parents without questioning them. According to Marcia, her status is
(A) identity diffusion (B) moratorium (C) identity achievement
(D) generativity (E) foreclosure
10. A 70-year-old can no longer solve unfamiliar puzzles as fast as before, yet her vocabulary is excellent. This pattern illustrates
(A) declining crystallized but stable fluid intelligence
(B) declining fluid but stable crystallized intelligence
(C) dementia
(D) accommodation
(E) the Moro reflex
11. A researcher compares memory scores of 25-, 45-, and 65-year-olds tested this year and concludes memory declines with age. A limitation of this study is
(A) attrition
(B) experimenter expectancy in a double-blind design
(C) the placebo effect
(D) cohort effects
(E) random assignment of ages

SET C Apply and Extend

Respond in complete sentences; answers show scoring points.

12. Explain two ways the adolescent brain and social context together affect decision making. Then name Erikson's central crisis of adolescence and describe a healthy resolution.
13. A study of life satisfaction compares groups of 30-, 50-, and 70-year-olds tested at the same time and finds the oldest group is happiest. (a) Identify the design. (b) Give one alternative explanation. (c) Explain how Kubler-Ross's stages might be misapplied to a dying person.

4.5 Classical Conditioning

You will learn the terms and phases of classical conditioning, the Little Albert and taste aversion studies, and real-world applications.

Learning is a relatively permanent change in behavior or mental processes resulting from experience. The simplest form is **associative learning**: linking events that occur together. **Classical conditioning** is learning that two stimuli are associated, so one comes to predict the other. It was discovered by Russian physiologist Ivan Pavlov while studying digestion in dogs: the dogs began salivating at the sight of the lab assistant or the sound of footsteps before food arrived.

The parts

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Term	Meaning	Pavlov's dogs
Unconditioned stimulus (UCS)	Naturally triggers a response without learning	Food
Unconditioned response (UCR)	Unlearned reaction to the UCS	Salivation to food
Neutral stimulus (NS)	Initially triggers no relevant response	Tone, before training
Conditioned stimulus (CS)	Formerly neutral stimulus that now triggers a response	Tone, after pairing
Conditioned response (CR)	Learned response to the CS	Salivation to the tone

Key idea: Before, during, after

Before: UCS → UCR (food → salivation); NS → no response (tone).

During: NS + UCS → UCR (tone + food → salivation).

After: CS → CR (tone → salivation). The CR is usually weaker than the UCR but similar in form.

Classical conditioning involves involuntary, reflexive responses.

Phases and phenomena

- ◆ **Acquisition:** the initial stage in which the CS is paired with the UCS and the CR strengthens. The CS should come just before the UCS, about half a second, for the best learning. The CS must also predict the UCS reliably (contingency).
- ◆ **Extinction:** the CR weakens when the CS is repeatedly presented without the UCS.
- ◆ **Spontaneous recovery:** after a rest, an extinguished CR briefly reappears when the CS is presented again, showing extinction suppresses rather than erases learning.
- ◆ **Generalization:** responding to stimuli similar to the CS, like a bell with a slightly different pitch.
- ◆ **Discrimination:** learning to respond to the CS but not to similar stimuli, which happens when only one stimulus is paired with the UCS.
- ◆ **Higher-order conditioning:** a CS is paired with a new neutral stimulus, so that the new stimulus also produces the CR (a light paired with the tone alone).

Watson, Little Albert, and fear

John B. Watson and Rosalie Rayner (1920) conditioned an infant, Little Albert, to fear a white rat. A loud clanging noise (UCS) that produced fear (UCR) was paired with the rat (NS, then CS), and Albert later feared the rat (CR) and generalized his fear to similar furry objects. The study shows that emotional responses, including phobias, can be learned; it is also an example of an unethical experiment by modern standards, as Albert's fear was never removed. Counterconditioning is used in therapy such as systematic desensitization: a feared stimulus is paired with relaxation.

Biology and applications

Classical conditioning is limited by biology. John Garcia and Robert Koelling showed that rats associate nausea with taste, not with lights or sounds. This **taste aversion** can form after a single pairing and with a delay of hours between the taste (CS) and illness (UCS). This is adaptive because it protects animals from poisons and challenges the idea that any stimuli can be associated equally. Real-life applications include phobias and advertising (pairing a product with pleasant images), drug cravings triggered by cues, allergic reactions to stimuli associated with allergens, and conditioned immune suppression. Rescorla emphasized that conditioning depends on how well the CS predicts the UCS, not merely on pairing, which makes it cognitive.

Key idea: Timing and predictability

Best acquisition: CS comes slightly before the UCS (delayed or forward pairing). Presenting the CS after the UCS (backward pairing) works poorly.

A CS that reliably predicts the UCS becomes stronger; if the UCS also occurs without the CS, learning weakens.

Classical conditioning shapes everyday emotions. A person who once suffered a car accident at a particular intersection may feel tension each time he approaches it; the intersection became a conditioned stimulus. Pleasant associations work the same way: the smell of a grandparent's kitchen can bring warm feelings. Because emotional reactions are learned associations, they can also be unlearned through extinction or replaced by counterconditioning. Therapists use this for phobias by gradually exposing patients to the feared object while keeping them relaxed.

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EXAMPLE 1: IDENTIFY THE ELEMENTS

A child is bitten by a dog and feels fear. Weeks later, the child feels fear when she hears a dog's bark. Identify UCS, UCR, CS, CR. Then name what happens if she also fears a similar-looking wolf.

SOLUTION

UCS: the dog bite. UCR: the fear and pain response.

CS: the bark (it initially was neutral). CR: fear at the sound.

Fear of a similar animal is stimulus generalization.

EXAMPLE 2: EXTINCTION AND SPONTANEOUS RECOVERY

A dog salivates to a tone. The tone is sounded 20 times with no food; salivation disappears. After a week, the tone sounds again and the dog salivates a little. Explain.

SOLUTION

The 20 unreinforced tones are extinction: the CS no longer predicts the UCS.

The weak return after rest is spontaneous recovery.

This shows the original learning was not erased; if the tone again appears without food, the CR will disappear quickly.

Exam tip

To label a scenario, ask first: what naturally triggers a reaction (UCS and UCR)? The CS is the stimulus that was neutral and now predicts it. The CR resembles the UCR but is triggered by the CS. Remember that the UCR and CR are the same behavior, so label by what triggers it.

Practice**SET A Check Your Understanding**

Answer each question in one to three sentences.

1. Explain why Pavlov's discovery was a surprise.
2. Identify the UCS, UCR, CS, and CR: a person who got food poisoning from shrimp now feels nauseated at the smell of shrimp.
3. What is the difference between extinction and spontaneous recovery?
4. Distinguish generalization from discrimination.
5. What did Watson and Rayner's Little Albert study demonstrate and why is it criticized?
6. Why is conditioned taste aversion considered evidence for biological preparedness?

SET B Exam-Style Multiple Choice

Choose the best answer.

7. A dentist's drill initially produces pain and fear. After many visits, the sound of the drill in the waiting room produces anxiety. The sound of the drill is the
(A) unconditioned stimulus (B) conditioned stimulus (C) unconditioned response
(D) conditioned response (E) neutral stimulus
8. A dog trained to salivate to a 1000-Hz tone also salivates to a 1100-Hz tone. This is
(A) stimulus generalization (B) discrimination (C) extinction
(D) spontaneous recovery (E) acquisition
9. After a CR is extinguished, the CS is presented a day later and the CR reappears briefly. This is
(A) acquisition (B) higher-order conditioning
(C) stimulus discrimination (D) spontaneous recovery
(E) generalization

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10. Garcia and Koelling's rats avoided flavored water paired with radiation-induced illness hours earlier but did not avoid sounds paired with the illness. This finding best supports
- (A) that learning requires awareness of the pairing
 - (B) that extinction erases learning
 - (C) biological predispositions in conditioning
 - (D) that conditioning depends only on timing
 - (E) that every stimulus can be paired equally well
11. A commercial shows a soft drink with attractive people having fun so that viewers feel good about the drink. The advertisers rely on
- (A) operant punishment
 - (B) latent learning
 - (C) shaping
 - (D) negative reinforcement
 - (E) classical conditioning

SET C Apply and Extend

Respond in complete sentences; answers show scoring points.

12. A child has an allergic sneeze when she sees a photo of a cat after previously reacting to a real cat. (a) Identify the UCS and CS. (b) Describe how extinction could be used to reduce the response. (c) Explain why the response might return after treatment.
13. Design a short experiment to condition a student to blink to a buzzer, identifying the stimuli and a control for the claim that the buzzer alone causes blinking.

4.6 Operant Conditioning

You will learn how consequences shape behavior through reinforcement and punishment, the four schedules of reinforcement, shaping, and biological limits on conditioning.

Operant conditioning is learning in which behavior is strengthened or weakened by its consequences. Unlike classical conditioning, which involves involuntary responses, operant behavior is voluntary and acts on the environment. Edward Thorndike's **law of effect** states that behaviors followed by satisfying consequences become more likely, and those followed by unpleasant consequences less likely; he showed this by timing cats escaping puzzle boxes. B. F. Skinner built on this with the operant chamber (Skinner box), where rats press a lever for food, and he studied behavior with precise records of response rates.

Reinforcement and punishment

Reinforcement increases a behavior; **punishment** decreases it. 'Positive' means a stimulus is added, and 'negative' means a stimulus is removed. These words describe addition and subtraction, not good and bad.

	Add a stimulus	Remove a stimulus
Behavior increases (reinforcement)	Positive reinforcement: praise after homework	Negative reinforcement: taking painkiller removes headache; seatbelt buzzer stops when buckled
Behavior decreases (punishment)	Positive punishment: scolding, extra chores	Negative punishment: loss of phone privileges

Key idea: The four consequences

Ask two questions: Did the behavior become more or less frequent? Was something added or taken away?

Negative reinforcement is not punishment; it strengthens the behavior that ends or avoids something unpleasant (escape and avoidance learning).

Primary reinforcers satisfy biological needs (food); conditioned (secondary) reinforcers gain value through association (money, tokens).

Punishment has drawbacks: it can produce fear and aggression, suppresses rather than teaches, and works best when immediate, consistent, and paired with reinforcement of an alternative behavior. Physical punishment in particular is linked with later aggression. Reinforcement is generally more effective.

Schedules of reinforcement

Reinforcement does not need to follow every response. **Continuous reinforcement** speeds learning, but **partial (intermittent) reinforcement** produces behavior that resists extinction. Ratio schedules depend on number of responses; interval schedules depend on time.

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Schedule	Rule	Pattern	Example
Fixed ratio (FR)	After a set number of responses	High rate, brief pause after reward	Paid per 10 items assembled
Variable ratio (VR)	After an unpredictable number	Highest, steady rate; most resistant to extinction	Slot machine, fishing
Fixed interval (FI)	First response after a set time	Scalloped pattern: rises near the deadline	Weekly paycheck, studying for scheduled exams
Variable interval (VI)	First response after unpredictable time	Slow, steady	Checking for text messages; pop quizzes

Shaping, cues, and extinction

Shaping reinforces successive approximations of a target behavior, as when a trainer rewards a dog for moving toward a hoop, then for touching it, then for jumping through. Linking several behaviors in a sequence is **chaining**. A **discriminative stimulus** signals that a response will be reinforced: a lit 'open' sign tells a customer that the store accepts business. Operant **extinction** occurs when reinforcement stops, and the behavior declines, often after a brief burst of increased responding. A previously extinguished operant behavior can also show spontaneous recovery. Skinner noted **superstitious behavior**: pigeons given food at random intervals repeated whatever they happened to be doing, mistaking coincidence for cause, much like an athlete's lucky ritual.

Key idea: Schedule shortcuts

Ratio = responses counted; interval = time passes. Fixed = predictable; variable = unpredictable.

Partial reinforcement is slower to learn but far more resistant to extinction than continuous reinforcement. Variable schedules give steadier responding than fixed ones.

Applications and biological constraints

In everyday life, operant principles explain why people repeat habits: a coffee that relieves sleepiness is negatively reinforced, a compliment is positively reinforced, and a speeding ticket is a positive punishment that may reduce speeding only while police are present. The timing of consequences matters: immediate consequences change behavior far more than delayed ones, which is why a treat given hours after good behavior has weak effects. Consistency also matters, because inconsistent enforcement creates a partial reinforcement schedule that makes unwanted behavior hard to eliminate.

Applications include animal training, classroom behavior management, biofeedback, and programmed instruction. Some behaviors are hard to condition because of biology. Keller and Marian Breland found that animals revert to **instinctive drift**, behaviors from their natural repertoire, such as raccoons rubbing coins together instead of depositing them. Also, rats learn to press a lever for food more easily than to press it to avoid shock. Cognitive influences also matter: rats in mazes build **cognitive maps** (discussed in the next lesson). Overjustification can happen, as rewarding an enjoyable activity may reduce intrinsic motivation.

EXAMPLE 1: CLASSIFY THE CONSEQUENCE

A child whines in a store. The parent buys candy, and the child stops whining. Next time the child whines more. Identify what is reinforced for each person.

SOLUTION

For the child: whining is followed by candy (positive reinforcement), so whining increases.

For the parent: buying candy removes the unpleasant whining (negative reinforcement), so buying candy increases.

The cycle shows how both sides' behavior can be strengthened.

EXAMPLE 2: SCHEDULE

A salesperson receives a bonus after every fifth sale. Another receives a bonus after a randomly varying number of sales averaging five. Identify schedules and predict which behavior resists extinction more.

SOLUTION

The first is fixed ratio and the second is variable ratio.

Variable ratio gives steadier, faster responding since any response may pay off.

So the second salesperson's behavior is more resistant to extinction.

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Common mistakes

Negative reinforcement is not punishment and does not mean bad. A reinforcer is defined by its effect on behavior, not by whether it seems pleasant. Do not confuse the fixed-interval scalloped pattern with variable ratio's steady high rate. Shaping reinforces approximations; chaining links steps.

Practice**SET A Check Your Understanding**

Answer each question in one to three sentences.

1. State the law of effect and the evidence Thorndike used.
2. Give one original example each of positive reinforcement and negative reinforcement.
3. Why are positive punishment and negative punishment both considered punishment?
4. Which schedule produces the highest steady response rate and the greatest resistance to extinction? Explain.
5. Describe shaping with an example.
6. What is a discriminative stimulus? Give an example.

SET B Exam-Style Multiple Choice

Choose the best answer.

7. A student's teacher stops giving extra credit when the student talks in class. Talking decreases. This is
(A) positive punishment (B) negative reinforcement (C) negative punishment
(D) positive reinforcement (E) extinction
8. A rat presses a lever to turn off a mild shock. The lever pressing increases. The shock offset is
(A) negative reinforcement (B) positive reinforcement (C) positive punishment
(D) negative punishment (E) classical conditioning
9. People check social media repeatedly because new posts appear at unpredictable times. This is most like which schedule?
(A) fixed interval (B) fixed ratio (C) variable ratio
(D) variable interval (E) continuous reinforcement
10. Which pattern would a cumulative record show for a fixed-interval schedule?
(A) A steady, rapid line with few pauses
(B) A scalloped pattern of pauses followed by accelerating responses
(C) A flat line
(D) An extremely steep line with no pauses
(E) A smooth, slow decline
11. A pigeon is given food every 30 seconds regardless of what it does and begins to perform a head-bobbing ritual. This illustrates
(A) shaping (B) insight learning (C) discrimination
(D) instinctive drift (E) superstitious behavior

SET C Apply and Extend

Respond in complete sentences; answers show scoring points.

12. A teacher wants students to finish a long project. (a) Describe how shaping could be used. (b) Identify which schedule would produce a steady effort, and justify it. (c) Explain one risk of relying on rewards.
13. A mother takes away her son's tablet for an hour when he hits his sister, and hitting decreases. Identify the type of consequence and give two reasons why research favors pairing it with reinforcement of alternative behavior.

4.7 Observational and Cognitive Learning

You will learn how observation, mental maps, insight, and expectations of control shape learning beyond simple conditioning.

Behaviorists explained learning with stimuli, responses, and consequences. **Cognitive learning** adds mental processes such as attention, expectation, and understanding. This lesson covers learning by watching, learning without immediate reward, sudden insight, and learned helplessness.

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Observational learning

Observational learning is learning by watching others. The person who is watched is a **model**, and copying a model is **modeling** or imitation. Albert Bandura demonstrated this in the Bobo doll experiments (1961, 1963). Preschool children watched an adult punch, kick, and shout at an inflatable doll, or watched a non-aggressive adult. Later, children who saw the aggressive model were far more likely to imitate the same physical and verbal aggression, even though they were never directly rewarded. Children also learned from filmed models and were less likely to imitate when the model was punished, though they could still show the knowledge when offered an incentive. This distinction between **learning** and **performance** is key.

Key idea: Bandura's four steps

Attention (notice the model), retention (remember it), reproduction (be able to do it), motivation (expect a reward or see the model rewarded: **vicarious reinforcement**).

Models are imitated more when they are similar, admired, powerful, or rewarded.

Observational learning explains how children acquire aggression, gender roles, prosocial habits (a child who sees parents donate to charity), and cultural skills. Research on media violence suggests that watching violence modestly raises aggression and desensitizes viewers, though correlation does not prove causation. **Mirror neurons**, cells that fire both when an animal performs an action and when it watches another perform it, may be a neural basis for imitation and empathy, though their exact role in humans is debated. Prosocial models can teach positive behavior as well: children's programs that show cooperation improve cooperation.

Latent learning and cognitive maps

Edward Tolman had three groups of rats run a maze. One group always got food at the end and improved steadily. A second never got food and continued to wander. A third explored without food for ten days and then received food on day 11. That group quickly matched the always-rewarded group, showing **latent learning**: learning that is not shown until there is an incentive. The rats had formed a **cognitive map**, a mental representation of the maze layout. Learning is therefore not the same as performance, and reinforcement affects performance more than learning.

Key idea: Learning vs. performance

Learning is the internal change; performance is the visible behavior.

Latent learning and the Bobo doll incentive test both show that people can know more than they show.

Insight learning

Wolfgang Kohler observed chimpanzees solving problems that were out of reach. His chimp Sultan stacked boxes and joined sticks to reach hanging bananas, often after a pause, and then seemed to suddenly get the solution. This **insight learning**, an abrupt realization of how to solve a problem, indicates mental restructuring rather than trial and error. People call it the 'aha' moment.

Brain research supports these ideas: the hippocampus helps build cognitive maps, and the prefrontal cortex supports planning and insight. Dopamine neurons respond to unexpected rewards, so reward learning depends on prediction as well as pairing.

Learned helplessness

Martin Seligman and Steven Maier exposed dogs to shocks. Dogs that could not escape later failed to escape shocks even when escape was easy, passively accepting them. This **learned helplessness** appears in humans who believe nothing they do matters, and it is linked to depression. A sense of control and explanatory style (attributing failures to internal, stable, global causes) influence vulnerability. Therapy can restore a sense of control.

Type of learning	Key idea	Classic study	Role of mind
Classical	Associating stimuli	Pavlov	Predicting events
Operant	Consequences change behavior	Skinner	Expectations of outcome
Observational	Learning by watching models	Bandura	Attention and memory
Latent	Learning without reinforcement	Tolman	Cognitive maps
Insight	Sudden understanding	Kohler	Restructuring the problem

In education, modeling and worked examples let students see skills before trying them, and teachers can build mental maps by previewing. In therapy, **modeling** helps people overcome fears by watching others handle the feared object, and social skills training uses role-play.

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EXAMPLE 1: BOBO DOLL DESIGN

In a study, one group of children saw an adult hit a doll; another saw no aggression. Later each child was left alone with the doll. Identify the IV, DV, and conclusion. Name a threat to generalizing.

SOLUTION

IV: whether the child observed aggressive modeling. DV: the amount of imitative aggression.

If the model group aggressed more, observation can cause learning of aggression without direct reinforcement.

Limitation: children may think hitting a Bobo doll is allowed, so the lab setting may not generalize to real aggression.

EXAMPLE 2: TOLMAN

Rats given no food reward in a maze for 10 days quickly find the goal once food is introduced on day 11. Which concept does this show? Why is it a problem for strict behaviorism?

SOLUTION

It shows latent learning, forming a cognitive map without reinforcement.

Behaviorism claimed learning requires reinforcement and is visible in behavior.

The rats learned, but performance appeared only with a reward, so learning can be hidden.

Common mistakes

Learning and performance are not the same thing: reinforcement may change what is shown, not what is learned. Do not call latent learning insight learning: latent learning is gradual and hidden until rewarded; insight is sudden. Observational learning can occur without any direct reinforcement of the observer.

Practice**SET A Check Your Understanding**

Answer each question in one to three sentences.

1. Describe what happened in Bandura's Bobo doll experiment and what it showed.
2. What is vicarious reinforcement?
3. List Bandura's four conditions for observational learning.
4. What are mirror neurons and why are they relevant to learning?
5. Explain how Tolman's rats challenged the idea that reinforcement is required for learning.
6. What is learned helplessness and how was it demonstrated?

SET B Exam-Style Multiple Choice

Choose the best answer.

7. A child sees her older brother praised for cleaning his room and then cleans her own room. This best illustrates
(A) negative reinforcement (B) spontaneous recovery (C) insight learning
(D) latent learning (E) vicarious reinforcement
8. A chimp stacks boxes to reach a banana after sitting quietly for a minute and then suddenly acting. This most likely demonstrates
(A) insight learning (B) shaping (C) observational learning
(D) classical conditioning (E) latent learning
9. Rats that wander a maze with no reward for ten days quickly run it efficiently once food appears. Their earlier learning is called
(A) extinction (B) learned helplessness (C) insight learning
(D) latent learning (E) modeling
10. Which statement about the Bobo doll studies is most accurate?
(A) Children imitated only if rewarded themselves.
(B) Children imitated aggression they had watched without being directly rewarded.
(C) Only boys imitated the models.
(D) Children failed to imitate filmed models.
(E) Children avoided any aggression after watching it.

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11. A student who failed several exams, believing nothing she does matters, stops studying even when a tutor is available. This is most consistent with
- (A) latent learning (B) observational learning (C) learned helplessness
(D) shaping (E) stimulus generalization

SET C Apply and Extend

Respond in complete sentences; answers show scoring points.

12. A researcher wants to test whether watching a prosocial TV show increases sharing among 6-year-olds. (a) State a hypothesis. (b) Describe a design with random assignment. (c) Explain how Bandura's concepts predict the outcome.
13. Compare latent learning and insight learning, and explain how each challenges strict behaviorism.

4.8 Applying Learning Principles

You will learn to compare classical, operant, and observational learning, use behavior modification techniques, and design a plan to change behavior.

The three major forms of learning are useful tools. **Behavior modification** applies learning principles, especially operant and classical conditioning, to change specific behaviors. This lesson shows how to choose a principle and design a plan, and how to analyze a scenario on the AP exam.

Comparing the three learning types

Feature	Classical	Operant	Observational
What is learned	Association between two stimuli	Association between behavior and consequence	Behavior by watching a model
Behavior type	Involuntary, reflexive	Voluntary	Voluntary, often complex
Timing of key event	Before the response (stimulus predicts)	After the response (consequence)	Watching, then later performing
Key figures	Pavlov, Watson	Thorndike, Skinner	Bandura
Extinction means	CS without UCS	Reinforcement stops	Model no longer rewarded or seen
Typical example	Fear of the dentist's drill	Studying for grades	Copying a sibling's slang

Key idea: How to identify the type

Ask: Is the behavior reflexive and triggered by a cue (classical)? Is it a voluntary behavior followed by a consequence (operant)? Did someone copy another person (observational)?

Real situations often mix all three: a child fears a dog (classical), learns to avoid it (negative reinforcement), and sees a parent do the same (observational).

Behavior modification techniques

- ◆ **Token economy:** desirable behaviors earn tokens (conditioned reinforcers) that can be exchanged for backup reinforcers. It is used in classrooms, hospitals, and prisons; tokens can be given immediately and are less subject to satiation.
- ◆ **Shaping:** reinforce small steps toward a goal, such as reading five minutes, then ten.
- ◆ **Premack principle:** a more preferred activity can reinforce a less preferred one (video games after homework).
- ◆ **Extinction:** ignore attention-seeking behavior. Expect an extinction burst, a temporary increase, so be consistent.
- ◆ **Counterconditioning and systematic desensitization:** pair a feared stimulus with relaxation, moving up a fear hierarchy.
- ◆ **Aversion therapy:** pair an unwanted behavior with unpleasant stimulus (limited effectiveness).
- ◆ **Biofeedback:** operant control of physiological responses, such as using a display of heart rate to practice relaxation.
- ◆ **Self-monitoring and contracts:** track behavior, set goals, arrange rewards for oneself.

Designing a conditioning plan

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- 1 **Define the target behavior** State it in observable, measurable terms: 'completes 3 math problems' not 'tries harder.'
- 2 **Take a baseline** Record how often the behavior occurs before changing anything.
- 3 **Choose the principle and consequence** Use reinforcement for behaviors to increase; for those to decrease, use extinction or negative punishment while reinforcing an alternative.
- 4 **Select a schedule** Begin with continuous reinforcement, then move to a variable schedule so the behavior lasts.
- 5 **Deliver consequences immediately and consistently** Delays weaken the link between behavior and consequence.
- 6 **Evaluate and fade** Compare to baseline, adjust, and gradually replace tangible rewards with natural ones such as praise.

Key idea: Principles for effective consequences

Immediacy: the sooner the consequence, the stronger the link.

Consistency: unpredictable enforcement creates partial reinforcement of the very behavior you want to remove.

Contingency: the consequence must depend on the target behavior, not be given freely.

Always reinforce an alternative behavior when reducing an unwanted one.

Habit change and classroom use

Habits are behaviors cued by contexts and kept by rewards. To change one, change the cue (remove cookies from view), the response (replace snacking with a walk), or the reward. Teachers can use positive reinforcement and clear signals (discriminative stimuli), use modeling to teach skills, and avoid excessive punishment. Over-reliance on external rewards can undermine intrinsic motivation, so rewards for hard-won achievement and praise for effort work better than rewards for tasks students already enjoy.

Applications reach beyond schools. Employers use ratio schedules such as commissions, and fitness apps use streaks and badges as conditioned reinforcers. Parents use time-outs, which are a form of negative punishment (removing access to reinforcing attention), and are most effective when brief and calm. Public health campaigns use modeling of healthy choices, and therapists combine techniques. Ethical practice requires consent, avoiding harm, and favoring reinforcement over punishment. Remember that conditioning plans work best when they respect individual differences, including temperament, culture, and biology: not every animal or person can be trained to do everything, and cognitive factors such as beliefs about control still matter.

EXAMPLE 1: MIXED SCENARIO

Tyler's classmates laugh when he makes jokes in class, and he jokes more. After a teacher moves his desk to the front, joking drops. Later, Tyler's younger brother starts telling the same jokes at home. Identify the learning principles.

SOLUTION

Laughter is positive reinforcement, which increases joking (operant).

Moving the desk removes the audience, so reinforcement stops: extinction (or, depending on interpretation, negative punishment).

The brother's imitation is observational learning.

EXAMPLE 2: PLAN FOR A CHILD WHO WILL NOT DO HOMEWORK

Design a short plan using at least two principles.

SOLUTION

Target behavior: finishing 20 minutes of homework at the kitchen table. Take a baseline for a week.

Use a token economy: one token per 10 minutes; tokens exchange for screen time (Premack principle).

Begin with a token every session, then move to variable ratio, and fade tokens as praise and grades become reinforcing. Evaluate against baseline.

Exam tip

In scenario questions, name the principle, identify the elements in the scenario, and then explain how the principle produces the outcome. Use precise terms (positive reinforcement, variable ratio) and link them to the example.

Naming without applying earns no credit.

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Practice

SET A Check Your Understanding

Answer each question in one to three sentences.

1. Classify as classical, operant, or observational: a toddler cries when she sees a doctor's white coat after painful shots.
2. Classify: A teen practices guitar daily because his playing earns praise at home.
3. Classify: A girl begins using her teacher's hand gestures when she explains ideas.
4. What is a token economy and why does it work?
5. Explain the Premack principle with an example.
6. Why should a plan define the behavior in measurable terms and take a baseline?

SET B Exam-Style Multiple Choice

Choose the best answer.

7. A teacher gives stickers for every completed worksheet, and later gives them only occasionally and unpredictably. Why might she make this change?
(A) Continuous reinforcement works only for reflexes.
(B) It switches the learning to classical conditioning.
(C) Partial reinforcement produces greater resistance to extinction.
(D) Stickers become unconditioned stimuli.
(E) Variable schedules prevent learning.
8. Which scenario is classical conditioning?
(A) A rat presses a lever for food.
(B) A person gets nauseated at the smell of a food that once made him sick.
(C) A boy copies a character's dance.
(D) A dog learns to sit for a treat.
(E) A student studies to earn an A.
9. A parent ignores a child's tantrums, and the tantrums briefly get worse before decreasing. The temporary worsening is called
(A) an extinction burst (B) spontaneous recovery (C) shaping
(D) vicarious reinforcement (E) insight
10. A smoker who smokes after each meal is encouraged to replace the post-meal cigarette with a short walk. This changes the habit by
(A) removing the cue (B) eliminating the reinforcement
(C) using positive punishment (D) altering the response while keeping the cue
(E) using higher-order conditioning
11. A therapist teaches a person with a spider phobia to relax while viewing progressively more frightening spider images. This technique uses
(A) shaping through reinforcement (B) observational learning
(C) token economy (D) positive punishment
(E) counterconditioning

SET C Apply and Extend

Respond in complete sentences; answers show scoring points.

12. A school wants to increase students' reading outside class. (a) Describe a token economy plan. (b) Explain how to prevent the program from reducing intrinsic interest. (c) Identify one possible role of observational learning.
13. A child fears dogs after being knocked down by one and now avoids parks. (a) Explain the origin of the fear with classical terms. (b) Explain why avoidance maintains the fear. (c) Suggest a treatment.

4.9 Multiple-Choice Practice: Development and Learning

Practice AP-style questions on development, classical and operant conditioning, and cognitive learning.

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Choose the best answer for each question. Sets move from core concepts to applications and data to exam-level stretch items. Read the explanation for every answer, including the ones you got right.

SET A Core Concepts

Choose the best answer.

1. A study compares the vocabulary of 3-, 6-, and 9-year-olds all tested in the same month. Which is a limitation of this design?
(A) Participants will drop out before the study ends.
(B) It takes decades to complete.
(C) Differences might reflect cohort effects rather than age.
(D) It cannot compare different ages.
(E) It requires a placebo group.
2. A pregnant woman drinks heavily throughout pregnancy. Her child is most likely at risk for
(A) fetal alcohol syndrome
(B) Down syndrome
(C) autism caused by vaccines
(D) phenylketonuria
(E) schizophrenia caused by alcohol
3. In Harlow's experiments, infant monkeys spent most of the time with a cloth surrogate even though a wire surrogate provided milk. This suggests that attachment depends on
(A) feeding
(B) imprinting
(C) maturation
(D) modeling
(E) contact comfort
4. A parent sets firm rules, explains them, listens to the child's opinions, and shows affection. Baumrind would call this
(A) authoritarian
(B) authoritative
(C) permissive
(D) neglectful
(E) disorganized
5. A 5-year-old says a taller glass holds more even after watching the same water poured. According to Piaget, the child lacks
(A) object permanence
(B) abstract thinking
(C) theory of mind
(D) conservation
(E) the ability to assimilate
6. A teacher helps a student with a hard essay by outlining it together, then gradually withdraws support. This reflects Vygotsky's concept of
(A) scaffolding
(B) accommodation
(C) egocentrism
(D) conservation
(E) latent learning
7. Which person is reasoning at Kohlberg's conventional level?
(A) A child who says he will obey only to avoid being grounded.
(B) An adult who says a law may be broken to protect human life.
(C) A student who says rules must be followed so that the school can run fairly.
(D) A teen who says whatever is useful is right.
(E) A toddler who has not formed moral ideas.

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SET B Applications and Data

Choose the best answer.

8. A student sees a dog's bark and flinches because she was previously bitten. Which statement is correct?
- (A) The bark is an unconditioned stimulus and the flinch is a conditioned response.
 - (B) The bark is a conditioned stimulus and the flinch is a conditioned response.
 - (C) The bark is a conditioned response and the bite is a conditioned stimulus.
 - (D) The bite is a conditioned stimulus and the flinch is an unconditioned response.
 - (E) The bark is a neutral stimulus after conditioning.
9. A rat is placed in a box and receives food on average after every 12 lever presses, with the exact number varying. This is
- (A) fixed ratio
 - (B) fixed interval
 - (C) variable interval
 - (D) variable ratio
 - (E) continuous reinforcement
10. A mother always lets her daughter stay up late after she throws a fit. Later, the daughter throws fits more often. For the mother, giving in is maintained by
- (A) positive reinforcement
 - (B) positive punishment
 - (C) negative punishment
 - (D) extinction
 - (E) negative reinforcement
11. Children who watched adults rewarded for aggression showed more aggression than children who saw punished adults. The difference illustrates
- (A) vicarious reinforcement
 - (B) spontaneous recovery
 - (C) latent learning
 - (D) stimulus discrimination
 - (E) shaping
12. A chimpanzee, after failing to reach a banana, stops, then joins two sticks and gets it. This is best explained by
- (A) operant conditioning with shaping
 - (B) classical conditioning
 - (C) insight
 - (D) trial-and-error learning only
 - (E) imprinting
13. Which research finding would most challenge a strict stage theory of cognitive development?
- (A) All children pass through the stages in the same order.
 - (B) Teenagers show more abstract reasoning than six-year-olds.
 - (C) Children fail the false-belief task at 3.
 - (D) Infants display some understanding of hidden objects earlier than Piaget predicted.
 - (E) Egocentrism declines with age.
14. A 17-year-old has examined several career paths but has not chosen one. Marcia would classify this status as
- (A) foreclosure
 - (B) moratorium
 - (C) identity achievement
 - (D) identity diffusion
 - (E) generativity

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SET C Exam-Level Stretch

Choose the best answer.

15. A study followed 500 children from age 3 to 30, measuring parenting style at age 3 and adult success. A major concern about the conclusion that authoritative parenting causes success is
- (A) Attrition cannot occur in longitudinal studies.
 - (B) The study did not use different ages.
 - (C) Authoritative parenting is not defined.
 - (D) The sample is too young.
 - (E) Child temperament and genes may influence both parenting and outcomes.
16. In a Strange Situation, a baby is distressed when the mother leaves, but upon return clings to her yet pushes her away and cries for a long time. The caregiving history most associated with this behavior is
- (A) inconsistent responsiveness
 - (B) consistent sensitivity
 - (C) rejection and emotional distance
 - (D) a permissive parenting style by definition
 - (E) a difficult temperament only
17. A researcher trains a rat to press a lever only when a light is on. When the light is off, pressing is never reinforced, and the rat stops pressing. The light functions as
- (A) an unconditioned stimulus
 - (B) a negative reinforcer
 - (C) a discriminative stimulus
 - (D) a punisher
 - (E) a conditioned response
18. A man gets sick after eating clams at lunch and avoids clams for years, although he did not feel sick until six hours later. Which principle is illustrated?
- (A) Conditioning requires the UCS immediately after the CS.
 - (B) Operant extinction is faster with delay.
 - (C) Observational learning of illness.
 - (D) Biological predisposition allows learning with a long delay.
 - (E) Higher-order conditioning.
19. A graph of cumulative responses shows a sharp scalloped pattern, with pauses after each reward and acceleration before the next. Which schedule is most likely?
- (A) Variable ratio
 - (B) Fixed interval
 - (C) Fixed ratio
 - (D) Variable interval
 - (E) Continuous
20. A researcher finds that cross-sectional data show older adults score lower on a vocabulary test than younger adults, but a longitudinal study shows vocabulary rising with age. The best explanation is
- (A) attrition in the cross-sectional study
 - (B) dementia in all older adults
 - (C) crystallized intelligence declining with age
 - (D) observer bias in longitudinal data
 - (E) cohort effects in the cross-sectional study

4.10 Free-Response Practice: Development and Learning

Practice responding to research-based free-response questions on development and learning.

Each question is worth 4 points, one per part. Answer every part, use precise terms from the course, and apply them to the information given; naming a term without linking it to the stimulus earns no credit. Compare your response with the scoring points listed.

QUESTION 1 Article Analysis: Attachment and Parenting

Researchers studied 120 mothers and their 12-month-old infants. Using the Strange Situation, they classified each infant's attachment. They also observed mothers at home for two hours and rated how quickly and consistently each mother responded to her baby's crying. Infants of highly responsive mothers were more likely to be classified as securely attached ($r = +0.52$). The researchers concluded that responsive parenting causes secure attachment.

1. (a) Identify the research method used in the study.
2. (b) Identify the operational definition of the dependent (outcome) variable.
3. (c) Explain one reason the conclusion that responsiveness causes secure attachment is not justified.
4. (d) Explain how Baumrind's authoritative style would be expected to relate to the attachment findings.

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QUESTION 2 Evidence-Based: Operant Conditioning

Source A: A teacher gives each student a sticker the first 5 times they complete homework, then gives stickers after a varying number of completed assignments (average 4). Homework completion rose from 60% to 90%. Source B: When stickers were stopped for one class, homework completion dropped to 50% after three weeks, while a class that had stickers every time dropped to 30% within one week. Source C: In a different study, children who loved drawing were rewarded for it; afterward they drew less during free time than children who were not rewarded.

5. (a) Identify the type of reinforcement schedule used in Source A and the type of reinforcer.
6. (b) Use Source B to explain why the variable schedule class declined more slowly.
7. (c) Use Source C to describe a risk of using rewards and name the concept.
8. (d) Recommend one change to the plan that addresses the risk, with a justification.

QUESTION 3 Evidence-Based: Cognitive Development

Source A: In a conservation task, 4-year-olds said a tall glass held more juice than a wide glass, while 8-year-olds said the amounts were equal and explained, 'You could pour it back.' Source B: In a puzzle study, 5-year-olds who worked alone completed 20% of puzzles; those who worked with an adult who gave hints completed 70%. Source C: In a looking-time experiment, 5-month-olds looked longer when a hidden toy 'disappeared' impossibly than when it reappeared normally.

9. (a) Use Source A to identify the Piagetian stages of the two age groups.
10. (b) Explain how Source B supports Vygotsky's ideas, naming two terms.
11. (c) Explain how Source C challenges Piaget's claims about object permanence.
12. (d) Explain one difference between the Piaget and Vygotsky views of how development occurs.

QUESTION 4 Article Analysis: Observational Learning

A researcher randomly assigned 80 first-graders to watch one of two 10-minute videos. In one, an adult model shared toys with a peer and was praised. In the other, an adult played with the toys alone. Afterward, each child was given 10 stickers and a chance to share them with an absent classmate. Children who saw the sharing model gave away an average of 4.1 stickers; the other group gave away 1.9. The difference was statistically significant ($p < .01$).

13. (a) State the independent and dependent variables.
14. (b) Explain what the p value means and what conclusion it supports.
15. (c) Apply Bandura's concept of vicarious reinforcement to the result.
16. (d) Identify one limitation and one improvement to the design.

Answers Chapter 4: Answers and Explanations

Answers for every practice problem, numbered to match. Read the explanation even when your answer is correct.

4.1 Developmental Psychology: Research and Prenatal Development**SET A · CHECK YOUR UNDERSTANDING**

1. Nature is biological inheritance and maturation; nurture is environment, learning, and culture. Interaction means they work together: genes set a range of potential, and experiences determine how it is expressed, so neither alone explains development.
2. It tracks the same people over time, so differences cannot come from different generations. A cross-sectional study compares different people and may confuse age with cohort effects.
3. Germinal: zygote divides and implants in the uterus. Embryonic: major organs and structures form. Fetal: growth continues and the brain and organs mature until birth.
4. A teratogen is an environmental agent that can cross the placenta and harm an embryo or fetus. Alcohol is an example; heavy exposure can cause fetal alcohol syndrome, including facial abnormalities and intellectual problems.
5. Rooting turns the head toward a touch on the cheek to find the nipple; Moro throws out the arms in response to a startle or loss of support. Reflexes are inborn, automatic responses that help survival before learning is possible.
6. An easy baby is cheerful, regular in routines, and adapts quickly. A slow-to-warm-up baby reacts cautiously and with mild withdrawal to new situations but adapts gradually with repeated exposure.

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SET B · EXAM-STYLE MULTIPLE CHOICE

7. A. Different age groups are also different cohorts, so group differences may reflect generational experiences. Attrition affects longitudinal studies, not cross-sectional ones.
8. C. Organogenesis happens in the embryonic stage (weeks 2-8). The germinal stage is mainly division and implantation, and the fetal stage is mostly growth and maturation.
9. D. Rooting helps newborns locate food. The Moro reflex is a startle response, and habituation is a decreased response to repeated stimuli, not a reflex.
10. B. A fixed biological sequence largely independent of practice defines maturation. Scaffolding is Vygotsky's term for social support in learning.
11. E. Irritability, irregularity, and resistance to change describe a difficult temperament. Attachment categories describe relationships, not temperament.

SET C · APPLY AND EXTEND

12. (a) 1 point: Measure TV viewing in childhood, then retest aggression of the same participants at intervals into adulthood. (b) 1 point: Attrition, high cost, or long duration; also correlation does not prove cause. (c) 1 point: Genetic temperament (nature) may predispose some children to aggression while models and environment (nurture) shape whether it is expressed; the two interact.
13. 1 point: Exposure during the embryonic stage risks structural malformations because organs form then. 1 point: Heavy alcohol use across pregnancy can cause fetal alcohol syndrome (facial features, small head, learning and behavior problems), and effects on the brain can occur at any stage. 1 point: Another risk, e.g., tobacco causing low birth weight, or maternal rubella or Zika causing defects.

4.2 Attachment and Social Development in Childhood**SET A · CHECK YOUR UNDERSTANDING**

1. Infant monkeys chose a cloth surrogate that gave contact comfort over a wire surrogate that provided milk. Attachment therefore depends more on warm contact than on feeding.
2. She used the Strange Situation. Secure infants are upset at separation and quickly comforted at reunion; avoidant infants show little distress and ignore the caregiver on return.
3. A responsive caregiver gives the infant confidence to explore, knowing a safe place to return to. Bowlby saw this as an evolved survival mechanism.
4. Authoritative: high warmth, high control with reasons. Authoritarian: low warmth, high control. Permissive: high warmth, low control.
5. Industry vs. inferiority; success brings a sense of competence and pride in skills, while repeated failure leads to feelings of inferiority.
6. Social learning theory stresses observing, imitating, and being rewarded for gender-typed behavior. Gender schema theory says children actively build mental categories of gender that organize what they pay attention to and remember.

SET B · EXAM-STYLE MULTIPLE CHOICE

7. D. The monkeys preferred the soft cloth mother over the food-giving wire mother, contradicting the idea that attachment arises from being fed. Critical period concepts relate to imprinting, not this contradiction.
8. A. Lack of distress and avoidance at reunion define avoidant attachment. Anxious/ambivalent children are highly upset and angry, which is the opposite pattern.
9. C. High control plus high warmth defines authoritative. Authoritarian parents are also strict but cold and rely on obedience without explanation.
10. E. Ages three to six center on initiative. Industry vs. inferiority comes later, when children master school skills.
11. B. Imitating a rewarded model is the core of Bandura's social learning theory. Schema theory focuses on internal mental categories rather than imitation.

SET C · APPLY AND EXTEND

12. (a) 1 point: 38/60 is about 63 percent. (b) 1 point: The avoidant infant ignores or turns away from the caregiver and shows little emotion. (c) 1 point: Infant temperament (a biological factor) may affect both the child's behavior and how caregivers respond; the study is correlational.
13. 1 point: Name two crises, e.g., autonomy vs. shame and doubt or industry vs. inferiority. 1 point: Authoritative warmth and consistency build trust and allow safe independence, supporting autonomy. 1 point: Clear expectations with encouragement foster competence in school tasks, supporting industry, while explanations avoid shame.

4.3 Cognitive Development: Piaget and Vygotsky**SET A · CHECK YOUR UNDERSTANDING**

1. Assimilation fits new information into an existing schema, such as calling a zebra a 'striped horse.' Accommodation modifies the schema, such as creating a new 'zebra' category after learning it is different.
2. It is the understanding that objects continue to exist when out of sight. It emerges during the sensorimotor stage, often around 8 months.
3. Preoperational children lack conservation: they judge the amount in a tall glass to be greater than in a short wide one even when the liquid is unchanged. Egocentrism, shown on the three-mountains task, is another limitation.
4. Concrete operational children reason logically only about real objects. Formal operational thinkers reason abstractly, hypothetically, and systematically, such as testing variables one at a time.
5. It measures theory of mind. Success means saying Sally will look in the basket where she left the marble, showing the child understands her belief differs from reality.
6. ZPD is the range of tasks a child can do with help but not alone. Scaffolding is the adjustable support given within it that is reduced as the child improves.

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SET B · EXAM-STYLE MULTIPLE CHOICE

7. E. Altering a schema to fit new information is accommodation. The earlier use of the dog label for the cat was assimilation.
9. A. Failing to understand that Sally's belief differs from reality shows an immature theory of mind. Conservation concerns quantity, not beliefs.
11. D. This choice captures the core difference. Piaget, not Vygotsky, proposed universal stages.
8. C. Failing to see that quantity stays the same despite changes in shape shows lack of conservation. Object permanence develops much earlier.
10. B. Temporary, decreasing support is scaffolding in Vygotsky's theory. Maturation is biological readiness, not guided help.

SET C · APPLY AND EXTEND

12. (a) 1 point: Concrete operational; reversibility (mentally undoing the pour). (b) 1 point: Abstract or hypothetical reasoning, such as controlling several variables in a science experiment or reasoning from an unlikely premise. (c) 1 point: Provide scaffolding within the ZPD, with guided questions and demonstrations from a more skilled partner that fade as she gains skill.
13. 1 point: He underestimated infants' and young children's abilities. 1 point: Looking-time studies show infants are surprised by 'impossible' events in which an object seems to vanish, suggesting early object knowledge. 1 point: Development is also more gradual and culturally influenced than strict stages imply, as children may succeed on tasks with supportive instructions.

4.4 Moral Development, Adolescence, and Adulthood**SET A · CHECK YOUR UNDERSTANDING**

1. The same decision can come from different stages. For example, someone may say steal to save a wife for self-interest or from universal principles, so the reasoning identifies the level.
2. Gilligan said his work used mostly males and prioritized justice, ignoring an ethic of care that emphasizes relationships. Later studies found few consistent gender differences.
3. The emotion- and reward-focused limbic system matures earlier than the prefrontal cortex that controls impulses and judgment. This imbalance makes teens more reward-seeking and less restrained.
4. Primary traits are the reproductive organs themselves. Secondary traits appear at puberty but are not directly involved in reproduction, such as body hair, breast development, and voice deepening.
5. Moratorium: the teen is exploring alternatives but has not yet committed to an identity.
6. Fluid intelligence, such as processing speed and novel reasoning, declines. Crystallized intelligence, such as vocabulary and general knowledge, remains stable or improves.

SET B · EXAM-STYLE MULTIPLE CHOICE

7. C. Concern for social approval and roles is conventional. Postconventional reasoning uses abstract principles that can override laws.
9. E. Commitment without exploration is foreclosure. Diffusion lacks both exploration and commitment.
11. D. Cross-sectional comparisons confound age with generation. Attrition is a problem in longitudinal studies.
8. A. The developmental gap between emotional and control centers explains risk taking. Peer influence matters too, but the claim that peers never influence behavior is false.
10. B. Speed with novel problems is fluid; vocabulary is crystallized. Dementia is a serious pathological decline, not normal aging.

SET C · APPLY AND EXTEND

12. 1 point: The limbic system matures before the prefrontal cortex, so rewards and emotions outweigh impulse control. 1 point: Peers increase the salience of rewards, so teens take more risks in groups. 1 point: Identity vs. role confusion; a healthy resolution is exploring options and forming a coherent sense of self (identity achievement).
13. (a) 1 point: Cross-sectional. (b) 1 point: Cohort effect (e.g., differences in life experience) or healthier people surviving to be 70. (c) 1 point: Not everyone experiences all five stages or in order; they are common reactions, not required steps.

4.5 Classical Conditioning**SET A · CHECK YOUR UNDERSTANDING**

1. He expected only food to cause salivation, but dogs salivated to stimuli that predicted food. This showed that organisms learn associations between events.
2. UCS: the toxin in the shrimp (or the spoiled food). UCR: nausea. CS: the smell of shrimp. CR: nausea at the smell.
3. Extinction is the weakening of the CR when the CS is presented without the UCS. Spontaneous recovery is the reappearance of the weakened CR after a rest period.
4. Generalization is responding to stimuli similar to the CS. Discrimination is responding only to the CS and not to similar stimuli, which develops when only the CS is followed by the UCS.
5. It showed that fear can be classically conditioned and generalized to similar objects. It is criticized for ethics: it caused distress and Albert's fear was never reversed.
6. It can form after a single trial and a long delay between taste and illness, and it forms more easily for taste than for sights or sounds, indicating evolution prepares animals to link certain stimuli.

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SET B · EXAM-STYLE MULTIPLE CHOICE

7. B. The sound was neutral and now predicts pain, so it is the CS. The pain from the drill is the UCS and anxiety to the sound is the CR.
9. D. The brief return after a rest period is spontaneous recovery. Higher-order conditioning requires pairing with a new stimulus.
11. E. Pairing a product (CS) with pleasant stimuli (UCS) so the product evokes positive feelings is classical conditioning. Shaping is an operant technique.
8. A. Responding to a similar stimulus is generalization. Discrimination would mean salivating only to the trained tone.
10. C. Taste-illness links form readily, so not all stimuli associate equally. Observational learning involves watching models.

SET C · APPLY AND EXTEND

12. (a) 1 point: UCS is the cat (cat dander); CS is the photo of a cat. (b) 1 point: Present the CS (photo) repeatedly without the UCS (real cat) until the CR fades. (c) 1 point: Spontaneous recovery after a rest period, because extinction does not erase the association.
13. 1 point: UCS is a puff of air that causes the UCR blink. 1 point: Pair the buzzer (NS) just before the puff for many trials until the buzzer alone elicits a blink (CR). 1 point: Control group hears the buzzer without pairing, or test the buzzer alone before training to show it was neutral.

4.6 Operant Conditioning**SET A · CHECK YOUR UNDERSTANDING**

1. Behavior followed by satisfying consequences is more likely to be repeated. Thorndike showed cats took less time to escape puzzle boxes over trials as the successful action was rewarded.
2. Positive: a student receives a sticker for finishing homework. Negative: a person takes an aspirin, which removes a headache, so taking aspirin becomes more likely.
3. Both decrease the behavior. Positive punishment adds an unpleasant stimulus (extra chores) and negative punishment removes a pleasant stimulus (taking away video games).
4. Variable ratio. Rewards come after an unpredictable number of responses, so any response may pay off and the organism keeps responding even when reinforcement stops.
5. Shaping reinforces successive approximations of a target behavior. A trainer first rewards a pigeon for turning toward a disk, then for approaching, then only for pecking it.
6. A cue signaling that a response will be reinforced. A green traffic light signals that pressing the accelerator will be rewarded by moving forward.

SET B · EXAM-STYLE MULTIPLE CHOICE

7. C. A pleasant stimulus is removed and the behavior decreases, so it is negative punishment. In extinction, a reinforcer stops following a previously reinforced behavior, but no new consequence is imposed.
9. D. The reinforcer depends on time passing and varies unpredictably. A variable ratio schedule depends on a number of responses, like gambling.
11. E. Accidental pairings of behavior and reward create superstitions. Shaping requires reinforcing approximations deliberately.
8. A. Removing an aversive stimulus increases the behavior. Positive punishment would add shock after pressing.
10. B. Responding speeds up as the interval's end approaches and falls right after reinforcement. Variable ratio produces the steady rapid line.

SET C · APPLY AND EXTEND

12. (a) 1 point: Reinforce successive steps (topic choice, outline, draft, final). (b) 1 point: Variable ratio or variable interval, since unpredictability produces steady responding. (c) 1 point: Overjustification may reduce intrinsic motivation, or students work only when rewards are available.
13. 1 point: Negative punishment. 1 point: Punishment suppresses behavior without teaching an appropriate alternative. 1 point: Reinforcing cooperative behavior teaches what to do and avoids fear, resentment, or aggression that punishment alone can cause.

4.7 Observational and Cognitive Learning**SET A · CHECK YOUR UNDERSTANDING**

1. Children who watched an adult behave aggressively toward the doll imitated the aggression later, even with no direct reward. This showed that aggression can be learned through observation.
2. Increased likelihood of a behavior after seeing a model rewarded for it. Seeing a classmate praised for sharing makes children more likely to share.
3. Attention, retention (memory), reproduction (ability to perform the behavior), and motivation (reasons to perform it).
4. They are neurons that fire both when performing an action and when watching another do it. They may support imitation, empathy, and learning by observation, though their role in humans remains debated.
5. Rats given no reward for ten days still learned the maze layout, as they ran it quickly once food was introduced. They developed a cognitive map without reinforcement.
6. A passive resignation after repeated uncontrollable bad events. Seligman's dogs that could not escape shock later failed to escape even when escape was possible.

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SET B · EXAM-STYLE MULTIPLE CHOICE

7. E. She was influenced by a model's rewarded behavior. Latent learning concerns hidden learning without reward.
9. D. Learning that remains hidden until an incentive exists is latent. Insight is sudden, not hidden.
11. C. Believing outcomes are uncontrollable and passively giving up reflects learned helplessness.
8. A. Sudden understanding of a solution is insight, as Kohler described. Shaping is gradual reinforcement of approximations.
10. B. The key finding was imitation without direct reward. Children also imitated filmed models, so the other choices are incorrect.

SET C · APPLY AND EXTEND

12. (a) 1 point: Children who watch the prosocial show will share more than those who watch a neutral show. (b) 1 point: Randomly assign children to the prosocial or a neutral program, then measure sharing of stickers with a peer later. (c) 1 point: Children pay attention to and remember a rewarded model and imitate it, especially when the model is similar and rewarded.
13. 1 point: Latent learning is gradual and hidden until incentive; insight is sudden understanding. 1 point: Latent learning shows learning without reinforcement and creates cognitive maps. 1 point: Insight shows problem solving by mental restructuring rather than trial and error; both show internal mental processes.

4.8 Applying Learning Principles**SET A · CHECK YOUR UNDERSTANDING**

1. Classical conditioning; the coat is a CS that was paired with painful shots (UCS) and now elicits fear (CR).
3. Observational learning; she is imitating a model.
5. A preferred activity reinforces a less preferred one. A child may watch a favorite show only after finishing chores, so the show reinforces chores.
2. Operant conditioning; praise is positive reinforcement that increases practice.
4. A system in which desired behaviors earn tokens exchangeable for backup reinforcers. Tokens are conditioned reinforcers that can be delivered immediately and bridge the delay before the real reward.
6. Observable behavior can be counted, and a baseline provides a comparison to see whether the intervention changed behavior, rather than relying on impressions.

SET B · EXAM-STYLE MULTIPLE CHOICE

7. C. Moving from continuous to variable reinforcement makes the behavior last when rewards stop. The other statements are false descriptions of conditioning.
9. A. When reinforcement stops, behavior often briefly intensifies before declining. Spontaneous recovery refers to a return after a pause.
11. E. Pairing the feared stimulus with relaxation replaces the fear response. Gradual steps are not shaping since the goal is to reduce a CR, not build new voluntary behavior.
8. B. An involuntary reaction to a stimulus paired with illness is classical. The others involve consequences or imitation.
10. D. The cue (meal) remains but the response is replaced. The change does not remove cues.

SET C · APPLY AND EXTEND

12. (a) 1 point: Students earn tokens for minutes read, exchangeable for privileges, starting with immediate delivery. (b) 1 point: Fade tokens, use praise, and offer choice of books so reading is valued for itself (avoid overjustification). (c) 1 point: Teachers and older students model reading and talk about books, so peers imitate.
13. (a) 1 point: Being knocked down (UCS) caused fear (UCR); the dog became CS producing fear (CR). (b) 1 point: Avoiding parks removes the fear, which is negative reinforcement, and prevents extinction since the CS is never presented without the UCS. (c) 1 point: Systematic desensitization or gradual exposure with relaxation, or modeling calm interaction with dogs.

4.9 Multiple-Choice Practice: Development and Learning**SET A · CORE CONCEPTS**

1. C. Cross-sectional comparisons confound age with generation. Dropout and long duration are weaknesses of longitudinal designs.
3. E. Contact comfort was more important than food. Imprinting is a critical period phenomenon studied in birds.
5. D. Failing to realize quantity remains the same despite appearance indicates no conservation, typical of preoperational thought. Object permanence appears in infancy.
7. C. Upholding social order and rules is conventional. Avoiding punishment is preconventional, and valuing principles above law is postconventional.
2. A. Alcohol is a teratogen associated with fetal alcohol syndrome. Down syndrome is a chromosomal condition not caused by drinking.
4. B. High demands and high warmth define authoritative. Authoritarian parents demand obedience without explanation.
6. A. Temporary, fading support within the zone of proximal development is scaffolding.

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SET B · APPLICATIONS AND DATA

- 8. B. The bite is the UCS; the bark became the CS, and the flinch to it is the CR. After conditioning, the bark is no longer neutral.
- 10. E. Giving in removes the unpleasant fit, so the mother's behavior increases. The daughter's fits are positively reinforced by late bedtimes.
- 12. C. A sudden solution after a pause suggests insight. Trial and error would show gradual improvement.
- 14. B. Active exploration without commitment is moratorium.
- 9. D. Rewards come after an unpredictable number of responses. Interval schedules depend on time.
- 11. A. Observing consequences to a model changes the likelihood of imitation. Latent learning is about hidden learning without incentives.
- 13. D. Early competence suggests development is more continuous or earlier than the stages claim. The others fit Piaget's theory.

SET C · EXAM-LEVEL STRETCH

- 15. E. The design is correlational and genetic and temperament third variables may explain both. Attrition does occur in long studies.
- 17. C. It signals when a response will be reinforced. It is neither a consequence nor a reflex trigger.
- 19. B. Fixed-interval schedules produce scalloped records as reward time approaches. Fixed ratio produces a pause and then a steady burst, not a gradual acceleration.
- 16. A. Anxious/ambivalent attachment is linked to unpredictable caregiving. Rejection tends to be associated with avoidant attachment.
- 18. D. Taste aversion can form after a single trial with long delays, supporting biological preparedness. Most conditioning is weaker with long delays.
- 20. E. Older cohorts may have had less schooling, making cross-sectional data misleading, whereas crystallized intelligence increases or holds steady with age.

4.10 Free-Response Practice: Development and Learning**QUESTION 1 · ARTICLE ANALYSIS: ATTACHMENT AND PARENTING**

- 1. 1 point: Correlational study (observation and Strange Situation measures); no manipulation of an independent variable.
- 2. 1 point: Classification of infants as secure (or insecure) by their behavior in the Strange Situation, e.g., reaction to separation and reunion.
- 3. 1 point: The design is correlational, so causation cannot be inferred; infant temperament or genes could affect both the baby's behavior and the mother's responses (third variable), or direction may be reversed (calmer babies elicit responsiveness).
- 4. 1 point: Authoritative parents are warm and responsive with consistent limits, which should foster trust and secure attachment, consistent with the positive correlation.

QUESTION 2 · EVIDENCE-BASED: OPERANT CONDITIONING

- 5. 1 point: The schedule moves from continuous reinforcement to variable ratio; the reinforcer is a positive reinforcer (a secondary/conditioned reinforcer, the sticker).
- 6. 1 point: Partial reinforcement produces greater resistance to extinction, so behavior persists longer when reinforcement stops (50% vs. 30%).
- 7. 1 point: Overjustification: rewarding an already enjoyable activity can reduce intrinsic motivation, as shown by less free drawing.
- 8. 1 point: Fade stickers and use verbal praise or choice, or reward effort on non-preferred tasks, so intrinsic motivation is retained; justification links to the overjustification effect.

QUESTION 3 · EVIDENCE-BASED: COGNITIVE DEVELOPMENT

- 9. 1 point: 4-year-olds are preoperational (lack conservation, centration); 8-year-olds are concrete operational (reversibility).
- 11. 1 point: Infants showed surprise at impossible events at 5 months, suggesting some object knowledge earlier than Piaget's estimate of about 8 months.
- 10. 1 point: Children succeeded with adult guidance, illustrating the zone of proximal development and scaffolding.
- 12. 1 point: Piaget emphasized independent exploration and universal stages; Vygotsky emphasized social interaction and culture, with development guided by more skilled partners.

QUESTION 4 · ARTICLE ANALYSIS: OBSERVATIONAL LEARNING

- 13. 1 point: IV = which video the child watched (sharing model vs. playing alone). DV = the number of stickers shared.
- 14. 1 point: $p < .01$ means a difference this large would occur less than 1 percent of the time by chance if there were no effect; because of random assignment, the video can be said to have caused the difference.
- 15. 1 point: The model was praised for sharing; children who saw this reinforcement were more motivated to imitate.
- 16. 1 point: Limitation, e.g., short-term lab measure or the stickers may reflect demand characteristics. Improvement: test later in a natural setting, add a model who is not praised, or test a follow-up to see lasting effects.

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Chapter 5: Social Psychology and Personality.

10 sections with explanations and worked examples, then 139 practice problems. Answers and full explanations are at the end of the chapter.

5.1 Attribution and Social Cognition

You will learn how people explain behavior, how attitudes form and change, and which persuasion techniques the AP exam expects you to recognize.

Social psychology studies how our thoughts, feelings, and behavior are shaped by other people, real or imagined. Social cognition is the part that deals with how we interpret people and situations. Two big topics start the chapter: how we explain behavior (attribution) and how our attitudes and actions influence each other.

Attribution theory describes how people explain the causes of behavior. A **dispositional (internal) attribution** credits personality, ability, or character. A **situational (external) attribution** credits circumstances such as pressure, luck, or the environment. Attributions can also be stable or unstable, which matters for motivation: blaming a failure on lack of ability (internal, stable) discourages effort more than blaming it on a bad night of sleep (internal, unstable).

Attribution biases to know

Fundamental attribution error (FAE): overestimating dispositional causes and underestimating situational causes when explaining OTHER people's behavior.

Actor-observer bias: we explain our own behavior with situations but other people's with dispositions.

Self-serving bias: we take credit for successes (internal) and blame failures on circumstances (external).

Just-world hypothesis: the belief that the world is fair, so people get what they deserve; this leads to blaming victims.

The FAE is stronger in individualistic cultures (such as the United States) than in collectivist cultures, which tend to weigh context more. Notice how the biases fit together: the actor-observer bias is the FAE applied to others plus the opposite pattern for ourselves. The self-serving bias protects self-esteem, though people with depression often show the reverse pattern. A related idea is the **self-fulfilling prophecy**: an expectation (for example, a teacher expecting a student to excel) changes how we act, which causes the expected outcome.

Kelley's covariation model explains how we decide between the two kinds of attribution by checking three kinds of information. Consensus asks whether other people act the same way in the same situation. Distinctiveness asks whether the person acts this way only in this situation. Consistency asks whether the person acts this way every time. If consensus and distinctiveness are low but consistency is high, we blame the person; if all three are high, we blame the situation.

EXAMPLE 1: IDENTIFY THE BIAS

Maya arrives late to a meeting and her manager thinks, "She is irresponsible." Later Maya's manager arrives late because of a traffic accident and says, "I could not help it." After Maya gets an A on a test she says she is smart, but after a D on the next she says the test was unfair. Name the bias in each case.

SOLUTION

The manager blames Maya's lateness on her character and ignores possible situations: fundamental attribution error.

The manager explains his own lateness with the situation but Maya's with a trait: actor-observer bias.

Maya credits success to ability and failure to the test: self-serving bias.

Attitudes are learned evaluations of people, objects, or ideas, with cognitive (beliefs), affective (feelings), and behavioral components. Attitudes do not predict behavior perfectly. They predict best when they are strong, specific to the behavior, and when outside pressures are weak. Behavior also changes attitudes, and this is the heart of cognitive dissonance.

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Cognitive dissonance (Festinger)

Dissonance is the uncomfortable tension felt when our attitudes and our behavior (or two beliefs) are inconsistent.

We reduce it by changing the attitude, changing the behavior, or adding a justification.

Classic result: people paid only \$1 to tell others a boring task was fun came to believe it was fun more than people paid \$20, because \$1 was not enough external justification.

Dissonance also explains effort justification (valuing something more after suffering for it) and post-decision rationalization (rating a chosen option better after the choice). Note the direction: when external justification is weak, internal attitude change is strong.

Persuasion research asks who says what to whom. The elaboration likelihood model describes two routes. The **central route** uses careful thought about the strength of arguments and works when the audience is motivated and able to think; it produces lasting change. The **peripheral route** relies on surface cues such as attractiveness, celebrity, or the number of arguments; it works when people are distracted or uninvolved and produces weaker, more temporary change. Credible, likable, and similar communicators are more persuasive.

Technique	How it works	Example
Foot-in-the-door	Small request first, then a larger one; agreeing to the small step shifts self-image and raises compliance	Sign a petition, then agree to donate
Door-in-the-face	Large request first (refused), then a smaller one; the target feels pressure to reciprocate the concession	Asked to volunteer 20 hours, refused, then agrees to 2 hours
Low-ball	Get agreement on a good deal, then raise the cost	Car dealer adds fees after you agree
Mere exposure	Repeated contact increases liking	Liking a song more after hearing it often

EXAMPLE 2: DISSONANCE OR PERSUASION ROUTE?

A smoker who knows smoking causes cancer says, "I only smoke socially, and my grandfather smoked until 90." Separately, a viewer buys a watch because a famous athlete wears it. Explain each using a psychological concept.

SOLUTION

The smoker's belief (smoking is harmful) conflicts with behavior, creating cognitive dissonance. He reduces it by adding justifications and minimizing the risk.

The viewer is influenced by a celebrity cue, not by the quality of arguments: the peripheral route to persuasion.

Common mistakes

Do not confuse the FAE (about judging others) with self-serving bias (about judging ourselves). Foot-in-the-door starts SMALL; door-in-the-face starts LARGE. Dissonance theory says behavior can change attitudes, not only the reverse, and the attitude change is largest when the reward for the behavior is small.

Practice

SET A Check Your Understanding

Answer each question in one to three sentences.

1. Define fundamental attribution error and give one example of your own.
2. Distinguish dispositional from situational attributions.
3. Explain how the self-serving bias protects self-esteem.
4. A person who sees a homeless man says, "He must have made bad choices; things like this do not happen to good people." Name the belief at work and one harmful consequence.
5. Describe how cognitive dissonance can be reduced after you act against an attitude.
6. Contrast the central and peripheral routes to persuasion.

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SET B Exam-Style Multiple Choice

Choose the best answer.

7. A student fails a quiz and says the teacher wrote unfair questions, but says a classmate who failed "just did not study." Which concepts are shown?
(A) Cognitive dissonance only
(B) Self-serving bias only
(C) Actor-observer bias
(D) Just-world hypothesis
(E) Mere exposure effect
8. A fundraiser first asks for a 30-day commitment to volunteer, is refused, then asks for one afternoon, which is accepted. This is an example of the
(A) door-in-the-face technique
(B) foot-in-the-door technique
(C) low-ball technique
(D) central route to persuasion
(E) mere exposure effect
9. Participants paid \$1 to say a dull task was enjoyable later rated the task as more enjoyable than participants paid \$20. This result is best explained by
(A) operant reinforcement
(B) the peripheral route
(C) the just-world hypothesis
(D) the fundamental attribution error
(E) cognitive dissonance
10. A shopper reads detailed product comparisons and carefully weighs the evidence before buying a laptop. Which concept applies?
(A) Peripheral route
(B) Central route
(C) Foot-in-the-door
(D) Actor-observer bias
(E) Self-fulfilling prophecy
11. Which statement about attitudes and behavior is most accurate?
(A) Attitudes always predict behavior.
(B) Attitudes never change after adolescence.
(C) Behavior can change attitudes, as in cognitive dissonance.
(D) Only the cognitive component of attitudes matters.
(E) Attitudes are inherited and unlearned.

SET C Apply and Extend

Respond as you would on a free-response question.

12. A school principal wants students to reduce littering. Describe how (a) foot-in-the-door and (b) cognitive dissonance could each be used in a plan, and explain why each would work.
13. A researcher hypothesizes that people in individualistic cultures show a stronger fundamental attribution error. Describe how a study could test this, identifying the independent and dependent variables, and state what result would support the hypothesis.

5.2 Conformity, Obedience, and Group Behavior

You will learn the classic studies of social influence and how the presence of others changes individual performance, judgment, and willingness to help.

Much of social psychology shows that the situation can overpower personality. Three classic studies demonstrate three forms of influence: conformity (Asch), obedience to authority (Milgram), and adopting assigned social roles (Zimbardo).

Conformity is adjusting your behavior or thinking to match a group standard. In Solomon Asch's line-judgment experiments, participants compared a standard line with three comparison lines, an easy task with an obvious answer. The other group members were confederates (actors) who sometimes unanimously gave the same wrong answer. About three-quarters of participants conformed at least once, and on average roughly one-third of critical trials produced a wrong, conforming answer. Conformity dropped sharply if even one confederate gave the correct answer, so unanimity matters. Conformity also rose with group size up to about three or four confederates and then leveled off.

Two motives for conformity

Normative influence: going along to be accepted or avoid rejection (public compliance, even if you privately disagree).

Informational influence: going along because you believe the group knows more, especially when the task is ambiguous or difficult (private acceptance).

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Obedience is following the orders of an authority. In Stanley Milgram's studies at Yale, a participant (the "teacher") was told to deliver increasing electric shocks, up to 450 volts, to a "learner" (a confederate who received no real shocks) for wrong answers. When the participant hesitated, the experimenter said things like "The experiment requires that you continue." About 65 percent of participants went all the way to 450 volts, and every participant went to at least 300 volts. Obedience fell when the experimenter was absent or gave orders by phone, when the learner was physically close, when the setting was an ordinary office rather than a university, and when other "teachers" refused. Milgram's work raised serious ethical concerns, including deception and stress, and it helped shape current informed consent and debriefing rules.

In Philip Zimbardo's 1971 Stanford prison simulation, college men were randomly assigned to be guards or prisoners in a mock prison. Guards became abusive and prisoners passive and distressed, and the study was stopped after six days instead of the planned two weeks. It illustrates the power of **social roles** and situational forces. Critics note that guards may have been coached, that the sample was small, and that the ethical harm was significant.

Study	Procedure	Key finding	Concept
Asch	Line judgments with confederates giving wrong answers	About 75% conformed at least once; one ally reduced conformity	Conformity, normative influence
Milgram	Increasing shocks ordered by experimenter	65% reached 450 volts	Obedience to authority
Zimbardo	Random assignment to guard or prisoner roles	Guards became abusive within days	Social roles, situational power

EXAMPLE 1: CLASSIFY THE INFLUENCE

In a meeting, Dana privately thinks a budget plan is flawed but votes yes after everyone else does, to avoid looking difficult. In another meeting, Dana is new to a software tool and copies the choices of experienced coworkers because she assumes they know best. Identify the type of influence in each and the likely private attitude.

SOLUTION

First meeting: normative influence. She wants acceptance, so she complies publicly while privately disagreeing.

Second meeting: informational influence. The task is ambiguous for her and she accepts others as a source of correct information, so she likely privately agrees.

The presence of others also changes performance. **Social facilitation** (Zajonc) is improved performance on well-learned or easy tasks, and worse performance on difficult or new tasks, when others are present, because an audience raises arousal and arousal strengthens the dominant response. **Social loafing** is reduced effort when individual contributions are not identifiable in a group (as in pulling a rope or group projects with shared grades). It is reduced by making contributions identifiable and by making the task meaningful.

Deindividuation is loss of self-awareness and restraint in a crowd or when anonymous, as in riots, hooded groups, or online harassment.

Group decisions can go wrong. **Group polarization** is the strengthening of a group's initial leaning after discussion; a group of moderately cautious people becomes more cautious, and a group leaning risky becomes riskier. **Groupthink** (Janis) is a desire for harmony that overrides realistic appraisal of alternatives. Symptoms include illusion of invulnerability, self-censorship, pressure on dissenters, and mindguards who shield the leader from contrary evidence. The Bay of Pigs invasion is the classic example.

Bystander effect

The more bystanders present, the less likely any one person helps (Darley and Latane).

Cause: diffusion of responsibility, the feeling that others will act. Also pluralistic ignorance, where people look to others, see calm, and decide it is not an emergency.

In their seizure study, 85% of people who thought they were alone reported the emergency, but only 31% did when they thought four others were present.

EXAMPLE 2: PREDICT PERFORMANCE

A cyclist who has trained for years sets a personal record when racing next to others. A beginner at chess plays much worse in front of a crowd. Explain both using one concept.

SOLUTION

Both outcomes come from social facilitation: the presence of others raises arousal.

Arousal enhances the dominant response. For the expert cyclist, the dominant response is correct, so performance improves.

For the beginner the dominant response is error-prone, so performance drops.

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Exam tip

Match the study to the concept quickly. Asch = conformity (peers, unanimity); Milgram = obedience (authority, 65% to 450 volts); Zimbardo = roles. Do not say Milgram studied conformity. In a bystander question, always name diffusion of responsibility and explain that the individual feels less personally responsible as the number of witnesses increases.

Practice**SET A Check Your Understanding**

Answer each question in one to three sentences.

1. What was the independent variable in the Asch line studies, and what did one dissenting confederate do to conformity?
2. State two situational factors that reduced obedience in Milgram's research.
3. Explain the difference between normative and informational influence.
4. Why does social loafing occur, and how could a teacher reduce it in a group project?
5. Define groupthink and name two of its symptoms.
6. Explain how diffusion of responsibility reduces helping.

SET B Exam-Style Multiple Choice

Choose the best answer.

7. A teenager vapes at a party only because her friends do and she fears being left out, although she privately dislikes it. This is best described as
(A) informational influence (B) groupthink (C) normative influence
(D) deindividuation (E) social facilitation
8. In Milgram's original obedience study, approximately what percentage of participants delivered the maximum 450-volt shock?
(A) 65% (B) 15% (C) 35% (D) 90% (E) 5%
9. A sprinter runs faster in a stadium crowd than in practice. Which concept best explains this?
(A) Social loafing (B) Diffusion of responsibility
(C) Group polarization (D) Social facilitation
(E) Pluralistic ignorance
10. After discussion, a group of voters who were mildly in favor of a policy become strongly in favor. This illustrates
(A) groupthink (B) group polarization (C) the bystander effect
(D) obedience (E) normative loafing
11. Which factor would most likely INCREASE the chance a person helps someone collapsed on a street?
(A) Many strangers are nearby
(B) The person believes others have already called for help
(C) The person is alone with the victim
(D) The situation is ambiguous
(E) The crowd is noisy and passive

SET C Apply and Extend

Respond as you would on a free-response question.

12. A company has employees prepare a major decision in a single tight-knit committee led by a forceful chief executive. No one voices doubts. The plan fails. (a) Identify the group process and two symptoms present. (b) Suggest two ways to prevent it.
13. A researcher wants to test whether anonymity increases aggression. Describe an experiment, including the independent variable, dependent variable, and the concept being tested, and explain one ethical safeguard.

5.3 Prejudice, Aggression, and Prosocial Behavior

You will learn how stereotypes become prejudice and discrimination, how to reduce intergroup conflict, why people aggress or help, and what draws people together.

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Three related ideas are often confused. A **stereotype** is a cognitive belief or generalization about a group. **Prejudice** is a negative attitude (an emotion or evaluation) toward a group and its members. **Discrimination** is unjustified negative behavior toward group members. Think of them as thinking, feeling, and acting: a person can hold prejudice without discriminating, and institutions can discriminate without any individual intending it.

ABC of intergroup bias

Stereotype = Cognitive (belief about a group)

Prejudice = Affective (feeling or attitude)

Discrimination = Behavioral (action)

Several processes help produce prejudice. **In-group bias** is favoring the group you belong to; the out-group is seen as more uniform (out-group homogeneity effect). Merely assigning people to arbitrary groups, as in minimal-group experiments, produces favoritism. **Social identity theory** says part of our self-esteem comes from group membership, so boosting our group boosts us. The **scapegoat theory** says that when people are frustrated, they displace blame onto a vulnerable out-group. The **just-world hypothesis** and the **ultimate attribution error** (explaining the out-group's negative acts dispositionally and its positive acts as flukes) maintain prejudice. A **self-fulfilling prophecy** can lock stereotypes in place when expectations change how we treat others. Stereotype threat (Steele) occurs when worry about confirming a stereotype lowers performance.

How can intergroup conflict be reduced? Muzafer Sherif's Robbers Cave study put two groups of boys in competition at a camp, which produced hostility. Contact alone did not help. What worked was **superordinate goals**: shared goals that require cooperation, such as repairing the water supply or pushing a stuck truck. The **contact hypothesis** (Allport) says contact reduces prejudice when groups have equal status, share common goals, cooperate, and have institutional support. The jigsaw classroom, where each student holds one piece of the material that others need, applies these conditions.

EXAMPLE 1: STEREOTYPE, PREJUDICE, OR DISCRIMINATION?

A hiring manager believes older workers cannot learn new software (a), feels uneasy around older applicants (b), and never interviews anyone over 60 (c). Label each and suggest one way to reduce it.

SOLUTION

(a) is a stereotype, a belief about a group.

(b) is prejudice, a negative feeling.

(c) is discrimination, a behavior.

Reduction: working side by side with older colleagues on a shared goal (contact hypothesis with common goals and equal status).

Reducing prejudice

Contact helps only under equal status, common goals, cooperation, and institutional support.

Superordinate goals: shared goals that neither group can reach alone (Sherif).

Jigsaw classroom: students depend on each other's material.

Aggression is behavior intended to harm. **Hostile aggression** springs from anger and aims to hurt; **instrumental aggression** uses harm as a means to an end, such as a robbery. Explanations come from several perspectives. Biologically, aggression is linked to testosterone, low serotonin, the amygdala, and genetics. The **frustration-aggression hypothesis** (Dollard) holds that blocked goals create frustration that can lead to aggression, though the modern version says frustration only creates readiness, with aggression also shaped by cues such as weapons present. **Social-learning theory** (Bandura) states that aggression is learned by watching rewarded models, as in the Bobo doll studies. Alcohol, heat, crowding, and violent media are also risk factors.

Perspective	Explanation of aggression	Evidence
Biological	Brain areas, hormones, genes	Higher testosterone and lower serotonin linked to aggression
Frustration-aggression	Blocked goals produce aggression	Frustration plus aggressive cues raises aggression
Social learning	Imitating rewarded models	Children copying an adult hitting a doll
Situational	Heat, crowding, alcohol, provocation	Higher assault rates in hot weather

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Prosocial behavior is acting to benefit others. **Altruism** is helping without expecting external reward. Explanations include the empathy-altruism hypothesis (Batson): empathy motivates helping for the other's sake; **social exchange theory**: we help when rewards (such as self-esteem or avoiding guilt) outweigh costs; evolutionary views of kin selection and reciprocity; and norms. The **reciprocity norm** says we should return favors, and the **social responsibility norm** says we should help those who depend on us. Helping is more likely when we are not in a hurry, when the person seems deserving, and when we are in a good mood or have just seen a helping model. The presence of many bystanders lowers helping (diffusion of responsibility).

Attraction research finds that liking is predicted by proximity (physical closeness), the **mere exposure effect** (repeated exposure increases liking, shown by Zajonc), similarity of attitudes and background (the idea that opposites attract is weakly supported), physical attractiveness (people often assume attractive people have other good traits, the halo effect), and reciprocal liking (we like those who like us). Romantic love is sometimes described by Sternberg as intimacy, passion, and commitment; companionate love is high in intimacy and commitment but low in passion.

EXAMPLE 2: EXPLAIN WITH TWO THEORIES

A boy is passed over for a team, hits a classmate, and then repeats a move he saw in a violent video game. Explain with two theories.

SOLUTION

Frustration-aggression: being cut from the team blocked a goal, creating frustration and readiness to aggress.

Social-learning: he observed the aggressive model being rewarded in the game and imitated the behavior.

Because the hit was driven by anger, it would be classified as hostile aggression.

Common mistakes

Do not call a negative belief about a group "prejudice"; the belief is the stereotype, and prejudice is the attitude. Contact alone (just putting groups together) does not reliably reduce prejudice; the Robbers Cave study shows that cooperation toward superordinate goals is required. Mere exposure involves liking through repetition, not through similarity.

Practice

SET A Check Your Understanding

Answer each question in one to three sentences.

1. Distinguish stereotype, prejudice, and discrimination with one example each.
2. Explain how scapegoating can occur after an economic downturn.
3. List two conditions of the contact hypothesis and one real-world application.
4. What did the Robbers Cave study show about reducing conflict?
5. Differentiate hostile aggression from instrumental aggression.
6. State two factors that predict who becomes friends or partners and describe the evidence for one.

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SET B Exam-Style Multiple Choice

Choose the best answer.

7. A person who is rude to a barber of a different ethnicity and refuses to be served is demonstrating
(A) a stereotype (B) an attribution (C) discrimination
(D) a superordinate goal (E) the mere exposure effect
8. In Sherif's Robbers Cave study, hostility between the two groups of boys declined mainly when they
(A) spent time together at meals
(B) were punished by camp leaders
(C) were told they were similar
(D) worked jointly toward a goal that neither group could achieve alone
(E) were separated
9. Children who watched an adult punch an inflatable doll and then imitated the behavior provide evidence for
(A) frustration-aggression (B) the empathy-altruism hypothesis
(C) scapegoat theory (D) instinct theory
(E) social-learning theory
10. Which pair is correctly matched?
(A) Altruism and expecting a reward (B) Mere exposure and similarity
(C) Reciprocity norm and returning favors (D) Instrumental aggression and anger
(E) Stereotype and behavior
11. A student starts to like a song after hearing it on the radio repeatedly although she disliked it at first. This is the
(A) mere exposure effect (B) halo effect
(C) reciprocity norm (D) ultimate attribution error
(E) foot-in-the-door effect

SET C Apply and Extend

Respond as you would on a free-response question.

12. Two neighboring towns have long histories of conflict. A mayor proposes a joint youth soccer league that mixes players from both towns on each team. Using the contact hypothesis and superordinate goals, explain why the plan may reduce prejudice and what it must include to succeed.
13. A bystander sees a stranger drop a bag of groceries on a busy sidewalk. Explain, using two psychological concepts, why the person might or might not help, and design a brief experiment to test the effect of crowd size on helping.

5.4 Personality Theories I: Psychodynamic and Humanistic

You will learn Freud's model of the mind, the neo-Freudians who revised it, and the humanistic theories of Maslow and Rogers, along with their strengths and weaknesses.

Personality is an individual's relatively stable pattern of thoughts, feelings, and behaviors. Each theory answers where personality comes from: unconscious conflict (psychodynamic), growth toward potential (humanistic), traits and genes (trait), or learning and thinking (social-cognitive).

Sigmund Freud's **psychoanalytic theory** holds that most mental life is unconscious, and that behavior arises from conflict among three structures. The **id** operates on the pleasure principle, demanding immediate satisfaction of instinctual urges. The **superego** is the internalized conscience and ideals of parents and society. The **ego** operates on the reality principle, mediating between the id, superego, and the real world. Freud also divided the mind into the conscious, the preconscious (easily retrievable), and the unconscious, which contains repressed urges and memories.

Freud's structures

Id = pleasure principle ("I want it now")

Ego = reality principle ("Let's find a realistic way")

Superego = morality ("You should not")

Anxiety arises from the ego's conflict; it protects itself with defense mechanisms.

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Defense mechanisms are unconscious strategies the ego uses to reduce anxiety by distorting reality. **Repression** pushes anxiety-provoking thoughts into the unconscious. **Denial** refuses to accept reality. **Projection** attributes your own unacceptable impulses to others. **Displacement** redirects an impulse to a safer target. **Reaction formation** converts an unacceptable impulse into its opposite. **Rationalization** invents acceptable reasons for behavior. **Regression** returns to an earlier developmental behavior. **Sublimation** redirects urges into socially acceptable activities. **Intellectualization** treats an emotional situation in a detached, logical way.

Defense mechanism	Example
Displacement	Yelling at your sibling after being scolded by a teacher
Projection	A person who is angry with a coworker insists the coworker is angry with them
Reaction formation	Someone who feels hostility toward a rival is excessively friendly
Sublimation	Channeling aggressive urges into boxing or art
Regression	An adult sucks a thumb or sulks like a child under stress

EXAMPLE 1: NAME THE DEFENSE MECHANISM

(a) After failing to make the team, a student says he never wanted to play anyway. (b) A man furious at his boss slams doors at home. (c) A woman with strong hostile urges is unusually sweet to the person she dislikes. Identify each mechanism.

SOLUTION

- (a) Rationalization (or denial of disappointment), giving an acceptable reason.
 (b) Displacement: the anger is redirected from the boss to a safer target.
 (c) Reaction formation: the impulse is expressed as its opposite.

Freud's **psychosexual stages** say personality develops through childhood stages in which the libido focuses on different body areas. Too much frustration or indulgence in a stage causes **fixation**, a lingering focus. The stages are oral (birth to about 18 months; pleasure from the mouth), anal (about 18 months to 3 years; toilet training), phallic (about 3 to 6; Oedipus complex and identification with the same-sex parent), latency (about 6 to puberty; sexual feelings dormant), and genital (puberty onward; mature sexuality).

The neo-Freudians kept the importance of the unconscious but reduced the focus on sexuality. **Carl Jung** proposed the **collective unconscious**, a shared storehouse of inherited memories and archetypes (such as the mother, hero, and shadow), and popularized introversion and extraversion. **Alfred Adler** emphasized social interests, the striving for superiority to overcome feelings of inferiority (the **inferiority complex**), and the effects of birth order. **Karen Horney** challenged Freud's view of women, argued that cultural and social factors matter, and focused on basic anxiety, the child's feeling of helplessness.

Critics say psychoanalytic ideas are hard to test or falsify, were built on a few unrepresentative case studies, and can be used to explain any result after the fact (hindsight). Supporters note that Freud popularized the unconscious, childhood influences, and defense mechanisms, and modern research confirms that much processing is outside awareness.

The **humanistic perspective** arose as a "third force" against psychoanalysis and behaviorism, emphasizing free will, personal growth, and the conscious experience. **Abraham Maslow** proposed a **hierarchy of needs** drawn as a pyramid: physiological needs, safety, belonging and love, esteem, and finally **self-actualization**, the drive to fulfill one's potential. Lower needs usually must be met before higher needs dominate. Maslow studied healthy people, such as Lincoln and Einstein, who showed acceptance, spontaneity, and peak experiences.

Rogers' person-centered theory

Actualizing tendency: an inborn drive to grow and fulfill potential.

Unconditional positive regard: accepting a person without conditions; it supports a healthy self-concept.

Conditions of worth (love only when we meet standards) create a gap between the real self and the ideal self (incongruence).

Therapist traits: genuineness, acceptance, and empathy.

EXAMPLE 2: APPLY THE HUMANISTIC VIEW

Jordan's parents praise him only when he earns top grades. He feels worthless after an A-minus. Using Rogers, explain. How would Maslow describe a student who writes poetry purely for its own sake after meeting all other needs?

SOLUTION

Rogers: parental love depends on conditions of worth, not unconditional positive regard, so Jordan's real self and ideal self are incongruent, lowering self-esteem.

Maslow: writing for its own sake after meeting lower needs reflects self-actualization at the top of the hierarchy.

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Common mistakes

Do not confuse the ego with the superego: the ego is realistic, the superego is moralistic. Remember that Rogers stresses acceptance of the person (unconditional positive regard), not approval of every behavior. Criticisms of humanistic theory differ from criticisms of Freud: humanistic ideas are seen as unscientific, subjective, and overly optimistic, while Freud's are seen as untestable and sexist.

Practice**SET A Check Your Understanding**

Answer each question in one to three sentences.

1. Describe the roles of the id, ego, and superego.
2. What is fixation, and which stage is associated with toilet training?
3. Distinguish repression from denial.
4. How did Jung's collective unconscious differ from Freud's unconscious?
5. Order the levels of Maslow's hierarchy from bottom to top.
6. Explain why Rogers believes conditions of worth harm development.

SET B Exam-Style Multiple Choice

Choose the best answer.

7. A child hit by a parent kicks the family dog. This is best classified as
(A) projection (B) displacement (C) reaction formation
(D) sublimation (E) regression
8. Which theorist proposed that people strive for superiority to overcome feelings of inferiority?
(A) Jung (B) Horney (C) Rogers (D) Adler (E) Maslow
9. A therapist who always accepts clients without judgment regardless of what they say is demonstrating
(A) unconditional positive regard (B) reaction formation
(C) self-actualization (D) the pleasure principle
(E) the collective unconscious
10. Which criticism applies MOST directly to Freud's psychoanalytic theory?
(A) It ignores the role of free will.
(B) It cannot be tested or falsified through scientific research.
(C) It overestimates the role of conscious thought.
(D) It is too optimistic about human nature.
(E) It denies that childhood matters.
11. A man with a strong sexual urge for a coworker becomes active in a campaign against immoral behavior. This best illustrates
(A) denial (B) sublimation (C) reaction formation
(D) regression (E) intellectualization

SET C Apply and Extend

Respond as you would on a free-response question.

12. A college student, anxious about a failing grade, jokes that the course is pointless, then yells at a roommate. (a) Using Freud, name two defense mechanisms and explain why the ego uses them. (b) Explain how a Rogerian counselor would respond.
13. Compare the psychoanalytic and humanistic perspectives on (a) the role of the unconscious or conscious experience, (b) the view of human nature, and (c) one limitation of each.

5.5 Personality Theories II: Trait and Social-Cognitive

You will learn how trait theorists describe and measure stable personality, what twin studies say about heredity, and how social-cognitive theory explains personality through thinking, learning, and the environment.

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Trait theories describe personality as a set of relatively stable characteristics that can be measured and compared. Instead of asking why a person developed a personality, they ask what the personality is like. Gordon Allport sifted through thousands of descriptive words and sorted traits by their pervasiveness. A **cardinal trait** dominates a person's whole life (rare, such as Machiavellian), **central traits** are the handful of general characteristics (honest, shy), and **secondary traits** appear only in certain situations (a preference for certain food).

Hans Eysenck used factor analysis, a statistical method that groups correlated items, and proposed that personality varies along two dimensions: extraversion-introversion and emotional stability-neuroticism (he later added psychoticism). Combinations of the two define types such as the stable extravert and the neurotic introvert. He also linked the dimensions to biology: introverts, he said, have higher baseline cortical arousal, so they avoid stimulation.

The Big Five (OCEAN)

Openness: imaginative, curious, open to new experiences vs conventional.

Conscientiousness: organized, careful, disciplined vs impulsive.

Extraversion: outgoing, assertive, sociable vs reserved.

Agreeableness: trusting, helpful, cooperative vs suspicious, antagonistic.

Neuroticism: anxious, moody, emotionally unstable vs calm, secure.

The Big Five (or five-factor model) is the most widely accepted trait model. The dimensions are continuous, not categories, and each has a high and low end. Conscientiousness predicts job performance and health; high neuroticism predicts anxiety and depression. The traits show moderate stability over adulthood and appear across many cultures. A limitation is that traits describe rather than explain, and a person's behavior varies across situations.

Heredity contributes substantially to the Big Five. Studies of identical twins, including twins raised apart, show that identical twins are much more alike in personality than fraternal twins, with heritability estimates of roughly 40 to 50 percent for the major traits. Adopted siblings raised in the same home are usually no more alike than strangers. This suggests that the shared family environment matters less than expected and that each person's unique experiences and genes matter more. Remember that heritability is a group statistic and does not tell how much of one individual's personality is genetic.

EXAMPLE 1: INTERPRET TWIN DATA

In a study the correlation for extraversion is $+.52$ for identical twins and $+.20$ for fraternal twins. What does this suggest, and what is a limitation?

SOLUTION

Identical twins share 100% of genes and fraternal twins about 50%, and both pairs share a similar family environment.

The higher correlation for identical twins suggests a genetic contribution to extraversion.

Limitation: identical twins may also be treated more alike, so the environment is not fully controlled; also, the correlation is not 1.0, so the environment contributes as well.

Albert Bandura's **social-cognitive perspective** says personality is shaped by the interaction of learning, thought, and the environment. People learn by observing models, and they interpret and anticipate events. Bandura's key idea is **reciprocal determinism**: behavior, personal factors (thoughts, beliefs, genes), and the environment influence one another in a continuous loop. For example, an anxious person (personal factor) avoids parties (behavior), which leads to fewer friends (environment), which strengthens anxiety.

Concept	Meaning	Example
Reciprocal determinism	Person, behavior, and environment influence each other	A confident student studies, earns good grades, and gains more confidence
Self-efficacy	Belief in your ability to succeed at a task (Bandura)	"I can learn to swim"
Internal locus of control	Belief that you control outcomes (Rotter)	"I got the job because I prepared"
External locus of control	Belief that chance or others control outcomes	"It's all luck"
Learned helplessness	Expecting no control after uncontrollable events	Giving up after repeated failures (Seligman)

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Self-efficacy predicts persistence, goal setting, and achievement; it is built through mastery experiences, observing others succeed, encouragement, and low anxiety. **Locus of control** (Rotter) differs: internals tend to cope better, earn higher grades, and show better health behaviors. **Self-esteem** is overall evaluation of one's worth; high self-esteem protects against stress but excessive self-esteem tied to narcissism can be harmful, and self-esteem is often the result, not the cause, of success. The **self-serving bias** supports it.

Culture also shapes personality. In **individualistic** cultures (such as the United States and Western Europe), people define themselves as independent and value personal goals. In **collectivist** cultures (many parts of Asia, Africa, and Latin America), people define themselves by relationships and group duties, and harmony and obligation take priority. These differences influence self-concept, self-esteem, attribution, and conformity.

Person-situation debate

Mischel argued that behavior varies so much from one situation to another that traits predict specific behavior poorly.

Trait supporters reply that traits predict average behavior across many situations and over time and that strong situations hide traits.

Current view: personality and situation interact; traits are better at predicting overall patterns than single acts.

EXAMPLE 2: APPLY SOCIAL-COGNITIVE CONCEPTS

Priya believes she is capable of public speaking after succeeding in a small talk, and she signs up for more talks. Identify two concepts and explain.

SOLUTION

Self-efficacy: Priya's belief in her ability, built by a mastery experience.

Reciprocal determinism: her belief (personal) leads to more speaking (behavior), which creates opportunities and feedback (environment), reinforcing her belief.

Common mistakes

Self-efficacy is about a specific task ("I can pass this test"); self-esteem is a global feeling of worth. Locus of control concerns who controls OUTCOMES. Reciprocal determinism has three parts, and the arrows go both ways, so do not describe it as the environment causing behavior.

Practice

SET A Check Your Understanding

Answer each question in one to three sentences.

1. Name the Big Five traits using the OCEAN mnemonic and give the low end of one.
2. What two dimensions did Eysenck use to describe personality?
3. Explain Allport's distinction among cardinal, central, and secondary traits.
4. Why are twin studies used to estimate heritability of personality?
5. Define reciprocal determinism and give an example.
6. How does an external locus of control differ from low self-efficacy?

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SET B Exam-Style Multiple Choice

Choose the best answer.

7. A person who is organized, careful, and reliable would score high on which Big Five trait?
(A) Openness (B) Agreeableness (C) Neuroticism
(D) Extraversion (E) Conscientiousness
8. Bandura's concept of reciprocal determinism emphasizes that
(A) personality is fixed at birth
(B) behavior is controlled only by the environment
(C) behavior, cognition, and environment influence one another
(D) traits are unrelated to situations
(E) unconscious conflicts shape behavior
9. Which finding about heredity and personality is best supported by twin research?
(A) Shared family environment explains most personality differences.
(B) Identical twins reared apart are no more similar than strangers.
(C) Heritability explains an individual's personality.
(D) Identical twins are more alike than fraternal twins on major traits.
(E) Personality is entirely genetic.
10. A student says, "I do well on exams because I work hard," while another says, "Grades are just luck." The second student's view best shows
(A) internal locus of control (B) external locus of control
(C) high self-efficacy (D) self-actualization
(E) reaction formation
11. Mischel's criticism of trait theory was that
(A) traits cannot be measured
(B) there is little evidence of heredity
(C) behavior is not consistent enough across situations to be predicted well by traits
(D) traits are determined by unconscious conflicts
(E) humans have free will

SET C Apply and Extend

Respond as you would on a free-response question.

12. A researcher wants to know if conscientiousness predicts college grades. (a) Describe a correlational study including how to measure each variable. (b) Explain why a positive correlation does not prove that conscientiousness causes better grades.
13. Contrast trait and social-cognitive explanations of why a woman is shy at parties but outgoing at work, and indicate how the person-situation debate applies.

5.6 Personality Assessment

You will learn the main ways psychologists assess personality, how reliability and validity judge a test, why the Barnum effect fools people, and what ethical rules apply.

Psychologists assess personality to diagnose disorders, select employees, guide counseling, and conduct research. The main methods are self-report inventories, projective tests, behavioral observation, and interviews. A good method is **standardized** (given and scored the same way for everyone, with norms from a representative sample), **reliable**, and **valid**.

Self-report inventories (also called objective tests) are questionnaires with fixed responses, such as true/false or rating scales. They are scored by formula, so scorers do not need to interpret, and they are efficient and reliable. The best-known clinical example is the **Minnesota Multiphasic Personality Inventory (MMPI)**, created by Hathaway and McKinley and revised as the MMPI-2. It has several hundred true/false items and was built empirically: items were kept if they separated people with a diagnosis from those without. It has clinical scales (such as depression and paranoia) and validity scales that detect lying, defensiveness, or random answering. Other inventories measure the Big Five, as in the NEO inventories. Weaknesses include faking, social desirability bias, and answers limited by self-insight.

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Projective tests present ambiguous stimuli and ask the person to interpret them, on the assumption that unconscious conflicts, motives, and feelings will be projected onto the stimulus. The **Rorschach inkblot test** (Hermann Rorschach) asks what ten symmetrical inkblots look like. The **Thematic Apperception Test (TAT)** (Murray and Morgan) shows ambiguous scenes and asks the person to tell a story about each; it is used to assess motives such as the need for achievement. Projective tests are rooted in psychoanalytic theory and can open conversation with a client, but they have been criticized for low reliability (different scorers interpret differently) and weak validity, especially for diagnosing disorders. Scoring systems improved agreement but did not remove the concerns.

Feature	Self-report inventory (MMPI)	Projective test (Rorschach, TAT)
Stimulus	Clear statements	Ambiguous images
Scoring	Objective, formula-based	Subjective interpretation
Reliability	Generally high	Often lower
Validity	Stronger, with validity scales	Often questioned
Main weakness	Faking and social desirability	Interpreter bias, weak validity
Theory	Empirical, trait	Psychodynamic

Reliability and validity

Reliability = consistency of a test: test-retest (same scores later), split-half or internal consistency (parts agree), inter-rater (scorers agree).

Validity = does the test measure what it claims? Content validity (covers the domain), criterion/predictive validity (predicts outcomes), construct validity (matches the theoretical concept).

A test can be reliable without being valid, but a test cannot be valid unless it is reliable.

Other methods supplement tests. **Behavioral observation** records what a person actually does, in natural settings or staged situations, avoiding the limits of self-report; observers must be trained to reduce bias. **Interviews** gather rich information but can be subjective, and interviewer bias, such as the halo effect or confirmation bias, can distort impressions. Many professionals use a battery of several methods to cross-check results.

EXAMPLE 1: EVALUATE A TEST

A company gives applicants a 40-item questionnaire on conscientiousness. When 100 people retake it two weeks later, scores correlate $+0.88$. Job performance ratings a year later correlate only $+0.05$ with scores. Evaluate the reliability and validity.

SOLUTION

The $+0.88$ test-retest correlation shows high reliability: scores are consistent over time.

The $+0.05$ correlation with later job performance means low predictive (criterion) validity.

Conclusion: the test is reliable but not valid for predicting job performance; consistent scores do not make a test accurate.

The **Barnum effect** (also called the Forer effect) is the tendency to accept vague, general statements as uniquely accurate descriptions of oneself, such as "You have a great need for others to like you, yet you can be critical of yourself." In Forer's classroom demonstration, students rated the same generic description as highly accurate (about 4.3 out of 5). The effect helps explain the popularity of horoscopes, graphology, and some online quizzes. Defenses include asking whether the description would fit almost anyone, and demanding evidence that a test predicts specific outcomes.

Quick comparison rule

Objective (self-report): fixed answers, formula scoring, strong reliability, risk of faking.

Projective: ambiguous stimuli, interpreter judgment, weaker evidence, useful for rapport and themes.

Barnum effect: vague statements feel personally true; always ask if the description fits nearly everyone.

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EXAMPLE 2: SPOT THE BARNUM EFFECT

A website gives all visitors the same paragraph: "At times you are outgoing, but at other times you prefer to be alone. You have untapped potential." Visitors rate it 90 percent accurate. Explain.

SOLUTION

The statements are vague and apply to almost everyone: the Barnum effect.

People focus on the matches and overlook that it is not specific to them.

To test genuine accuracy, give each person a personalized result and a control description and ask which one they think fits them better.

Ethics of assessment matter because results can affect jobs, schooling, and treatment. Psychologists must obtain informed consent, maintain confidentiality (except where there is danger to self or others), use only tests with evidence of reliability and validity for the purpose, interpret results with norms appropriate to the person's culture and language, and avoid using a single test for important decisions. Test security and qualified administration are also required. Test results are descriptive and should not label a person permanently; they are best treated as one source of evidence alongside history, interviews, and observation.

Exam tip

When a stem says "ambiguous stimuli" or "tell a story", think projective test; when it says "true/false items" or "validity scales", think MMPI. For research questions, ask: is the issue consistency (reliability) or accuracy (validity)? Avoid claiming that a reliable test must be valid.

Practice**SET A Check Your Understanding**

Answer each question in one to three sentences.

1. What is a projective test, and what assumption underlies it?
2. Name two strengths and one weakness of the MMPI.
3. Distinguish reliability from validity with an example.
4. Why is the TAT said to measure motives?
5. Explain the Barnum effect and one real-life example.
6. State two ethical obligations of a psychologist giving a personality test.

SET B Exam-Style Multiple Choice

Choose the best answer.

7. A client is shown ten inkblots and asked what each looks like. This is an example of a
 - (A) self-report inventory
 - (B) projective test
 - (C) behavioral observation
 - (D) structured interview
 - (E) aptitude test
8. A personality test yields almost identical scores when taken by the same people one month apart, but its scores do not predict any of the behaviors it was designed to predict. The test is
 - (A) reliable but not valid
 - (B) valid but not reliable
 - (C) neither reliable nor valid
 - (D) both reliable and valid
 - (E) standardized but unreliable
9. The MMPI-2 includes validity scales in order to
 - (A) determine intelligence
 - (B) interpret unconscious conflicts
 - (C) score inkblot responses
 - (D) measure the Big Five
 - (E) detect inconsistent, dishonest, or defensive responding
10. Students read a personality description supposedly written for them, rate it as highly accurate, and later learn everyone received the same one. This illustrates the
 - (A) halo effect
 - (B) fundamental attribution error
 - (C) Barnum effect
 - (D) self-serving bias
 - (E) hindsight bias

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11. Which is the most common criticism of projective tests?
- (A) They are easy to fake.
 - (B) They are too long for most clients.
 - (C) They can only be given to adults.
 - (D) They show low reliability and validity because scoring is subjective.
 - (E) They ignore unconscious processes.

SET C Apply and Extend

Respond as you would on a free-response question.

12. A hospital psychologist must decide whether a patient is experiencing depression and paranoia. (a) Choose one objective and one projective method and justify each. (b) Explain a limitation of each. (c) State one ethical step before administering.
13. A student claims an online quiz "proves" she is a rare personality type because the description fits her perfectly. Using two psychological concepts, evaluate the claim and design a simple test of the quiz's validity.

5.7 Motivation

You will learn the major theories of what energizes and directs behavior, the biology and psychology of hunger and sex, and why rewards can sometimes undermine motivation.

Motivation is a need or desire that energizes and directs behavior toward a goal. Psychologists have offered several theories, each emphasizing something different: inborn programs, internal imbalance, optimal stimulation, or external rewards.

Theory	Core idea	Key term or example	Limitation
Instinct	Behavior is driven by inborn, unlearned patterns	Fixed action pattern; migration	Labels behavior rather than explaining it; ignores learning
Drive reduction (Hull)	A need creates a drive (tension) that pushes us to restore homeostasis	Hunger, thirst; primary and secondary (learned) drives	Cannot explain behaviors that increase arousal, like horror movies
Arousal theory	We seek an optimal level of arousal	Sensation seeking; Yerkes-Dodson law	Optimal level varies between people
Incentive	External rewards and goals pull behavior	Money, praise, grades	Does not explain behavior without obvious incentives
Hierarchy of needs (Maslow)	Needs are arranged from basic to growth needs	Physiological, safety, belonging, esteem, self-actualization	Order not rigid; hard to test

Yerkes-Dodson law

Performance is best at a moderate level of arousal, an inverted U-shaped curve.

For easy or well-learned tasks, the best arousal is higher; for difficult or new tasks, the best arousal is lower.

Too little arousal means boredom; too much means anxiety and poor performance.

EXAMPLE 1: APPLY AROUSAL THEORY

An expert pianist plays best in a packed recital hall, while a student learning a new piece does better in a quiet room. Explain why.

SOLUTION

Performance follows an inverted U with arousal (Yerkes-Dodson).

The well-learned piece benefits from higher arousal, so the crowd helps the expert.

The new piece is a difficult task requiring lower arousal, so the quiet room helps the beginner.

Maslow's hierarchy of needs arranges motives in a pyramid: physiological needs (food, water, sleep), safety, belonging and love, esteem, and self-actualization. The assumption is that a starving person cares little about esteem. The model is intuitive and influential in education and business, but critics note that people sometimes pursue higher goals while basic needs go unmet, such as hunger strikes or artists who sacrifice comfort, and that the ordering seems to differ across cultures.

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Hunger is regulated by the body and the mind. In the brain, the hypothalamus is key: the lateral hypothalamus triggers eating, while the ventromedial hypothalamus signals fullness. Hormones carry signals: **ghrelin** from the empty stomach increases hunger, **leptin** from fat cells signals satiety and long-term energy stores, and insulin controls blood glucose. Hunger is also influenced by taste, culture, the sight of food, stress, and learned habits. Body weight tends to hover near a **set point**, and the body defends it by changing metabolism; this helps explain why dieters regain weight. **Obesity** is linked to genes, environment (high-calorie food, inactivity), sleep loss, and learned eating habits. Eating disorders (anorexia nervosa, bulimia nervosa, binge-eating disorder) are discussed with psychological disorders.

Sexual motivation combines hormones, such as testosterone, with psychological and cultural factors. Masters and Johnson observed the human sexual response cycle in four phases: excitement, plateau, orgasm, and resolution, followed in men by a refractory period during which another orgasm is not possible. Sexual orientation is influenced by a mix of biological factors, such as prenatal hormones and genetics, and there is no evidence that parenting or childhood experiences cause it. Sexual behavior is shaped strongly by culture and learning.

Achievement motivation is the desire for significant accomplishment, mastering skills, and meeting high standards. David McClelland measured the need for achievement (nAch) with the TAT. High achievers prefer moderately challenging tasks, because easy tasks give no satisfaction and impossible tasks guarantee failure. Specific, challenging, and attainable goals improve performance, as do short-term subgoals.

Intrinsic vs extrinsic motivation

Intrinsic: doing something for its own enjoyment or interest; linked to creativity, persistence, and well-being.

Extrinsic: doing something to earn a reward or avoid punishment.

Overjustification effect: giving rewards for an activity people already enjoy can reduce their intrinsic interest in it.

Self-determination theory (Deci and Ryan): motivation grows when people feel autonomy, competence, and relatedness.

In a classic study of the **overjustification effect**, preschoolers who liked to draw were promised a reward for drawing, and later they spent less free time drawing than children who got no reward or an unexpected reward. The reward shifted the explanation for their behavior from "I like it" to "I do it for the prize." Rewards are less harmful when they are unexpected, or when they give information about competence rather than controlling behavior.

EXAMPLE 2: DESIGN A RESEARCH PREDICTION

A teacher pays students \$2 for each book they read, though many of them already enjoyed reading. After the program ends, reading drops below its old level. Explain with a concept and predict what unexpected praise might do.

SOLUTION

The overjustification effect: the extrinsic reward replaced the intrinsic motive.

When the reward ended, the motive for reading disappeared and so did the behavior.

Unexpected praise that signals competence would be less likely to undermine intrinsic interest.

Common mistakes

Drive reduction says we are pushed by internal needs; incentive theory says we are pulled by external goals. Do not claim that Yerkes-Dodson says more arousal is always better. The overjustification effect applies to tasks that are already intrinsically interesting, and it does not mean rewards never work: for dull tasks, extrinsic rewards help.

Practice

SET A Check Your Understanding

Answer each question in one to three sentences.

1. Contrast drive-reduction theory with incentive theory using the example of eating.
2. Describe the Yerkes-Dodson law and how task difficulty changes it.
3. What are the roles of ghrelin and leptin?
4. List the four phases of the sexual response cycle.
5. Why do people with high achievement motivation prefer moderately difficult tasks?
6. Explain the overjustification effect.

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SET B Exam-Style Multiple Choice

Choose the best answer.

7. A person visits a bakery at lunchtime, despite having eaten, because the aroma of cinnamon rolls is irresistible. Which theory best explains this?
(A) Instinct theory (B) Drive-reduction theory (C) Incentive theory
(D) Hierarchy of needs (E) Arousal theory
8. According to the Yerkes-Dodson law, a very difficult task is performed best at
(A) very high arousal (B) very low arousal (C) moderate to high arousal
(D) any level of arousal (E) moderate to low arousal
9. Damage to the ventromedial hypothalamus in rats would most likely lead to
(A) loss of appetite (B) overeating (C) no change in eating
(D) increased ghrelin only (E) lower body weight
10. Children who enjoyed drawing were rewarded with prizes and later drew less than before. This best illustrates
(A) extinction (B) self-actualization (C) drive reduction
(D) overjustification effect (E) the Yerkes-Dodson law
11. Which sequence correctly orders Maslow's needs from most basic to most advanced?
(A) Physiological, safety, belonging, esteem, self-actualization
(B) Safety, physiological, esteem, belonging, self-actualization
(C) Physiological, belonging, safety, esteem, self-actualization
(D) Safety, belonging, physiological, self-actualization, esteem
(E) Physiological, safety, esteem, belonging, self-actualization

SET C Apply and Extend

Respond as you would on a free-response question.

12. A coach wants her athletes to stay motivated for the whole season. Using three concepts from motivation theory (for example arousal, intrinsic and extrinsic motivation, goal setting), describe how she could apply each.
13. Researchers want to test whether a sugary drink (rather than water) reduces hunger. Describe an experiment including the hormones or brain areas that you would measure, the control, and one ethical consideration.

5.8 Emotion

You will learn the major theories of emotion, the role of the brain in emotion, evidence for universal facial expressions, and how culture and regulation shape emotional display.

An **emotion** is a response of the whole organism with three parts: physiological arousal, expressive behavior, and conscious experience (feelings and thoughts). The central theoretical question is how these parts are ordered. Does feeling come first, or arousal, or thought?

The **James-Lange theory** says emotion is the awareness of our body's responses: a stimulus triggers physiological arousal, and the interpretation of that arousal is the emotion. We feel afraid because we tremble and run. The **Cannon-Bard theory** objects that the same bodily changes occur in different emotions and that the body responds too slowly. It says the thalamus sends signals at the same time to the cortex (giving the experience) and to the body (giving arousal), so emotion and arousal occur simultaneously and independently.

The **Schachter-Singer two-factor theory** says emotion requires physical arousal AND a cognitive label for that arousal based on the situation. In their experiment, participants were injected with epinephrine and placed with a confederate who acted euphoric or angry. Those who did not know the true effect of the drug took on the confederate's mood, labeling their arousal according to context. Later research found the effect was weaker than originally claimed, but the two-factor idea led to studies of misattribution of arousal, where people mislabel arousal from one source as another (as with romantic attraction on a shaky bridge).

Two other views focus on the role of thinking. **Richard Lazarus** argued that cognitive appraisal of an event (is it a threat? can I cope?) is always needed before we experience emotion. **Robert Zajonc** argued that some emotional reactions occur instantly and automatically, without conscious appraisal, as with sudden fear. Joseph LeDoux provided brain evidence: the amygdala receives a fast "low road" signal from the thalamus and can trigger fear before the cortex finishes processing. Both are right: emotions can arise by a quick, automatic route and by a slower, thoughtful route.

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Theory	Order of events	Example (seeing a bear)
James-Lange	Stimulus → arousal → emotion	I see a bear, my heart pounds, therefore I feel fear
Cannon-Bard	Stimulus → arousal AND emotion at the same time	I see a bear; my heart pounds and I feel fear together
Schachter-Singer	Stimulus → arousal + cognitive label → emotion	My heart pounds and I label it as fear because of the bear
Lazarus	Stimulus → appraisal → emotion and arousal	I judge the bear as dangerous, then feel fear
Zajonc/LeDoux	Stimulus → immediate emotional response before thinking	I jump before I realize it is a bear

Memorize the sequences

James-Lange: arousal comes BEFORE the feeling ("I am afraid because I run").

Cannon-Bard: arousal and feeling are SIMULTANEOUS.

Two-factor: arousal PLUS a cognitive label.

Lazarus: appraisal comes first; Zajonc: emotion can come first.

EXAMPLE 1: MATCH THE THEORY

A hiker feels her heart race, notices a snake, decides the snake is poisonous, and then feels terror. A second hiker says, "I knew I was frightened only after I found myself running away." Identify the theory best matching each account.

SOLUTION

First hiker: arousal plus a cognitive interpretation of the situation, matching Schachter-Singer (or Lazarus if the appraisal precedes everything).

Second hiker: emotion follows awareness of bodily action, matching James-Lange.

The brain's emotional circuitry involves the **limbic system**. The **amygdala** detects threat and is critical for fear and for tagging emotional events for memory; damage reduces fear. The hypothalamus triggers the body's arousal via the autonomic nervous system, with the sympathetic division mobilizing the body. The prefrontal cortex evaluates and regulates emotional responses, and the right hemisphere is somewhat more involved in negative emotion. Lie detectors (polygraphs) measure arousal indicators like heart rate and sweating, but arousal also occurs in innocent anxious people, so they are unreliable.

Facial expressions express emotion and also contribute to it: in the **facial feedback effect**, adopting a smile can slightly increase positive feelings, although recent replications show the effect is small. Paul Ekman found that people across cultures, including isolated groups such as the Fore of Papua New Guinea, identified expressions of happiness, sadness, anger, fear, surprise, and disgust, supporting the view that these basic expressions are universal and biologically based. But **display rules**, culturally learned norms about when and how to show emotion, vary. In one study, Japanese and American students watched disturbing films; alone, their expressions were similar, but in the presence of an authority figure the Japanese participants masked negative expressions more.

Universal expression, cultural display

Ekman: six basic expressions (happiness, sadness, anger, fear, surprise, disgust) are recognized across cultures.

Display rules: learned, culture-specific norms for when and how to show emotion.

Facial feedback: expression may slightly shape the emotion felt.

Emotion regulation is the use of strategies to influence which emotions we have and how we express them. Cognitive reappraisal, rethinking a situation to change its emotional meaning, usually works better and is healthier than suppression, which hides expression but not the internal arousal. Other strategies include distraction, exercise, sleep, and seeking social support.

EXAMPLE 2: EVALUATE THE EVIDENCE

Participants who just crossed a swaying suspension bridge gave more romantic stories about a researcher than participants who crossed a low solid bridge. Explain using a theory and name the confounding concern.

SOLUTION

Arousal from the bridge was labeled as attraction: misattribution of arousal, consistent with the two-factor theory.

A concern is that the researcher or the participants differed in other ways; random assignment and a control group at both bridges help rule this out.

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Common mistakes

Students often reverse James-Lange and Cannon-Bard. Remember: James-Lange is sequential (body then feeling); Cannon-Bard is simultaneous. Another trap: universal facial expressions do not mean cultures display emotion the same way, because display rules differ. The amygdala is not the only emotion center, and it processes positive emotion too.

Practice**SET A Check Your Understanding**

Answer each question in one to three sentences.

1. State the order of events in the James-Lange theory and give an example.
2. How does the Cannon-Bard theory challenge James-Lange?
3. Describe the procedure and finding of the Schachter-Singer experiment.
4. Contrast Lazarus's and Zajonc's views on thought and emotion.
5. What is a display rule? Give an example.
6. What does the amygdala do in emotion?

SET B Exam-Style Multiple Choice

Choose the best answer.

7. A person says, "I feel sad because I am crying." This statement best matches the
 - (A) Cannon-Bard theory
 - (B) Schachter-Singer theory
 - (C) Lazarus's theory
 - (D) James-Lange theory
 - (E) Zajonc's theory
8. According to Cannon-Bard, when a driver slams on the brakes to avoid a crash, fear and physiological arousal
 - (A) occur separately in different people
 - (B) occur at the same time
 - (C) come from the cortex alone
 - (D) occur before the stimulus
 - (E) are caused by the label applied to arousal
9. Ekman's cross-cultural research on facial expressions supports the idea that
 - (A) all emotions are learned
 - (B) display rules are universal
 - (C) basic emotional expressions are recognized across cultures
 - (D) the amygdala controls facial muscles
 - (E) emotions are always conscious
10. The Schachter-Singer two-factor theory says emotion depends on
 - (A) arousal and a cognitive label
 - (B) hormones only
 - (C) the thalamus only
 - (D) display rules
 - (E) unconscious motives
11. Which structure is most closely associated with a rapid, nonconscious fear response?
 - (A) Broca's area
 - (B) Hippocampus
 - (C) Cerebellum
 - (D) Amygdala
 - (E) Corpus callosum

SET C Apply and Extend

Respond as you would on a free-response question.

12. A student's heart races before a speech, and she tells herself, "I'm excited, not scared." Later she speaks well. (a) Apply the two-factor theory. (b) Explain how reappraisal differs from suppression. (c) Explain the effect on performance using the Yerkes-Dodson law.
13. Design a study to test whether display rules differ between two cultures, identifying the independent and dependent variables and one confound to control.

5.9 Multiple-Choice Practice: Social Psychology and Personality

Twenty AP-style questions covering attribution, social influence, prejudice, personality, assessment, motivation, and emotion.

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Choose the best answer to each question. Several items present short research scenarios; identify the variables and the concept being tested before you answer. Check the explanation for the reasoning behind both the correct answer and the most tempting wrong one.

SET A Core Concepts

Choose the best answer for each question.

1. A driver cuts you off and you conclude, "What a selfish person," without considering that the driver might be rushing to an emergency. This is the
 - (A) fundamental attribution error
 - (B) self-serving bias
 - (C) just-world hypothesis
 - (D) actor-observer bias
 - (E) mere exposure effect
2. In Asch's classic line-judgment study, conformity was reduced most when
 - (A) the lines were harder to compare
 - (B) the group became larger than ten
 - (C) one confederate gave the correct answer
 - (D) the participant answered last
 - (E) the confederates were strangers
3. Which statement about stereotypes, prejudice, and discrimination is correct?
 - (A) Discrimination is a belief and prejudice is an action.
 - (B) A stereotype is an emotional reaction to a group.
 - (C) Prejudice always leads to discrimination.
 - (D) Stereotypes are always negative and inaccurate.
 - (E) A person can hold prejudice without engaging in discrimination.
4. Freud proposed that the part of personality that operates on the reality principle is the
 - (A) id
 - (B) ego
 - (C) superego
 - (D) collective unconscious
 - (E) self-concept
5. A researcher scores a questionnaire by counting the number of true answers on each scale, and the test also checks for random answering. The test is most likely
 - (A) a projective test
 - (B) a behavioral observation
 - (C) a thematic apperception test
 - (D) a self-report inventory such as the MMPI
 - (E) a structured interview
6. According to the James-Lange theory, the sequence of emotion is
 - (A) stimulus, then arousal and emotion simultaneously
 - (B) stimulus, cognitive label, then arousal
 - (C) stimulus, then appraisal, then arousal only
 - (D) stimulus, then emotion, then arousal
 - (E) stimulus, physiological arousal, then the experience of emotion
7. According to drive-reduction theory, behavior is motivated primarily by
 - (A) external rewards
 - (B) the desire to fulfill potential
 - (C) an optimal level of arousal
 - (D) internal tension from unmet physiological needs
 - (E) inherited fixed action patterns

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SET B Applications and Data

Choose the best answer for each question.

8. Participants in a study wrote essays for a lower-paid or higher-paid reward arguing that a boring task was fun. Those paid less later rated the task as more enjoyable. Which explains the finding?
- (A) cognitive dissonance reduction through attitude change
 - (B) operant reinforcement from the payment
 - (C) the mere exposure effect
 - (D) diffusion of responsibility
 - (E) social loafing
9. A researcher asks 20 participants to complete a puzzle either alone or in a group where individual scores are not recorded. Group members solve fewer puzzles each. This demonstrates
- (A) social facilitation
 - (B) groupthink
 - (C) deindividuation
 - (D) social loafing
 - (E) group polarization
10. In a study of helping, a participant hears a confederate have a seizure. The percentage who seek help is 85% when alone, 62% with one other, and 31% with four others. This pattern shows
- (A) the foot-in-the-door effect
 - (B) diffusion of responsibility
 - (C) stereotype threat
 - (D) the contact hypothesis
 - (E) reciprocity
11. A school sets up classrooms where each student must teach one section of the lesson to teammates, who need all sections to pass. This design most clearly applies
- (A) the contact hypothesis and superordinate goals
 - (B) cognitive dissonance
 - (C) social facilitation
 - (D) the self-serving bias
 - (E) the overjustification effect
12. Students in a TAT study tell stories about ambiguous pictures; those whose stories feature mastering challenges tend to earn higher grades. The stories seem to measure
- (A) conscientiousness reliability
 - (B) locus of control
 - (C) need for achievement
 - (D) superego strength
 - (E) reaction formation
13. A new quiz gives scores that correlate $+ .85$ when repeated two weeks later but only $+ .10$ with independent ratings of the trait by friends. The best conclusion is that the quiz
- (A) is valid but unreliable
 - (B) is both reliable and valid
 - (C) is unreliable and invalid
 - (D) has high predictive validity
 - (E) is reliable but has poor validity
14. Participants who just exercised vigorously met an attractive confederate and reported more attraction than those who had not exercised. This is evidence for
- (A) the James-Lange theory only
 - (B) misattribution of arousal as in the two-factor theory
 - (C) the facial feedback hypothesis
 - (D) display rules
 - (E) the mere exposure effect

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SET C Exam-Level Stretch

Choose the best answer for each question.

15. Which research design would provide the strongest evidence that violent video games increase aggression?
(A) Survey gamers and nongamers about their aggression
(B) Randomly assign participants to play violent or nonviolent games and measure aggression afterward
(C) Observe children at home and count games they own
(D) Interview parents about children's behavior
(E) Compare national crime rates with game sales
16. A person who avoids parties because of anxiety has fewer friends, which increases anxiety. This cycle is best explained by
(A) the actor-observer bias (B) the Barnum effect (C) reaction formation
(D) the contact hypothesis (E) reciprocal determinism
17. Which statement best summarizes the Yerkes-Dodson principle for a student preparing for a difficult physics exam?
(A) Maximum arousal will always maximize scores
(B) Arousal has no relation to performance
(C) Staying calm to maintain moderate arousal will help most
(D) Arousal helps only on easy tasks
(E) Lower arousal always raises performance
18. A teacher expects a new student to be gifted, gives extra attention and challenging work, and the student excels. This best illustrates
(A) the fundamental attribution error (B) group polarization
(C) the Barnum effect (D) a self-fulfilling prophecy
(E) a defense mechanism
19. A therapist who adopts a person-centered approach differs from a psychoanalyst chiefly because the person-centered therapist
(A) avoids interpreting unconscious conflicts and instead provides acceptance and empathy
(B) stresses childhood psychosexual stages
(C) uses inkblots to reveal hidden desires
(D) directs the client to specific behaviors
(E) argues that traits are inherited
20. Which finding would most directly challenge Mischel's critique of trait theory?
(A) Behavior differs sharply between home and work
(B) Identical twins show different traits
(C) Aggregating behavior across many situations shows that traits predict average behavior well
(D) People rate their own traits inconsistently
(E) Test scores vary after a year

5.10 Free-Response Practice: Social Psychology and Personality

Four free-response questions in the Article Analysis and Evidence-Based formats.

Each question is scored by points for specific skills: identifying variables, naming and explaining concepts, applying evidence, and building a claim with reasoning. Answer every part in full sentences, name the concept, and connect it to the details given. Compare your response with the scoring points in the model answers.

QUESTION 1 Article Analysis: Group Effort

A researcher studied whether group size affects effort. Eighty volunteer students were randomly assigned to shout as loudly as they could, either alone or in a group of six, wearing headphones that blocked the sound of others. Half the participants in each condition were told their individual loudness would be measured, and half were told only the group's loudness would be measured. Average individual loudness was recorded in decibels. Participants in the group who believed only group loudness was measured shouted the least loudly; the other three conditions were similar to each other.

1. (a) Identify the independent variable(s) and the dependent variable in this study.
2. (b) Name the psychological phenomenon demonstrated and explain how the results show it.
3. (c) Explain one limitation of the study's generalizability, and one way a manager could apply the findings to reduce this effect.

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QUESTION 2 Evidence-Based Question: Personality

Use the following evidence and your knowledge of psychology to respond. Source 1: In a study of 400 pairs of twins, correlations for extraversion were $+0.55$ for identical twins and $+0.22$ for fraternal twins. Source 2: In a survey across several nations, individuals in collectivist cultures scored lower on average on self-reported individual assertiveness than people in individualistic cultures. Source 3: A longitudinal study found that children rated as highly conscientious at age 10 had better health and income decades later.

4. (a) Using Source 1, explain what the data suggest about heredity and extraversion and state one limitation.
5. (b) Using Source 2, explain how culture may influence personality expression and why a researcher should be cautious about generalizing the results to every individual.
6. (c) Using Source 3 and the Big Five, explain what the finding suggests about conscientiousness.
7. (d) Write a claim, supported by at least two of the sources, about whether personality is determined by nature or nurture.

QUESTION 3 Article Analysis: Rewards and Motivation

A psychologist observed 60 elementary students who frequently chose to read during free time. For six weeks, one randomly selected half received a sticker for every book they finished; the other half received no stickers. At the end of week six, stickers were stopped for everyone. In the following two weeks, students who had earned stickers spent 40 percent less time reading in free time than before the experiment, while the other group's reading time was unchanged.

8. (a) Identify the independent variable and the dependent variable.
9. (b) Identify the psychological effect demonstrated and explain it.
10. (c) Explain how self-determination theory suggests that the teacher could encourage reading without lowering intrinsic motivation.
11. (d) Explain one reason that the experiment's random assignment is an advantage.

QUESTION 4 Evidence-Based Question: Prejudice and Emotion

Use the following evidence and your knowledge of psychology. Source 1: At a summer camp, two groups of boys compete in tournaments and become hostile. Hostility decreased only after the camp leaders created situations such as repairing the water supply that required both groups to cooperate. Source 2: Participants from several cultures matched photographs of faces to emotion labels with high accuracy for happiness, anger, fear, and surprise. Source 3: Employees who were assigned to work with an outgroup member on a shared project reported less negative stereotyping afterward than employees who only attended a mixed social event.

12. (a) Identify the concept illustrated in Source 1 and explain how it reduced conflict.
13. (b) Explain what Source 2 suggests about the origin of basic emotional expressions, and name one factor that can still make the display of emotion differ across cultures.
14. (c) Use Source 3 and the contact hypothesis to explain why the two situations differed in effect.
15. (d) Make and defend a claim about how intergroup bias can be reduced, using at least two sources.

Answers Chapter 5: Answers and Explanations

Answers for every practice problem, numbered to match. Read the explanation even when your answer is correct.

5.1 Attribution and Social Cognition**SET A • CHECK YOUR UNDERSTANDING**

1. The FAE is the tendency to overestimate personality and underestimate the situation when explaining other people's behavior. Example: assuming a driver who cuts you off is rude, rather than hurrying to a hospital.
2. A dispositional attribution explains behavior by internal traits, motives, or abilities. A situational attribution explains it by external factors such as social pressure, luck, or the environment. The same act, such as failing a test, can be attributed either way.
3. People credit successes to their own ability or effort (internal) and blame failures on bad luck or unfair conditions (external). That keeps a positive self-image after failure and boosts pride after success.
4. This is the just-world hypothesis, the belief that people get what they deserve. A harmful consequence is victim blaming: the person is held responsible and may receive less sympathy or help.
5. Dissonance is reduced by changing the attitude to match the behavior, changing the behavior, or adding justifying thoughts that make the behavior seem acceptable. Weak external justification pushes people toward changing the attitude.
6. The central route persuades through careful evaluation of argument quality and gives lasting change when people are motivated and able to think. The peripheral route persuades through cues like celebrity or attractiveness, works when people are distracted or uninvolved, and gives more temporary change.

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SET B · EXAM-STYLE MULTIPLE CHOICE

7. C. She explains her own failure with the situation and the classmate's with a disposition, which is the actor-observer bias. B is tempting because her own explanation is self-serving, but the contrast between self and other is the key.
8. A. A large request is refused and then a smaller one follows, which is door-in-the-face. Foot-in-the-door (B) starts small and moves up.
9. E. Weak external justification (\$1) leaves people to justify the behavior internally by changing their attitude. Reinforcement (A) would predict MORE change with the larger payment.
10. B. Careful evaluation of arguments is the central route. The peripheral route (A) relies on cues like celebrity or looks.
11. C. Dissonance research shows behavior can change attitudes. A is false because attitudes predict behavior only imperfectly.

SET C · APPLY AND EXTEND

12. Scoring points: (1) Foot-in-the-door: ask students first to sign a small pledge or pick up five pieces of litter, then request a larger commitment such as joining a cleanup committee; compliance with the small step changes self-image, making a larger request more likely to be accepted. (2) Dissonance: have students publicly argue for anti-littering rules with little external reward; having stated the attitude, littering would create tension, so they reduce it by littering less and valuing cleanliness. Each part needs the method AND the psychological reason.
13. Scoring points: (1) IV: culture (individualistic vs collectivist participants). (2) DV: the extent to which participants attribute a described person's behavior to disposition rather than situation, for example a rating scale after reading an essay written under assigned instructions. (3) Both groups get the identical scenario. (4) Supporting result: the individualistic group gives significantly more dispositional ratings, ignoring the situational constraint, than the collectivist group.

5.2 Conformity, Obedience, and Group Behavior**SET A · CHECK YOUR UNDERSTANDING**

1. The IV was the size and unanimity of the group giving wrong answers (the group's responses). When one confederate gave the correct answer, conformity dropped sharply because the unanimity was broken and the participant felt supported in dissenting.
2. Obedience fell when the experimenter gave orders by phone or was absent, when the learner was in the same room, and when other teachers refused. Any two of these with brief reasoning are acceptable: reduced authority or increased personal responsibility lowers obedience.
3. Normative influence is conformity to gain approval or avoid rejection and often produces only public compliance. Informational influence is conformity because the group is seen as a source of accurate information, and often produces private acceptance.
4. Social loafing occurs because individuals feel their effort is not identifiable or needed, so they exert less. A teacher can assign individual roles, grade individual contributions, or make the task more meaningful and the group smaller.
5. Groupthink is a group's drive for harmony that overrides realistic evaluation of alternatives. Symptoms include self-censorship, illusion of unanimity, illusion of invulnerability, and pressure on dissenters.
6. With many witnesses, each person assumes someone else will act, so personal responsibility is spread thin and no individual feels obligated. As a result, the chance that any one person helps falls as the group grows.

SET B · EXAM-STYLE MULTIPLE CHOICE

7. C. She complies to be accepted while privately disagreeing, which is normative influence. A is tempting but informational influence involves believing the group is right.
8. A. About 65% reached 450 volts. D overstates; Milgram's surprise was that so many went all the way, but not nearly all.
9. D. Presence of an audience improves well-practiced performance, as with an expert sprinter. A is wrong because loafing is reduced effort in groups where effort is not identifiable.
10. B. Discussion strengthened the initial leaning, which is group polarization. A requires suppressed dissent and poor decision making, which is not described.
11. C. Being the only witness removes diffusion of responsibility, so responsibility is not shared. B and A reduce helping through diffusion; D and E promote pluralistic ignorance.

SET C · APPLY AND EXTEND

12. Scoring points: (a) Groupthink (1 point); two symptoms such as self-censorship and pressure toward conformity or a dominant leader and illusion of unanimity (2 points). (b) Any two preventive steps such as appointing a devil's advocate, inviting outside experts, having the leader withhold an opinion, or splitting into independent subgroups (1 point each), with a brief reason they restore critical evaluation.
13. Scoring points: IV = anonymity (e.g., participants in hoods or name tags vs identifiable) with random assignment; DV = measure of aggression such as the intensity or duration of a mild noise blast or points taken from a partner; concept = deindividuation, predicted to increase aggression when anonymous; safeguard = informed consent, debriefing, option to withdraw, or limiting harm (e.g., using harmless noise or a simulated opponent).

5.3 Prejudice, Aggression, and Prosocial Behavior

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SET A · CHECK YOUR UNDERSTANDING

1. A stereotype is a belief (for example, "teenagers are irresponsible"), prejudice is an attitude or emotion (disliking teenagers), and discrimination is an action (refusing to rent to teenagers). They correspond to cognitive, affective, and behavioral components.
2. When people are frustrated by job loss, they may displace blame onto a visible out-group, treating them as the cause of the problem. This lets the in-group explain its frustration and protects its self-image, as in the scapegoat theory.
3. Conditions include equal status, common goals, cooperation, and support from authority. An application is the jigsaw classroom, where students depend on one another's material and work together.
4. It showed that competition between groups produced hostility and that mere contact did not fix it. Cooperation toward superordinate goals, which neither group could reach alone, reduced the conflict and led to friendships.
5. Hostile aggression arises from anger and aims at harming the target (a punch in a fight). Instrumental aggression is harm used as a tool to obtain something else (a mugger hurting a victim to take a wallet).
6. Proximity and similarity are two. Proximity is shown by people forming friendships with those who live or sit nearby, and mere exposure explains that repeated contact increases liking, as Zajonc found with repeated unfamiliar symbols.

SET B · EXAM-STYLE MULTIPLE CHOICE

7. C. Unjustified negative behavior is discrimination. A is a belief, not an action.
8. D. Cooperation toward superordinate goals reduced conflict. A is the tempting wrong choice because contact alone did not.
9. E. Children imitated a rewarded or observed model, the point of social-learning theory. A would require blocked goals.
10. C. The reciprocity norm says to repay favors. A contradicts altruism, and D reverses hostile and instrumental aggression.
11. A. Repeated exposure increases liking. The halo effect (B) is about assuming attractive people have other positive traits.

SET C · APPLY AND EXTEND

12. Scoring points: (1) Mixed teams create contact where players share the superordinate goal of winning. (2) Success requires equal status (no town favored), cooperation rather than rivalry, and support from the mayors, coaches, and parents. (3) Cooperation breaks down in-group/out-group categories, so stereotypes weaken. Stating that contact alone could fail earns a bonus.
13. Scoring points: (1) Diffusion of responsibility or the bystander effect (many people, so less personal responsibility) AND (2) a second concept such as social exchange, reciprocity norm, empathy-altruism, or pluralistic ignorance. (3) Experiment: IV = number of bystanders (e.g., 1 vs 5 confederates), random assignment, DV = whether and how quickly the participant helps. (4) Prediction: less helping with more bystanders.

5.4 Personality Theories I: Psychodynamic and Humanistic**SET A · CHECK YOUR UNDERSTANDING**

1. The id seeks immediate gratification (pleasure principle), the superego imposes moral standards, and the ego balances them with reality (reality principle). Conflicts among them create anxiety that the ego manages with defense mechanisms.
2. Fixation is a lingering focus on an earlier psychosexual stage because needs there were over-frustrated or over-indulged. Toilet training is the anal stage.
3. Repression pushes threatening thoughts or memories into the unconscious so they are not remembered. Denial refuses to accept that a painful reality exists even though it is consciously available.
4. Freud's unconscious is personal, containing repressed individual experiences and urges. Jung's collective unconscious is shared by all humans and includes inherited archetypes.
5. The order is physiological, safety, belonging and love, esteem, then self-actualization. Lower needs generally need to be reasonably satisfied before higher ones become dominant.
6. Conditions of worth mean love and approval depend on meeting standards. People then distort or deny experiences to meet those conditions, creating a gap between the real self and ideal self and lowering self-esteem.

SET B · EXAM-STYLE MULTIPLE CHOICE

7. B. The aggressive impulse is redirected from the parent to a safer target, the dog. Projection (A) would attribute the child's own feelings to someone else.
8. D. Adler emphasized inferiority and the striving for superiority. Jung (A) is tied to the collective unconscious.
9. A. Acceptance without conditions is Rogers' unconditional positive regard. Self-actualization (C) is a goal, not a therapist's behavior.
10. B. Psychoanalytic ideas are hard to falsify and often explain results after the fact. A and D apply to determinism and optimism, which are criticisms of other perspectives or reversed.
11. C. An unacceptable urge is expressed as its opposite, which is reaction formation. Sublimation (B) would redirect it into a socially acceptable form, not oppose it.

SET C · APPLY AND EXTEND

12. Scoring points: (a) Rationalization (the course is pointless) and displacement (yelling at the roommate), 1 point each, with the explanation that the ego reduces anxiety by distorting reality (1 point). (b) The counselor would show empathy, genuineness, and unconditional positive regard, listening without judging so the student can explore feelings and reduce incongruence (1 point).
13. Scoring points: (a) Psychoanalytic: unconscious drives and conflicts determine behavior; humanistic: conscious experience and self-perception matter (1). (b) Psychoanalytic: people are driven by instincts and conflict, largely deterministic; humanistic: people are basically good with free will and a growth drive (1). (c) Limitations: Freud untestable; humanistic subjective and hard to measure, too optimistic (1).

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5.5 Personality Theories II: Trait and Social-Cognitive

SET A · CHECK YOUR UNDERSTANDING

1. Openness, Conscientiousness, Extraversion, Agreeableness, Neuroticism. The low end of conscientiousness is impulsive and disorganized; low extraversion is reserved or introverted.
2. Eysenck used extraversion-introversion and emotional stability-neuroticism, later adding psychoticism. Combining positions on the two dimensions describes types of personality.
3. Cardinal traits dominate a person's entire personality (rare), central traits are the few general characteristics that describe a person, and secondary traits appear in specific situations such as preferences.
4. Identical twins share all their genes and fraternal twins about half, so if identical twins are more similar, genes likely contribute. Twins reared apart help separate genes from the shared environment.
5. It is the idea that behavior, personal factors, and the environment all influence one another. Example: a shy student avoids clubs, so she makes fewer friends, which increases her shyness.
6. External locus of control is the belief that outside forces control outcomes in general. Low self-efficacy is doubt about your own ability to do a particular task. A person might believe outcomes are controlled by effort (internal) yet doubt that they personally have the skill.

SET B · EXAM-STYLE MULTIPLE CHOICE

7. E. Organization and reliability define conscientiousness. Agreeableness (B) concerns cooperation, not carefulness.
8. C. The three factors operate in both directions. B is a behaviorist view that ignores personal factors.
9. D. Identical twins show greater similarity than fraternal twins. C is wrong because heritability is a group statistic, and E overstates the findings.
10. B. Attributing outcomes to luck is external locus of control. A is the opposite of the second student's view and fits the first.
11. C. Mischel argued that situations strongly influence behavior and traits predict specific acts poorly. A is tempting but the dispute was about prediction, not measurement.

SET C · APPLY AND EXTEND

12. Scoring points: (a) Give a self-report Big Five questionnaire to students (1) and collect GPA from records (1), then calculate a correlation coefficient (1). (b) A correlation does not show causation: a third variable such as intelligence or parental support may influence both, or good grades may increase conscientiousness (1).
13. Scoring points: Trait view: shyness is a stable disposition (introversion), and the difference may reflect the weaker influence of the work role (1). Social-cognitive view: behavior depends on the situation, learned experiences, and beliefs such as self-efficacy, in reciprocal determinism with the setting (1). Person-situation debate: behavior varies across situations (Mischel), but traits still predict averages over time (1).

5.6 Personality Assessment

SET A · CHECK YOUR UNDERSTANDING

1. A projective test presents ambiguous stimuli, such as inkblots, and asks the person to interpret them. It assumes that unconscious motives and conflicts will shape the responses, so the interpretation reveals hidden personality.
2. Strengths: objective scoring and validity scales that detect lying or random responding; it was built empirically. Weakness: people can fake or answer in socially desirable ways, and results depend on self-insight.
3. Reliability is consistency, such as getting the same score when a test is retaken. Validity is accuracy, whether it measures what it claims. A scale that always reads 5 pounds too heavy is reliable but not valid.
4. People tell stories about ambiguous scenes, and the themes in the stories (achievement, power, affiliation) are thought to reflect their own motives. Murray used it to measure needs such as the need for achievement.
5. It is the tendency to see vague, general statements as personally accurate. Horoscopes are an example: many people feel the description fits them though it fits nearly anyone.
6. Obtain informed consent and keep results confidential, except for danger to self or others. Also use valid, reliable tests appropriate to the person's culture and avoid basing major decisions on a single test.

SET B · EXAM-STYLE MULTIPLE CHOICE

7. B. Interpreting ambiguous inkblots is the Rorschach, a projective test. A is wrong because self-report uses clear items.
8. A. Stable scores indicate reliability, but not predicting relevant behavior means low validity. D is tempting but validity is lacking.
9. E. Validity scales flag lying or random responding. C is wrong because inkblot scoring belongs to projective tests.
10. C. Accepting a generic description as personal is the Barnum effect. The halo effect (A) concerns generalizing from one positive trait.
11. D. Subjective scoring leads to inconsistent interpretations and weak validity. A describes self-report inventories more than projective tests.

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SET C · APPLY AND EXTEND

12. Scoring points: (a) MMPI-2 (clinical scales for depression and paranoia, validity scales) and a Rorschach or TAT (to explore unconscious themes and open discussion), 1 each. (b) MMPI: faking or limited self-insight; projective: subjective scoring and low validity, 1 each. (c) Informed consent or explaining confidentiality limits, 1.
13. Scoring points: (1) Barnum effect: the description is vague and fits almost anyone. (2) Validity concern: the quiz may not measure what it claims; confirmation bias may add. (3) Test: give participants either their own result or a randomly chosen one, and ask them to rate accuracy; if ratings are equal the quiz lacks validity. Another good option is to see whether results predict an independent criterion such as peer ratings.

5.7 Motivation**SET A · CHECK YOUR UNDERSTANDING**

1. Drive-reduction says a physiological need such as low energy creates tension that pushes us to eat and restore balance. Incentive theory says the smell or sight of appealing food pulls us to eat even when we are not hungry.
2. Performance rises with arousal up to a moderate level and then declines, an inverted U. The best arousal is higher for easy or well-learned tasks and lower for hard or new tasks.
3. Ghrelin is released by the empty stomach and increases hunger. Leptin is released by fat cells, signals the brain that energy stores are sufficient, and reduces appetite.
4. Excitement, plateau, orgasm, and resolution. In men there is also a refractory period after orgasm.
5. Easy tasks give little satisfaction from success, and very hard tasks risk failure with no payoff. Moderate tasks provide a challenge that is attainable, so success is both meaningful and possible.
6. It is the reduction of intrinsic motivation when external rewards are given for an activity already enjoyed. The person attributes the behavior to the reward and stops doing it when the reward is gone.

SET B · EXAM-STYLE MULTIPLE CHOICE

7. C. The aroma is an external incentive pulling the person, even without a biological need. B is tempting but there is no internal deficit.
9. B. The ventromedial hypothalamus signals fullness, so damage causes overeating and weight gain. A confuses it with the lateral hypothalamus.
11. A. The pyramid runs physiological, safety, belonging and love, esteem, self-actualization. E reverses esteem and belonging.
8. E. Difficult tasks are done best at lower arousal, while still being moderate. C fits simple tasks.
10. D. A reward for an enjoyed activity reduced interest, the overjustification effect. B is incorrect because self-actualization is a growth need.

SET C · APPLY AND EXTEND

12. Scoring points: any three applications with explanation. Arousal: lower pre-game anxiety on difficult skills, but energize simple drills (Yerkes-Dodson). Intrinsic: allow choice and emphasize mastery and enjoyment (self-determination: autonomy, competence). Extrinsic and overjustification: use rewards sparingly and informatively. Goal setting: specific, moderate, and short-term goals boost persistence (1 point each concept, 1 for correct application).
13. Scoring points: (1) IV = sugary drink vs water, with random assignment (and blind to the extent possible). (2) DV = self-reported hunger and/or amount eaten later, plus a measured hormone such as ghrelin or leptin, or blood glucose. (3) Control = water group; same timing and baseline hunger. (4) Ethics: informed consent and screening for conditions such as diabetes or allergies.

5.8 Emotion**SET A · CHECK YOUR UNDERSTANDING**

1. A stimulus produces physiological arousal, and the awareness of that arousal is the emotion. Example: you see a car skid, your heart pounds, and you feel afraid because you notice the pounding.
2. Cannon and Bard argued that the body produces similar arousal in many emotions, so arousal cannot identify them, and that the body is too slow. They said the thalamus triggers arousal and the experience of emotion simultaneously.
3. Participants were injected with epinephrine, with or without being told the effects, and placed with a confederate who acted euphoric or angry. Those who lacked an explanation for their arousal adopted the confederate's mood, showing that emotion depends on a cognitive label.
4. Lazarus said emotion requires an appraisal of the event; thought precedes feeling. Zajonc said some emotional reactions occur automatically without conscious thought. LeDoux's work on the quick amygdala pathway supports Zajonc.
5. A display rule is a culturally learned norm about how and when to show emotions. Example: in some cultures people suppress open displays of grief or anger in public, while in others they are expected to express them.
6. The amygdala detects threats, triggers fear responses, and helps tag emotional events for memory. People with amygdala damage show reduced fear responses and have difficulty recognizing fear.

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SET B • EXAM-STYLE MULTIPLE CHOICE

7. D. Awareness of bodily changes (crying) produces the emotion, which is James-Lange. A is wrong since Cannon-Bard says feeling and arousal happen together.
9. C. Recognition of basic expressions across cultures suggests that they are universal. B contradicts the evidence, since display rules vary between cultures.
11. D. The amygdala handles quick threat responses. Hippocampus (B) is associated with forming new explicit memories.
8. B. Cannon-Bard says arousal and emotion are simultaneous. A and E describe other theories (two-factor or individual differences).
10. A. Two factors: arousal plus a cognitive label from the situation. B is tempting but ignores thought, which is the unique element.

SET C • APPLY AND EXTEND

12. Scoring points: (a) Arousal (racing heart) is labeled with a cognitive interpretation ('excited'), which determines the emotion (1). (b) Reappraisal changes the meaning of the situation and the emotion; suppression hides the expression but not the internal arousal and is less effective (1). (c) Moderate arousal helps performance on a task, while too much hurts, so relabeling can keep arousal at a useful level (1).
13. Scoring points: IV = culture of participant (and possibly presence of an authority figure vs being alone); DV = degree of facial expression of negative emotion, rated by coders blind to the culture; same standardized stimulus films for all. Confounds to control: participants' age, language of instructions, prior exposure to films, or the experimenter's identity. Prediction: expression differs only in public settings, supporting display rules.

5.9 Multiple-Choice Practice: Social Psychology and Personality**SET A • CORE CONCEPTS**

1. A. You are overestimating disposition and ignoring the situation when judging another person. Actor-observer bias needs a contrast with how you explain your own behavior.
3. E. Prejudice is an attitude and discrimination is behavior, so one can exist without the other. The option reversing the two terms fails because stereotype is the belief, prejudice the feeling, and discrimination the act.
5. D. Fixed-response items scored by formula with validity checks fit an MMPI-like inventory. A projective test would use ambiguous stimuli and interpretation.
7. D. A need creates a drive that pushes organisms to restore homeostasis. External rewards belong to incentive theory.
2. C. Breaking unanimity with a single ally sharply lowers conformity. A larger group does not increase conformity beyond about three or four people.
4. B. The ego mediates between id demands and the real world. The superego is the moral component, not the realistic one.
6. E. James-Lange places arousal before feeling. The simultaneous sequence is Cannon-Bard.

SET B • APPLICATIONS AND DATA

8. A. Low pay offers little external justification, so people change the attitude to reduce dissonance. Reinforcement would predict more enjoyment with higher pay.
9. D. Reduced individual effort when contributions are not identifiable is social loafing. Social facilitation would show improved performance on easy tasks in front of others.
10. B. As witnesses increase, each person feels less responsible, so the rate of helping drops. The other options do not involve group size and responsibility.
11. A. Interdependent cooperation among equals mirrors the conditions for reducing prejudice. Overjustification involves rewards undermining interest, not cooperation.
12. C. Achievement themes in TAT stories are used to measure McClelland's need for achievement. Locus of control is typically measured with a self-report scale.
13. E. The stable scores show reliability, but poor agreement with an independent criterion shows low validity.
14. B. Arousal from exercise was labeled as attraction because of the context. Facial feedback concerns expression changing feelings, not mislabeling arousal.

SET C • EXAM-LEVEL STRETCH

15. B. Random assignment to a manipulated condition permits causal inference. The surveys and ecological data are correlational and open to third variables.
17. C. Difficult tasks are best performed at a moderate-to-low level of arousal. Maximum arousal usually impairs complex tasks.
19. A. Rogers' approach relies on genuineness, unconditional positive regard, and empathy. Interpretation of unconscious conflict characterizes psychoanalysis.
16. E. Behavior, personal factors, and the environment influence one another. The Barnum effect concerns accepting vague descriptions.
18. D. The teacher's expectation changed treatment, which produced the expected result. The FAE concerns explaining behavior, not creating it.
20. C. Trait supporters argue that traits predict behavior averaged across situations and time even if single acts vary. Variation across settings supports Mischel's critique.

5.10 Free-Response Practice: Social Psychology and Personality

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QUESTION 1 · ARTICLE ANALYSIS: GROUP EFFORT

- 1 point: IVs = group size (alone vs group of six) and whether individual output was identifiable (individual vs group-only measurement). 1 point: DV = average individual loudness in decibels.
- 1 point: social loafing. 1 point: individuals exerted less effort in a group when their own contribution was not identifiable, but not when it was measured individually or when alone.
- 1 point: a limitation, for example volunteer college students and a simple shouting task may not generalize to workers or complex tasks (or an artificial lab setting). 1 point: application, for example make individual contributions identifiable or assign individual accountability to reduce loafing.

QUESTION 2 · EVIDENCE-BASED QUESTION: PERSONALITY

- 1 point: identical twins are more similar than fraternal twins, suggesting a genetic influence on extraversion. 1 point: limitation such as identical twins may be treated more alike, or correlation below 1.0 shows environment matters.
- 1 point: individualistic cultures encourage independence and self-promotion, collectivist cultures emphasize group harmony, which shapes self-concept and traits. 1 point: group averages do not apply to each individual (variation within cultures; self-report bias).
- 1 point: conscientiousness is a Big Five trait that is stable over time and predicts life outcomes like health and income. 1 point: correct explanation of predictive value or stability, noting that it does not prove causation.
- 1 point: a defensible claim, such as personality results from the interaction of both heredity and environment. 1 point: use of at least two sources as evidence connected to the claim (twin data for nature, cultural data for nurture). 1 point: explanation or reasoning that links the evidence to the claim, with acknowledgement of a counterpoint.

QUESTION 3 · ARTICLE ANALYSIS: REWARDS AND MOTIVATION

- 1 point: IV = receiving stickers for finished books (sticker vs no sticker). 1 point: DV = amount of free-time reading, measured after stickers stopped.
- 1 point: overjustification effect. 1 point: an extrinsic reward for an activity already enjoyed shifts attribution of the behavior from interest to reward, lowering intrinsic motivation when the reward is removed.
- 1 point: support autonomy (let students choose their books), competence (give informative feedback), or relatedness (reading with peers), rather than controlling rewards.
- 1 point: random assignment makes the groups equivalent on average, such as initial interest in reading, so differences can be attributed to the stickers.

QUESTION 4 · EVIDENCE-BASED QUESTION: PREJUDICE AND EMOTION

- 1 point: superordinate goals (the Robbers Cave study). 1 point: shared goals that neither group could achieve alone forced cooperation, replacing competition and the in-group/out-group division.
- 1 point: the high agreement across cultures suggests basic expressions are universal and biologically based. 1 point: display rules (culturally learned norms about showing emotion).
- 1 point: the shared project provided cooperation, a common goal, and interdependence; a social event involves mere contact without these conditions. 1 point: explanation that contact reduces prejudice only under conditions such as equal status and common goals.
- 1 point: a defensible claim, such as cooperative contact toward common goals reduces prejudice. 1 point: uses Sources 1 and 3 as evidence. 1 point: reasoning that connects the evidence to the claim, perhaps noting that contact alone is insufficient.

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Chapter 6: Mental and Physical Health.

10 sections with explanations and worked examples, then 140 practice problems. Answers and full explanations are at the end of the chapter.

6.1 Defining and Classifying Psychological Disorders

Learn how psychologists define and classify disorders, the main explanatory models, and why labels and culture complicate diagnosis.

A **psychological disorder** is a pattern of thoughts, feelings, or behaviors that is deviant, distressing, and dysfunctional. Psychologists use the three Ds as a checklist: the pattern departs from what a culture treats as normal (**deviance**), it causes the person suffering (**distress**), and it interferes with work, school, or relationships (**dysfunction**). Some definitions add danger to self or others. No single D is enough. Being unusual alone is not a disorder (a world-class chess prodigy is deviant), and distress alone is not either (grief after a death is painful but expected).

Defining a disorder: the three Ds

Deviant: atypical for the person's culture and context.

Distressing: causes significant suffering to the person (or others).

Dysfunctional: impairs daily functioning in work, school, or relationships.

Judgments about deviance depend on culture, so diagnosis always needs context.

Clinicians classify disorders with the **DSM-5** (the Diagnostic and Statistical Manual of Mental Disorders, 5th edition, published by the American Psychiatric Association). It lists diagnostic criteria, meaning symptoms, duration, and degree of impairment, grouped into categories such as anxiety, depressive, and psychotic disorders. Its purpose is reliability: two clinicians given the same client should reach the same diagnosis. The **ICD** (International Classification of Diseases, from the World Health Organization) is the global system and is used for health statistics and billing in many countries. The DSM describes symptoms; it does not state causes or recommend treatment.

Different perspectives explain disorders differently. The **medical model** views disorders as illnesses with biological causes (genes, brain chemistry, structure) that are diagnosed and treated, often with drugs. The **psychodynamic** view points to unconscious conflict, **behavioral** to learning, **cognitive** to distorted thinking, and **sociocultural** to social and cultural pressures. Most modern psychologists endorse the **biopsychosocial approach**: disorders arise from the interaction of biological, psychological, and social-cultural influences, not from one cause alone.

The **diathesis-stress model** links these ideas. A **diathesis** is a predisposition (for example, a genetic vulnerability or a fragile temperament). A disorder appears when that predisposition meets enough environmental stress. Two people with the same stressful event may differ in outcome because only one carries the vulnerability.

Perspective	Main cause proposed	Typical emphasis
Medical/biological	Genes, neurotransmitters, brain structure	Drugs, brain stimulation
Psychodynamic	Unconscious conflict, childhood	Insight through talk
Behavioral	Learned associations and reinforcement	Relearning behavior
Cognitive	Negative or distorted thinking	Changing thoughts
Sociocultural	Culture, family, stressors, inequality	Context and community
Biopsychosocial	Interaction of all three domains	Combined treatment

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Prevalence is the percentage of people with a disorder in a given period. In the United States roughly one in five adults experiences a mental illness in a year, and anxiety and depressive disorders are the most common. Some conditions are culture-bound: for example, taijin kyofusho in Japan involves intense fear of offending others through one's body or behavior, while anorexia nervosa is far more reported in cultures that prize thinness. Cultures also differ in whether distress is expressed as emotional or bodily complaints, which can lead to misdiagnosis when clinicians apply their own cultural norms.

Diagnosis carries risks. **Stigma** is a negative social attitude that marks people with a disorder as different and can discourage them from seeking help. **Labeling** can bias how others interpret ordinary behavior. In the classic **Rosenhan study (1973)**, healthy confederates reported hearing a single word like "thud" to gain admission to psychiatric hospitals; once admitted they acted normally, yet were kept an average of about 19 days and staff read their normal behavior (such as note-taking) as symptoms. Rosenhan concluded that labels powerfully shape perception. Critics note that the study used deception, that the hospitals were reacting to a reported symptom, and that stronger diagnostic criteria (DSM-III onward) improved reliability. Ethical concerns in diagnosis include protecting confidentiality, avoiding overdiagnosis and cultural bias, and obtaining informed consent.

Key terms to own

Biopsychosocial approach: biology + psychology + social-cultural context.

Diathesis-stress model: vulnerability + stressor → disorder.

Stigma: social disapproval attached to a label.

Rosenhan (1973): pseudopatients showed that labels bias perception.

EXAMPLE 1: IS IT A DISORDER?

Marcus, 16, is passionate about a rare hobby and spends weekends at conventions. He is happy and his grades are strong. Separately, Dana has felt intense dread for months, skips class, and has lost friends. Apply the three Ds to each.

SOLUTION

Marcus: his behavior is unusual (deviant) but he reports no distress and functions well, so no disorder is indicated.

Dana: the dread is distressing, school avoidance and lost friendships show dysfunction, and persistent symptoms of this kind are atypical, so a clinician would investigate further.

Conclusion: diagnosis requires more than one D, and impairment is usually decisive.

EXAMPLE 2: DIATHESIS-STRESS

Identical twins grow up with a parent who has depression. Twin 1 experiences a divorce and develops depression; Twin 2 experiences the same stressors and does not. Explain using the diathesis-stress model and one nonbiological factor.

SOLUTION

Shared genes suggest both carry some diathesis, but diatheses are probabilities, not guarantees.

Twin 1's stress exceeded the threshold for that individual.

A protective factor, such as strong social support or effective coping for Twin 2, can keep stress below the threshold; this is a psychological and social influence, showing the biopsychosocial interaction.

Common mistakes

The DSM does not explain causes or prescribe treatments. The medical model is not the same as the biopsychosocial approach: the first emphasizes biology, the second integrates all domains. Also, Rosenhan's pseudopatients were healthy people who faked one symptom; do not describe them as truly ill.

Practice

SET A Check Your Understanding

Answer each question in one to three sentences.

1. Name the three Ds used to identify a psychological disorder.
2. Why might a behavior that is deviant in one culture not be a disorder in another?
3. What is the main purpose of the DSM-5, and what does it deliberately not provide?
4. Distinguish the medical model from the biopsychosocial approach.
5. Define diathesis and explain how it differs from a stressor.

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6. Describe one way the Rosenhan study showed the effect of labels.

SET B Exam-Style Multiple Choice

Choose the best answer.

7. A person has an unusual religious practice that is common in her community, causes her no distress, and does not interfere with her life. Which conclusion is best supported?
- (A) She has a disorder because the practice is deviant
 - (B) She does not meet criteria because there is no distress or dysfunction
 - (C) She has a disorder only if the practice is old
 - (D) She has a disorder because most people do not share it
 - (E) She meets criteria if a relative is worried
8. The DSM-5 is best described as
- (A) a theory of the causes of mental illness
 - (B) a list of recommended therapies
 - (C) a classification system with diagnostic criteria
 - (D) a test that measures personality
 - (E) a legal definition of insanity
9. A researcher argues that anxiety results from a genetic tendency toward a reactive nervous system, amplified by a stressful home and by cultural pressure to achieve. This is an example of
- (A) the medical model only
 - (B) a purely behavioral explanation
 - (C) the psychodynamic view
 - (D) the biopsychosocial approach
 - (E) the humanistic view
10. Healthy volunteers who reported hearing the word "thud" were admitted to psychiatric hospitals and, once admitted, behaved normally. Staff continued to treat them as patients. This study best illustrates
- (A) the power of diagnostic labels to bias perception
 - (B) the effectiveness of antipsychotic medication
 - (C) the validity of the DSM-5
 - (D) the lack of mental illness in hospitals
 - (E) the placebo effect
11. Which statement about the diathesis-stress model is accurate?
- (A) Stress alone always causes disorder
 - (B) Genes alone determine disorder
 - (C) A predisposition combines with life stress to raise risk
 - (D) The model applies only to schizophrenia
 - (E) Social support has no role

SET C Apply and Extend

Respond in complete sentences, using specific terms from the lesson.

12. A school psychologist notices a student, Lee, who withdraws after moving to a new country. Lee's mother says that in their culture, sadness is described as a headache or stomachache. (a) Explain how culture may affect diagnosis. (b) Describe one risk of labeling Lee.
13. Using the biopsychosocial approach, explain how a teen might develop an eating disorder. Give one biological, one psychological, and one social-cultural factor, and state how the diathesis-stress model applies.

6.2 Anxiety, OCD, and Trauma-Related Disorders

Distinguish the major anxiety, obsessive-compulsive, and trauma-related disorders and explain their causes through learning, biology, and cognition.

Anxiety disorders involve excessive fear or worry that is out of proportion to the situation and impairs functioning. Related categories, now listed separately in the DSM-5, include **obsessive-compulsive disorder** and **trauma- and stressor-related disorders** such as PTSD. Knowing each pattern's signature symptom is the key to exam questions.

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Disorder	Signature pattern	Quick clue
Generalized anxiety disorder (GAD)	Persistent, uncontrollable worry about many things for 6 months or more, with tension, fatigue, restlessness	Free-floating, chronic worry
Panic disorder	Recurrent, unexpected panic attacks (pounding heart, shortness of breath, fear of dying) plus worry about more attacks	Sudden peak within minutes
Specific phobia	Intense irrational fear of a particular object or situation (spiders, heights)	One trigger
Social anxiety disorder	Intense fear of being judged or embarrassed in social situations	Fear of scrutiny
Agoraphobia	Fear of places where escape or help seems hard (crowds, public transit)	Avoids leaving home
OCD	Unwanted intrusive thoughts (obsessions) and repetitive behaviors or mental acts (compulsions) that reduce anxiety	Obsession then ritual
PTSD	After a traumatic event: flashbacks, nightmares, avoidance, hypervigilance, negative mood, lasting over a month	Reliving trauma

Obsessions versus compulsions

Obsessions: unwanted, intrusive thoughts, images, or urges.

Compulsions: repetitive behaviors (washing, checking, counting) done to reduce the anxiety the obsession causes.

Relief is brief, which reinforces the ritual.

A **panic attack** is a sudden episode of intense fear with physical symptoms that peaks within minutes. It becomes **panic disorder** only when attacks are recurrent and the person worries about having more or changes behavior to avoid them. Panic and GAD differ in timing: panic is sudden and brief, GAD is continuous and diffuse.

Why do these disorders develop? Each psychological perspective contributes. Through **classical conditioning**, a neutral stimulus paired with fear (a dog that bit a child) becomes a conditioned stimulus; generalization spreads the fear to all dogs. **Operant conditioning** explains why phobias persist: avoiding the feared object produces relief, which is negative reinforcement. **Observational learning** also matters, as when a child watches a parent react fearfully. **Biological** factors include genetics (anxiety runs in families), an overreactive amygdala, and low activity of GABA, the neurotransmitter that calms neural firing. Evolutionary theory notes we are biologically prepared to fear snakes, heights, and spiders more easily than cars or electric outlets, a pattern called **biological preparedness**. In OCD, brain scans show heightened activity in the frontal-lobe orbitofrontal cortex and the caudate nucleus, and serotonin is implicated. **Cognitive** factors include catastrophic misinterpretation of body sensations (a racing heart means a heart attack), which fuels panic, and a habit of expecting danger.

Posttraumatic stress disorder (PTSD) follows exposure to actual or threatened death, serious injury, or violence, such as combat, assault, or disaster. Symptoms last more than a month and fall in four clusters: re-experiencing (flashbacks, nightmares), avoidance of reminders, negative changes in mood and thinking, and heightened arousal (hypervigilance, startle). Not everyone exposed to trauma develops PTSD, which fits the diathesis-stress model; some people also show **posttraumatic growth**, positive change after struggling with adversity. Stress responses lasting under a month are classified as acute stress disorder.

Causes of anxiety at a glance

Learning: classical conditioning (origin), negative reinforcement (maintenance), observational learning.

Biology: genetics, overreactive amygdala, low GABA, biological preparedness.

Cognition: catastrophic interpretation of sensations and expectation of danger.

Most anxiety disorders involve all three, consistent with the biopsychosocial approach.

Anxiety disorders are among the most common mental disorders, and they often occur together with depression. Many people live with them for years before seeking help, partly because avoidance itself feels like a solution. Fortunately they respond well to treatment, especially exposure-based therapy and, in some cases, medication. A useful study tip is to ask three questions of every case: what triggers the fear, what does the person do about it, and what keeps the pattern going?

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EXAMPLE 1: IDENTIFY THE DISORDER

Priya feels her heart pound and cannot breathe while in a grocery store. She thinks she is dying. It happens again twice that month, so now she avoids stores and constantly worries about another episode. Name the disorder and explain a cognitive contribution.

SOLUTION

The attacks are sudden, recurrent, and peak quickly, and she worries about more: this is panic disorder (with avoidance that may lead to agoraphobia).

Cognitive contribution: catastrophic misinterpretation. She reads normal arousal as a sign of death, which raises fear and arousal further in a cycle.

Avoiding stores gives relief, negative reinforcement that keeps the avoidance alive.

EXAMPLE 2: LEARNING ACCOUNT OF A PHOBIA

Ben was stuck in an elevator as a child and now refuses elevators. Explain the origin and the maintenance of his phobia.

SOLUTION

Origin: classical conditioning. The elevator (neutral stimulus) was paired with fear (unconditioned response), so the elevator became a conditioned stimulus for fear.

Maintenance: operant conditioning. Taking stairs removes anxiety, so avoidance is negatively reinforced and Ben never learns the elevator is safe.

Extinction would require exposure to the elevator without the feared outcome.

Common mistakes

Do not call a single panic attack a panic disorder. Do not confuse obsessions (thoughts) with compulsions (acts).

Negative reinforcement is not punishment: avoidance is strengthened because it removes something unpleasant.

PTSD, OCD, and anxiety are separate categories in the DSM-5 even though they are related.

Practice**SET A Check Your Understanding**

Answer each question in one to three sentences.

1. What distinguishes generalized anxiety disorder from panic disorder?
2. Give an example of an obsession and a compulsion that might occur together.
3. Explain biological preparedness and give an example.
4. Which neurotransmitter is linked to reduced anxiety, and what does it do?
5. Name the four symptom clusters of PTSD.
6. How does negative reinforcement keep a phobia going?

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SET B Exam-Style Multiple Choice

Choose the best answer.

7. A student fears speaking in class because she believes classmates will judge her harshly. She avoids all group presentations. This is best classified as
 - (A) social anxiety disorder
 - (B) specific phobia
 - (C) agoraphobia
 - (D) generalized anxiety disorder
 - (E) panic disorder
8. A veteran has nightmares, jumps at loud noises, and avoids news about war six months after returning. Which diagnosis is most likely?
 - (A) Generalized anxiety disorder
 - (B) Obsessive-compulsive disorder
 - (C) Acute stress disorder
 - (D) Posttraumatic stress disorder
 - (E) Panic disorder
9. Which explanation of a phobia relies on negative reinforcement?
 - (A) The person inherited the fear gene
 - (B) Serotonin levels are too low
 - (C) The fear was learned by watching a parent
 - (D) An unconditioned stimulus was paired with a neutral one
 - (E) Avoiding the stimulus reduces anxiety and so is repeated
10. A man checks the stove 20 times before leaving home, and doing so briefly eases his worry. The checking is best described as a
 - (A) phobia
 - (B) panic attack
 - (C) compulsion
 - (D) flashback
 - (E) dissociation
11. Brain-imaging studies of people with OCD often show
 - (A) reduced amygdala volume only
 - (B) high activity in frontal-lobe areas and the caudate nucleus
 - (C) damage to the hippocampus
 - (D) lack of dopamine
 - (E) reduced activity in the occipital lobe

SET C Apply and Extend

Respond in complete sentences, using specific terms from the lesson.

12. Read the scenario. Jamal was bitten by a dog at age 5. He now has a racing heart and sweats whenever he sees any dog, and he crosses the street to avoid them. (a) Identify the CS, UCS, and CR in the origin of his fear. (b) Explain how stimulus generalization applies. (c) Describe one treatment based on learning and explain why it works.
13. A researcher claims that PTSD is caused only by trauma. (a) Use the diathesis-stress model to evaluate the claim. (b) Name one biological and one cognitive factor that may raise risk.

6.3 Mood Disorders and Suicide

Compare depressive and bipolar disorders, explain biological, cognitive, and learning-based causes, and recognize suicide risk and ways to help.

Mood disorders are disturbances of emotion that last long and strongly affect functioning. They fall into two groups: depressive disorders and bipolar and related disorders.

Disorder	Key features	Duration clue
Major depressive disorder (MDD)	Depressed mood or loss of interest/pleasure plus changes in sleep, appetite, energy, concentration, feelings of worthlessness, thoughts of death	5 or more symptoms for at least 2 weeks
Persistent depressive disorder	Milder, chronic depressed mood on most days	2 years or more
Bipolar I disorder	At least one manic episode (elevated mood, high energy, little need for sleep, grandiosity, risky behavior), usually with depressive episodes	Mania lasts 1 week or more
Bipolar II disorder	Hypomania (milder, shorter) plus major depression, no full mania	Hypomania 4 days or more

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Disorder	Key features	Duration clue
Seasonal pattern (SAD)	Depression recurring in a season, usually winter, linked to less daylight	Yearly cycle

Depression versus mania

Major depression: sad or empty mood, lost interest, fatigue, slowed thinking, sleep and appetite change.

Mania: unusually elevated or irritable mood, racing thoughts, pressured speech, decreased sleep, impulsive spending or risk-taking.

Bipolar disorder includes mania; depression alone is a depressive disorder (unipolar).

Depression is common and affects about twice as many women as men in the United States. Sadness is a normal reaction to loss; MDD differs by its intensity, duration, and impairment. Bipolar disorder is less common, tends to appear in late adolescence or early adulthood, and involves swings that can last weeks. Treatment is typically a mood stabilizer.

Causes follow the biopsychosocial pattern. **Biological:** genes (risk is higher in identical twins of someone with depression), low levels or reduced activity of **serotonin** and **norepinephrine**, an overactive amygdala, reduced activity in the prefrontal cortex, and hormone changes. Brain activity also shows reduced use of glucose in depression and a high level in mania. Heredity helps explain bipolar disorder especially. **Cognitive:** Aaron Beck described the **negative cognitive triad**, a gloomy view of oneself, the world, and the future. Depressed people also show a pessimistic **explanatory style** that is stable, global, and internal ("it's my fault, it will last forever, and it affects everything"). **Learned helplessness**, from Martin Seligman's work, occurs after repeated uncontrollable bad events: animals and people learn that nothing they do matters and stop trying, even when escape becomes possible. **Social-cultural:** stressful life events, social isolation, and loss of relationships. A **self-perpetuating cycle** often forms: stressful experiences lead to negative thinking, which leads to withdrawal and low mood, which creates more stress.

In the lab, Seligman's dogs received unavoidable shocks, then later failed to jump a barrier to escape, while dogs without prior shocks escaped quickly. The finding links helplessness to depression only when people attribute the bad events to internal, stable, global causes.

EXAMPLE 1: CLASSIFY THE CASE

For two weeks, Omar has felt hopeless, slept 12 hours a day, lost his appetite, and stopped seeing friends. He had no manic episodes. Another person, Rhea, sometimes sleeps 2 hours for a week, feels invincible, and spends her savings on a spree, then crashes into depression. Classify both and defend your choice.

SOLUTION

Omar: symptoms for two weeks with no mania meet criteria for major depressive disorder.

Rhea: a week of elevated mood, little sleep, grandiosity, and risky spending is mania, and the depressive crashes fit bipolar I disorder.

The decisive feature is the presence or absence of a manic episode.

EXAMPLE 2: COGNITIVE EXPLANATION

After failing a test, Mia thinks, "I'm just stupid, I'll always fail, and I'll mess up every class." Identify the explanatory style and explain its link to depression.

SOLUTION

Internal ("I'm stupid"), stable ("always"), and global ("every class").

This style turns one setback into proof of permanent flaw, producing hopelessness.

Hopelessness and withdrawal reduce effort and social contact, reinforcing low mood, so Mia could enter the self-perpetuating cycle.

Suicide is a leading cause of death among adolescents and young adults, and most suicides follow a mental disorder, most often depression. Women attempt more often, but men die by suicide more often, partly because of more lethal methods. **Risk factors** include previous attempts, depression and other disorders, substance abuse, hopelessness, social isolation, access to firearms, and recent loss. **Warning signs** include talking about wanting to die or being a burden, giving away possessions, withdrawing, sudden calm after depression, and saying goodbye. A common myth is that asking about suicide plants the idea; research shows asking directly does not raise risk and can open the door to help.

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Suicide: what to remember

Risk factors: prior attempt, depression, substance abuse, hopelessness, isolation, access to lethal means.

Warning signs: talk of death or being a burden, giving away belongings, withdrawal, saying goodbye.

Asking directly is safe and helpful; connect the person to professional help right away.

Helping and prevention: take warning signs seriously, stay with the person, ask directly, listen without judging, and connect them with a trained professional or a crisis line (in the United States, call or text 988). Prevention efforts include restricting access to lethal means, school screening, treating depression, building social connection, and reducing stigma. Do not promise secrecy and do not leave a person in immediate danger alone.

Exam tip

When you see a long, harsh self-statement, name all three dimensions of explanatory style. Remember that mania, not sadness, separates bipolar disorder from depression. On suicide, the best answers combine risk factors, warning signs, and a concrete helping action.

Practice**SET A Check Your Understanding**

Answer each question in one to three sentences.

1. List the minimum duration for major depressive disorder and for persistent depressive disorder.
2. What feature distinguishes bipolar disorder from major depressive disorder?
3. Describe Beck's negative cognitive triad.
4. What is learned helplessness, and how does it relate to depression?
5. Name two neurotransmitters linked to depression and one brain area involved.
6. State two warning signs of suicide and one helpful response.

SET B Exam-Style Multiple Choice

Choose the best answer.

7. A person feels persistently low on most days for three years, with poor appetite and low self-esteem, but never meets the intensity of a major depressive episode. The best diagnosis is
 - (A) bipolar I disorder
 - (B) major depressive disorder
 - (C) seasonal affective disorder
 - (D) cyclothymia
 - (E) persistent depressive disorder
8. A teenager repeatedly experiences unpredictable failure no matter how hard he tries and eventually stops trying even when success is possible. This best illustrates
 - (A) learned helplessness
 - (B) observational learning
 - (C) spontaneous recovery
 - (D) stimulus generalization
 - (E) latent learning
9. Which pair describes a manic episode?
 - (A) Slowed speech and fatigue
 - (B) Insomnia without energy loss and sadness
 - (C) Elevated mood, racing thoughts, and decreased need for sleep
 - (D) Hallucinations and flat affect
 - (E) Hopelessness and loss of appetite
10. Which statement about suicide is accurate?
 - (A) Asking directly about suicide increases risk
 - (B) People who talk about suicide rarely attempt it
 - (C) Most people who die by suicide have no mental disorder
 - (D) Previous attempts and hopelessness are risk factors
 - (E) Suicide cannot be prevented

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11. Seasonal affective disorder is thought to be related to
- (A) manic episodes in summer
 - (B) reduced daylight affecting mood regulation
 - (C) excess dopamine
 - (D) an overactive hippocampus
 - (E) childhood trauma only

SET C Apply and Extend

Respond in complete sentences, using specific terms from the lesson.

12. A researcher wants to test whether an optimistic explanatory style protects against depression. (a) Identify the independent and dependent variables for a quasi-experiment comparing students. (b) Describe the three dimensions of a pessimistic explanatory style. (c) Explain why the study cannot conclude cause and effect.
13. Daniel, 17, recently lost a close friend, stopped attending school, gave away his guitar, and told his sister he is a burden. (a) Identify two warning signs. (b) Describe two actions a friend should take. (c) Explain one biological and one social factor that may contribute to his depression.

6.4 Schizophrenia, Personality, and Other Disorders

Identify the symptoms and causes of schizophrenia, personality, dissociative, eating, neurodevelopmental, and substance use disorders.

Psychosis means a loss of contact with reality. **Schizophrenia** is a severe disorder marked by disorganized thinking, perception, and emotion, usually emerging in late adolescence or early adulthood and affecting about 1 percent of people worldwide. The word does not mean "split personality"; that confusion is the most common error on the exam.

Symptom type	Meaning	Examples
Positive (added)	Presence of inappropriate behaviors	Hallucinations (often auditory), delusions (false beliefs such as persecution), disorganized speech, grossly disorganized behavior
Negative (absent)	Absence of normal behaviors	Flat affect, poverty of speech, social withdrawal, loss of motivation, catatonia (rigid immobility)
Cognitive	Impaired thinking	Poor attention, memory, and planning

Positive versus negative symptoms

Positive symptoms are things added to behavior (delusions, hallucinations, disorganized speech).

Negative symptoms are things taken away (flat affect, no motivation, no speech).

Antipsychotics help positive symptoms more than negative symptoms.

Biological causes: Schizophrenia has strong heritability (identical twin concordance about 50 percent, versus about 10 to 15 percent for fraternal twins). The **dopamine hypothesis** proposes overactivity of dopamine receptors, supported by the fact that drugs blocking D2 receptors reduce positive symptoms and amphetamines that raise dopamine can cause psychosis. Brain scans show enlarged ventricles and reduced frontal-lobe activity. Prenatal factors such as maternal viral infection or malnutrition and birth complications raise risk, as does heavy adolescent cannabis use. Stress and family conflict can trigger relapses, consistent with the diathesis-stress model. Early warning signs often appear before onset, and early intervention improves outcomes.

Personality disorders are inflexible, enduring patterns of behavior that impair social functioning. They are grouped in clusters: odd (paranoid, schizoid), dramatic (antisocial, borderline, narcissistic, histrionic), and anxious (avoidant, dependent, obsessive-compulsive personality). **Antisocial personality disorder** involves disregard for and violation of others' rights, lack of conscience or remorse, deceit, and impulsive aggression; it is linked to reduced arousal and frontal-lobe abnormalities, genetic predisposition, and childhood abuse.

Borderline personality disorder involves unstable relationships, self-image, and emotions with impulsivity and self-harm; **narcissistic** involves grandiosity and need for admiration.

Dissociative disorders involve a disruption of memory, identity, or consciousness. **Dissociative amnesia** is memory loss for important personal information, usually after trauma, that is too extensive to be ordinary forgetting. **Dissociative identity disorder (DID)** involves two or more distinct identities that alternately control behavior; it is rare and controversial. Skeptics argue that suggestion by therapists and media can create it, while others view it as a response to severe childhood trauma.

Eating disorders involve disturbed eating and body image. **Anorexia nervosa** is severe restriction, intense fear of weight gain, and distorted body image despite low weight. **Bulimia nervosa** features binge eating followed by compensatory behaviors (vomiting, laxatives, fasting, excessive exercise) while weight is typically normal. **Binge-eating disorder** involves binges without compensation. They are most common among adolescent girls and young women, and genetics, perfectionism, low self-esteem, and cultural ideals of thinness all contribute. Anorexia has one of the highest mortality rates of any psychological disorder.

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Neurodevelopmental disorders begin in childhood. **ADHD** includes a persistent pattern of inattention, hyperactivity, and impulsivity that is more severe than expected for age and appears in more than one setting. It is highly heritable and linked to differences in frontal-lobe and dopamine function, and it is often treated with stimulants (such as methylphenidate), which raise dopamine and norepinephrine and improve focus, combined with behavioral strategies. **Autism spectrum disorder (ASD)** involves difficulties in social communication and interaction plus restricted, repetitive behaviors and interests. Symptoms appear early and range in severity. Autism is strongly heritable, and there is no evidence that vaccines cause it, a claim that came from a fraudulent study. Some researchers link social difficulties to a weaker "theory of mind," the ability to infer others' mental states.

Substance use disorders involve continued use despite significant problems. Key features: **tolerance** (needing more for the same effect), **withdrawal** (distress when use stops), craving, and loss of control. Causes include biological factors (genetics, reward pathways using dopamine), psychological factors (stress relief, expectations), and social factors (peers, availability, culture). Prevention works best when it is early and combines education, life-skills training, and strong family and community support.

Eating disorders at a glance

Anorexia nervosa: restriction, very low weight, distorted body image.

Bulimia nervosa: binge-purge cycles, weight typically normal.

Binge-eating disorder: binges without purging.

EXAMPLE 1: POSITIVE OR NEGATIVE?

A patient hears voices commenting on his actions, believes the government is tracking him, and rarely speaks or shows facial expression. Classify each symptom and name the disorder.

SOLUTION

Voices are auditory hallucinations, and the tracking belief is a delusion: both are positive symptoms.

Rare speech and absent facial expression are negative symptoms (poverty of speech, flat affect).

Both positive and negative symptoms together with duration beyond six months suggest schizophrenia.

EXAMPLE 2: EATING DISORDER

Alana has a normal weight but binges on large amounts of food several times a week and then makes herself vomit. Identify the disorder and explain how it differs from anorexia.

SOLUTION

This is bulimia nervosa: binge eating followed by purging.

In anorexia, weight is dangerously low from restriction and there is extreme fear of weight gain.

The decisive contrast is body weight and the binge-purge cycle.

Common mistakes

Schizophrenia is not multiple personalities, and DID is a dissociative disorder. Negative symptoms are not "bad" symptoms; they are absences. ADHD stimulants calm and focus rather than sedate. Do not confuse antisocial personality disorder with social anxiety.

Practice

SET A Check Your Understanding

Answer each question in one to three sentences.

1. Define a delusion and a hallucination, and classify them as positive or negative symptoms.
2. What is the dopamine hypothesis of schizophrenia?
3. Distinguish anorexia nervosa from bulimia nervosa.
4. Describe two characteristics of antisocial personality disorder.
5. Name the core symptoms of ADHD and one common treatment.
6. Explain tolerance and withdrawal in substance use disorders.

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SET B Exam-Style Multiple Choice

Choose the best answer.

7. A patient claims that she is a famous queen and hears voices telling her what to do. These symptoms are best described as
 - (A) negative symptoms of depression
 - (B) positive symptoms of schizophrenia
 - (C) dissociative symptoms
 - (D) symptoms of mania only
 - (E) compulsions
8. Which research finding best supports a genetic contribution to schizophrenia?
 - (A) Patients have enlarged ventricles
 - (B) Symptoms respond to antipsychotics
 - (C) Identical twins show higher concordance than fraternal twins
 - (D) Stress triggers relapse
 - (E) Onset usually occurs in adolescence
9. A teenager has intense fear of weight gain, severely restricts food, and sees herself as overweight though dangerously thin. This is
 - (A) bulimia nervosa
 - (B) binge-eating disorder
 - (C) anorexia nervosa
 - (D) body dysmorphia only
 - (E) dissociative amnesia
10. A person has lost memory for several days after a violent assault, and the loss is not due to injury or drugs. The most likely diagnosis is
 - (A) dissociative amnesia
 - (B) schizophrenia
 - (C) PTSD only
 - (D) ADHD
 - (E) dissociative identity disorder
11. Which feature is characteristic of autism spectrum disorder?
 - (A) Hallucinations
 - (B) Persistent difficulty with social communication and repetitive behaviors
 - (C) Binge eating
 - (D) Unstable mood cycles
 - (E) Fear of weight gain

SET C Apply and Extend

Respond in complete sentences, using specific terms from the lesson.

12. A researcher compares dopamine activity in people with schizophrenia and a control group. (a) State a hypothesis about dopamine. (b) Explain how antipsychotic medication relates to the hypothesis. (c) Explain why finding higher dopamine activity does not prove dopamine causes the disorder.
13. Compare antisocial personality disorder and borderline personality disorder, and explain one biopsychosocial factor in antisocial personality disorder.

6.5 Biomedical Treatments

Match drug classes and brain stimulation methods to disorders, and evaluate their effectiveness and side effects.

Biomedical therapies treat psychological disorders by changing brain function with drugs, electrical or magnetic stimulation, or surgery. The best-known biomedical approach is **psychopharmacology**, the study of drug effects on mind and behavior. Most psychiatric drugs work by changing neurotransmitter activity at the synapse, so they are often combined with psychotherapy, in line with the biopsychosocial view.

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Drug class	Used for	How it works	Examples / side effects
Antipsychotics	Schizophrenia, psychosis (mainly positive symptoms)	Block dopamine D2 receptors	Haloperidol (older), clozapine, risperidone; older drugs can cause tardive dyskinesia (involuntary movements); newer ones weight gain
Antidepressants	Depression, anxiety, OCD	SSRIs block serotonin reuptake; others affect norepinephrine	Fluoxetine, sertraline; nausea, sexual dysfunction, sleep changes; take weeks to work
Anti-anxiety (benzodiazepines)	Anxiety, panic	Increase GABA activity	Diazepam, alprazolam; drowsiness, dependence, withdrawal
Mood stabilizers	Bipolar disorder	Even out mood swings	Lithium; tremor, thirst, toxicity needs blood monitoring
Stimulants	ADHD	Raise dopamine and norepinephrine	Methylphenidate; appetite loss, insomnia

Drug-to-disorder match

Antipsychotic → schizophrenia (blocks dopamine).

SSRI antidepressant → depression, also anxiety and OCD (raises serotonin).

Benzodiazepine → anxiety (boosts GABA).

Lithium → bipolar disorder.

Stimulant → ADHD.

Antidepressant effects typically take two to six weeks, and stopping suddenly can cause discontinuation symptoms. Many people stop treatment because of side effects. Benzodiazepines act fast but carry a risk of tolerance and dependence, so they are for short-term use. Lithium has a narrow safe range. Studies show that antidepressants outperform a placebo, but the gap is smaller than many expect and a large placebo response occurs, and they appear most helpful in severe depression. When evaluating effectiveness, researchers use double-blind, placebo-controlled designs to separate drug effects from expectations. Relapse is common when medication is stopped, so drug treatment often includes long-term maintenance.

Brain stimulation is used when drugs fail. In **electroconvulsive therapy (ECT)**, a brief electric current is passed through the brain of an anesthetized, muscle-relaxed patient to cause a seizure. It is used mainly for severe, treatment-resistant depression, and about 60 to 80 percent of such patients improve; side effects include temporary memory loss and confusion, and relapse can occur. **Transcranial magnetic stimulation (TMS)** applies magnetic pulses to the scalp to stimulate neurons, often the left prefrontal cortex, with no anesthesia and few side effects such as headache. **Deep brain stimulation (DBS)** implants electrodes that deliver electrical pulses to specific brain areas and is used for treatment-resistant depression, OCD, and Parkinson's disease. **Psychosurgery** removes or destroys brain tissue to change behavior. The now-discredited prefrontal **lobotomy** (popularized in the 1940s) left many patients passive or impaired. Modern psychosurgery, such as cingulotomy for severe OCD, is rare and precise and reserved for extreme cases.

Brain stimulation ladder

TMS: noninvasive magnetic pulses, no anesthesia.

ECT: induced seizure under anesthesia for severe, treatment-resistant depression.

DBS: implanted electrodes giving continuous pulses to a target region.

Psychosurgery: permanent tissue removal, last resort.

Choosing a treatment involves weighing risk and benefit. Doctors consider the diagnosis, severity, past response, side effects, and patient preference. For mild to moderate depression, psychotherapy can be as effective as medication, and combining the two often does better than either alone for severe cases. Biomedical treatments change symptoms but may not teach coping skills, which is one reason relapse rates after stopping drugs are high. Another issue is access and informed consent: patients must understand benefits, risks, and alternatives, and treatment should be the least restrictive that works. Finally, culture and individual biology matter, since people metabolize drugs at different rates because of genetic differences, a field called pharmacogenetics.

Remember the timeline of a typical medication course. A prescriber starts a low dose, monitors for side effects, adjusts the dose over several weeks, and continues treatment after symptoms ease to prevent relapse. Patients should never stop psychiatric medication abruptly without medical guidance, since discontinuation can trigger withdrawal symptoms or return of illness. Research on the placebo effect reminds us that expectation and the therapeutic relationship contribute to improvement even in drug treatment.

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EXAMPLE 1: MATCH TREATMENT TO CASE

A woman with severe depression has not improved after trying three antidepressants and is at high suicide risk. Recommend a biomedical option, state one benefit and one risk.

SOLUTION

Recommend ECT (or TMS), which is intended for treatment-resistant depression.

Benefit: rapid, often substantial improvement in severe cases.

Risk: temporary memory loss and confusion; relapse may occur without maintenance treatment.

EXAMPLE 2: EVALUATING A DRUG STUDY

A company reports that 60 percent of patients improved on its new antidepressant. Why is that statistic insufficient to claim the drug works?

SOLUTION

There is no comparison: placebo groups often show 30 to 40 percent improvement.

A double-blind, random-assignment placebo-controlled trial is needed to isolate the drug's effect.

Researchers should also report side effects and relapse after stopping.

Technique	Invasiveness	Typical target
ECT	Seizure under anesthesia	Severe depression
TMS	Noninvasive magnetic pulses	Depression
DBS	Implanted electrodes	Depression, OCD, Parkinson's
Psychosurgery	Irreversible tissue removal	Rare, extreme cases

Common mistakes

Do not say antipsychotics cure schizophrenia; they reduce symptoms. SSRIs do not instantly raise mood, and benzodiazepines are not antidepressants. ECT is not used mainly for schizophrenia and is not painful; patients are anesthetized. Lithium treats bipolar disorder, not schizophrenia.

Practice**SET A Check Your Understanding**

Answer each question in one to three sentences.

1. Which neurotransmitter system do traditional antipsychotics target, and which symptoms improve most?
2. How do SSRIs work?
3. Why are benzodiazepines usually prescribed for short-term use?
4. What is tardive dyskinesia, and which drug type causes it?
5. State one advantage of TMS over ECT.
6. Why are placebo-controlled, double-blind studies used to evaluate drugs?

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SET B Exam-Style Multiple Choice

Choose the best answer.

7. A patient with bipolar disorder is most likely to receive
 (A) haloperidol (B) fluoxetine (C) diazepam
 (D) lithium (E) methylphenidate
8. Which treatment involves inducing a seizure in an anesthetized patient?
 (A) Transcranial magnetic stimulation (B) Deep brain stimulation
 (C) Electroconvulsive therapy (D) Systematic desensitization
 (E) Lobotomy
9. A person starts an SSRI and reports no change after four days, so she wants to stop. The best response is that
 (A) the drug does not work
 (B) antidepressants usually take weeks to show benefit
 (C) the dose is too high
 (D) SSRIs work only by placebo
 (E) she should switch to a stimulant
10. A drug that increases GABA activity would most likely be prescribed for
 (A) schizophrenia (B) ADHD
 (C) bipolar disorder (D) dissociative identity disorder
 (E) panic disorder
11. Which statement accurately describes the effect of modern psychosurgery?
 (A) It is rare, targeted, and reserved for severe cases
 (B) It is common and reversible
 (C) It is a first-line treatment for depression
 (D) It is a replacement for ECT
 (E) It cures schizophrenia

SET C Apply and Extend

Respond in complete sentences, using specific terms from the lesson.

12. A researcher tests a new anti-anxiety medication. Group 1 gets the drug and Group 2 gets a sugar pill, with random assignment and neither participants nor staff knowing group membership. (a) Identify the independent and dependent variables. (b) Explain why random assignment and double-blind procedures are used. (c) State one ethical consideration.
13. Compare ECT and antidepressant medication for severe depression. Include one strength and one limitation of each.

6.6 Psychotherapies

Compare the major psychotherapies, match them to disorders, and evaluate how well therapy works.

Psychotherapy is treatment of psychological difficulties through talk and structured interaction between a trained therapist and a client. Each major approach rests on a different theory of why problems arise, and most therapists today are **eclectic**, drawing techniques from several approaches.

Approach	Founder / idea	Techniques	Goal
Psychoanalysis	Freud: unconscious conflicts from childhood cause symptoms	Free association, dream interpretation, interpreting resistance and transference	Insight into unconscious conflict
Psychodynamic	Modern, briefer version focused on relationships	Exploring patterns and past experiences	Insight and better relationships
Humanistic (client-centered)	Carl Rogers: people have growth potential	Active listening, genuineness, empathy, unconditional positive regard	Self-acceptance and growth
Behavior therapy	Learning principles	Systematic desensitization, exposure, aversive conditioning, token economies	Change problem behavior
Cognitive therapy	Beck, Ellis: distorted thoughts cause distress	Challenging irrational beliefs, cognitive restructuring	Healthier thinking

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Approach	Founder / idea	Techniques	Goal
CBT	Combines cognitive and behavioral methods	Homework, thought records, exposure	Change thoughts and behavior

Humanistic therapy terms

Client-centered therapy: nondirective, client leads the session.

Active listening: echo, restate, and clarify the client's feelings.

Unconditional positive regard: accepting the client without judgment.

Behavior therapies apply classical and operant conditioning. **Counterconditioning** replaces a fear response with relaxation. **Systematic desensitization** (Wolpe) builds a fear hierarchy, from least to most feared, and the client uses relaxation while imagining or encountering each step. **Exposure therapy** confronts feared stimuli directly, either gradually or all at once (flooding), and works by extinction; virtual reality can be used. **Aversive conditioning** pairs an unwanted behavior (such as drinking alcohol) with an unpleasant stimulus (a nausea-inducing drug) so the behavior becomes aversive. A **token economy** rewards desirable behavior with tokens exchangeable for rewards.

Cognitive therapies teach clients to notice and change thoughts that fuel distress. Albert Ellis's **rational-emotive behavior therapy** challenges irrational beliefs ("I must be perfect"), while Aaron Beck's cognitive therapy for depression helps clients test negative automatic thoughts. **Cognitive-behavioral therapy (CBT)** blends the two: clients keep thought records, practice skills as homework, and engage in behavioral experiments. CBT is short-term, structured, and has strong evidence for anxiety, depression, OCD, PTSD, and eating disorders. A newer form, dialectical behavior therapy, helps clients regulate emotion, often in borderline personality disorder.

Group therapy brings several clients together, saving money and providing feedback and support from people with similar problems. **Family therapy** treats the family as a system, assuming that an individual's problems often reflect patterns of communication; it helps members change roles and interactions. **Self-help and support groups**, like those for substance use, offer shared experience.

Evaluating effectiveness. Therapy outcome research, beginning with Hans Eysenck's challenge in 1952, shows that people who get therapy do better, on average, than those on a waiting list, although many people also improve without therapy because of **spontaneous remission** and the placebo effect. Meta-analyses show therapy is effective across approaches, and the **therapeutic alliance**, the bond of trust and cooperation between client and therapist, is among the strongest predictors of success. Common factors include hope, a new perspective, and an empathic relationship. **Evidence-based practice** integrates the best research, clinical expertise, and client preferences. Researchers prefer random assignment to treatment and control conditions. Therapists differ in training: clinical and counseling psychologists hold a doctorate and cannot usually prescribe (except in a few states), psychiatrists are medical doctors who can prescribe, and social workers and counselors usually hold a master's degree.

Disorder	Often effective treatment
Specific phobia	Exposure / systematic desensitization
Depression	CBT, antidepressants, or both
OCD	Exposure and response prevention, SSRIs
Bipolar disorder	Mood stabilizer plus psychoeducation
Schizophrenia	Antipsychotics plus family and skills support
Eating disorders	CBT, family-based therapy

Behavioral technique glossary

Counterconditioning: replace a fear response with an incompatible response such as relaxation.

Systematic desensitization: gradual hierarchy plus relaxation.

Flooding: intense, prolonged exposure until fear subsides.

Aversive conditioning: pair a behavior with an unpleasant stimulus.

Seeing the approaches side by side helps. Psychoanalysis looks backward to the past, humanistic therapy centers on the present relationship and the client's feelings, behavior therapy targets observable actions, and cognitive therapy targets the thoughts that sit between events and emotions. A useful rule: insight therapies (psychoanalytic and humanistic) aim to improve self-understanding, while action therapies (behavior therapy) aim directly at changing behavior. CBT sits in both camps and is the most heavily researched. Cultural competence also matters: therapists should adapt methods to a client's background and values.

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EXAMPLE 1: IDENTIFY THE THERAPY

A therapist tells a client, "You seem to feel overlooked by your coworkers," and avoids giving advice. The client leads the session and feels accepted. Name the therapy and two techniques.

SOLUTION

Client-centered (humanistic) therapy of Carl Rogers.

Techniques: active listening (restating feelings) and unconditional positive regard.

The therapist is nondirective, and the goal is self-acceptance and growth.

EXAMPLE 2: SYSTEMATIC DESENSITIZATION

Ana fears flying. Outline how a behavior therapist would apply systematic desensitization.

SOLUTION

Teach a relaxation technique, such as deep breathing.

Build a fear hierarchy, from looking at a plane photo to sitting in a plane in flight.

Pair each step with relaxation until anxiety fades, moving up the hierarchy; the relaxation response replaces fear (counterconditioning), and avoidance is no longer reinforced.

Exam tip

Match the therapy to the technique: free association means psychoanalysis; unconditional positive regard means Rogers; fear hierarchy means Wolpe; irrational beliefs means Ellis; thought record means CBT. Also remember that most clients, regardless of approach, benefit from a strong therapeutic alliance.

Practice**SET A Check Your Understanding**

Answer each question in one to three sentences.

1. What is the goal of psychoanalysis, and which two techniques are used?
2. Define unconditional positive regard and name the psychologist who emphasized it.
3. Explain how aversive conditioning might treat alcohol misuse.
4. Why does exposure therapy reduce fear?
5. What do cognitive therapists try to change, and how do they do it?
6. Why is the therapeutic alliance important?

SET B Exam-Style Multiple Choice

Choose the best answer.

7. A therapist asks a client to say whatever comes to mind without censoring. This technique is used in
 - (A) psychoanalysis
 - (B) client-centered therapy
 - (C) systematic desensitization
 - (D) cognitive therapy
 - (E) token economies
8. A client gradually imagines increasingly frightening scenes while relaxing. This is
 - (A) flooding
 - (B) aversive conditioning
 - (C) rational-emotive therapy
 - (D) a token economy
 - (E) systematic desensitization
9. Which statement best reflects Albert Ellis's view?
 - (A) Behavior is shaped by rewards
 - (B) Symptoms result from unconscious childhood conflict
 - (C) Self-actualization requires acceptance
 - (D) Distress is created by irrational beliefs about events
 - (E) Brain chemistry is the sole cause

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10. A study finds that a group of clients on a waiting list improved somewhat without therapy. This most clearly demonstrates
 (A) tolerance (B) the placebo effect only (C) spontaneous remission
 (D) a double-blind design (E) transference
11. Which professional can prescribe medication in most states?
 (A) Clinical psychologist (B) Psychiatrist (C) Counselor
 (D) Social worker (E) School psychologist

SET C Apply and Extend

Respond in complete sentences, using specific terms from the lesson.

12. A client with depression says, "I fail at everything, so there is no point." (a) Describe how a CBT therapist would respond. (b) Describe a homework assignment. (c) Explain how a client-centered therapist would respond differently.
13. Researchers compare CBT, psychodynamic therapy, and a waiting-list group for social anxiety. (a) Explain why a waiting-list group is included. (b) Name two ways to improve validity. (c) If CBT and psychodynamic therapy show equal results, suggest a factor that could explain the similarity.

6.7 Stress and Coping

Explain how stressors trigger bodily and cognitive responses, how stress affects health, and which coping strategies work.

Stress is the process by which we perceive and respond to events, called **stressors**, that we appraise as threatening or challenging. Stressors include catastrophes (disasters), significant life changes (marriage, job loss), and daily hassles (traffic, deadlines). Chronic daily hassles can harm health more than rare big events. Psychologists also separate **eustress**, positive stress that motivates (a championship game), from **distress**, harmful stress. The field that studies how stress affects health is **health psychology**, and the relationship runs both ways, as in the biopsychosocial model.

Richard Lazarus emphasized **appraisal**: stress depends on how we interpret an event. In **primary appraisal** we judge whether the event is irrelevant, benign, or stressful (a threat, harm, or challenge). In **secondary appraisal** we judge whether we have the resources to cope. The same exam can be a threat to one student and a challenge to another. Stress is larger when events are unpredictable, uncontrollable, or ambiguous.

Hans Selye described the body's pattern of response in the **general adaptation syndrome (GAS)** after studying animals exposed to different stressors. His claim: the body reacts the same way to any stressor.

GAS stage	What happens	Result
1. Alarm	Sympathetic nervous system activates; adrenaline and cortisol rise; heart rate and blood pressure increase (fight or flight)	Body mobilizes; short-term energy
2. Resistance	Body stays aroused to cope; hormone levels remain elevated while outward signs fade	Increased vulnerability to illness
3. Exhaustion	Resources are depleted; adaptation fails	Illness, collapse, even death

GAS in one line

Alarm → Resistance → Exhaustion (Selye).

Fight or flight is the alarm response, driven by the sympathetic nervous system and the adrenal glands (adrenaline, then cortisol).

Chronic stress keeps cortisol high, which harms health.

Walter Cannon named the **fight-or-flight response**. Shelley Taylor argued that females more often respond to stress by **tend and befriend**, caring for others and seeking social support, a pattern linked to oxytocin. Lazarus's model highlights cognitive appraisal, while Selye's focuses on physiology.

Stress and health. Psychoneuroimmunology studies how psychological, neural, and immune processes interact. Stress hormones suppress the immune system: wounds heal more slowly, vaccines are less effective, and people under stress catch more colds when exposed to a virus. Chronic stress is linked to high blood pressure, heart disease (coronary heart disease), headaches, and depression. Prolonged cortisol exposure can also damage the hippocampus and harm memory.

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Coping is reducing stress by alleviating or tolerating it. **Problem-focused coping** deals directly with the stressor (making a study plan). **Emotion-focused coping** manages feelings when the stressor cannot be changed (talking with a friend, relaxing, reframing). Problem-focused is generally better when we have control, and emotion-focused when we do not. Other adaptive strategies include **perceived control** (the belief that we can influence events), **social support** (friends and family, which lowers blood pressure and strengthens immune response), aerobic exercise, relaxation and meditation, and biofeedback. Maladaptive strategies include avoidance, rumination, and substance use. Having an optimistic explanatory style also improves health.

Coping at a glance

Problem-focused: change the stressor (plan, ask for help, solve).

Emotion-focused: manage the feelings (relax, seek comfort, reframe).

Protective resources: perceived control, social support, exercise, optimism.

Researchers have tried to measure stress. Holmes and Rahe built a scale assigning points to life-change events, and people with higher totals tended to get ill more often, although the scale ignores individual appraisal. Another source of stress is conflict: approach-approach (two attractive options), avoidance-avoidance (two unpleasant options), and approach-avoidance (one option with both good and bad aspects). Burnout, a state of emotional exhaustion from prolonged work stress, shows how chronic pressure wears people down. Stress can also affect behavior, leading some people to sleep less, eat poorly, or smoke more, which adds a second path from stress to illness. Understanding these indirect routes helps explain why stress management programs often target sleep, nutrition, and exercise together with relaxation and cognitive skills.

EXAMPLE 1: APPLY THE GAS

For weeks before finals, Tomas feels tense and alert, studies late each night, and seems to cope. By the end of finals week, he gets sick, is exhausted, and cannot concentrate. Identify the stage at each point.

SOLUTION

Heightened alertness and sustained coping while the stressor continues is the resistance stage.

Illness and collapse of coping at the end is the exhaustion stage.

The initial spike when he first learned of the finals schedule would have been alarm.

EXAMPLE 2: APPRAISAL AND COPING

Two students receive a surprise group project. Sara thinks, "This will be hard, but I can handle it," and divides tasks. Lena thinks, "I'll fail," and avoids the work. Use Lazarus's model to explain the difference.

SOLUTION

Sara appraises the project as a challenge (primary) and believes she has resources (secondary), so her coping is problem-focused.

Lena appraises it as a threat and doubts her resources, so her stress is greater and her coping is avoidance.

Same stressor, different appraisal, so different stress responses.

Common mistakes

Selye's alarm stage is not the same as exhaustion. Cortisol is a hormone released by the adrenal cortex, not a neurotransmitter. Emotion-focused coping is not necessarily bad; it is useful when the situation is uncontrollable.

Social support helps health but does not eliminate stressors.

Practice

SET A Check Your Understanding

Answer each question in one to three sentences.

1. Distinguish primary from secondary appraisal.
2. Name Selye's three stages in order and state what happens in the second.
3. What is tend and befriend, and who proposed it?
4. How does chronic stress affect the immune system?
5. Give one example each of problem-focused and emotion-focused coping.
6. Why is perceived control associated with lower stress?

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SET B Exam-Style Multiple Choice

Choose the best answer.

7. Which hormone is released by the adrenal glands during prolonged stress?
 (A) Melatonin (B) Oxytocin (C) Cortisol (D) Insulin (E) Leptin
8. A worker is exposed to a high-pressure job for years and develops frequent infections and high blood pressure. This best illustrates which GAS stage?
 (A) Alarm (B) Resistance (C) Recovery
 (D) Orienting (E) Exhaustion
9. A woman's best friend is moving away, and she responds by calling relatives and joining a support group. This is an example of
 (A) emotion-focused coping and social support (B) problem-focused coping only
 (C) denial (D) learned helplessness
 (E) hardiness
10. Lazarus would predict that two people facing the same exam could feel differently because of
 (A) cortisol levels alone
 (B) the stage of the GAS
 (C) genes
 (D) their appraisals of the event and their resources
 (E) the time of year
11. Psychoneuroimmunology studies the connections among
 (A) learning, memory, and perception (B) behavior, brain, and immune function
 (C) hormones and sleep (D) therapy and drug effects
 (E) development and aging

SET C Apply and Extend

Respond in complete sentences, using specific terms from the lesson.

12. A researcher wants to know whether social support reduces illness during final exams. Students are surveyed about support and then tracked for colds. (a) Identify the type of study. (b) State a likely finding. (c) Name a confounding variable and explain why correlation does not prove causation.
13. Maya just learned that she must give a speech. Her heart races and she feels a surge of energy. (a) Identify the nervous system branch and hormones involved. (b) Explain how her appraisal could change the outcome. (c) Describe one problem-focused and one emotion-focused strategy.

6.8 Health Psychology and Well-Being

Connect personality, behavior, and mindset to health, and apply positive psychology and the biopsychosocial model.

Health psychology studies how behavior, thinking, and social context influence health and illness. It rests on the biopsychosocial model: biological factors (genes, immune function), psychological factors (beliefs, coping, personality), and social factors (support, income, culture) interact to shape well-being.

Researchers once linked personality to heart disease. Friedman and Rosenman described **Type A** people as competitive, hurried, time-conscious, and easily angered, and **Type B** people as relaxed and easygoing. Follow-up research found that the key risk is not the whole Type A pattern but **hostility**, especially cynicism and anger, which is associated with coronary heart disease. Strong cardiovascular reactivity, meaning large rises in blood pressure and heart rate under stress, may explain why. Suzanne Kobasa described **hardiness**, a protective pattern of commitment, a sense of control, and viewing challenges as opportunities rather than threats. Optimism is also related to better health and longer life.

Pattern	Description	Health link
Type A	Competitive, hurried, hostile	Hostility raises heart-disease risk
Type B	Relaxed, patient	Lower risk
Hardiness	Commitment, control, challenge	Buffers stress
Optimism	Expects good outcomes	Better health and coping

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Personality and health

The toxic part of Type A is hostility, not just busyness.

Hardiness (Kobasa): commitment, control, challenge.

Optimism and perceived control protect health.

Health behaviors often matter more than any single biological factor. Smoking is the leading preventable cause of death. Regular **aerobic exercise** reduces risk of heart disease and diabetes, improves mood, reduces anxiety and depression, and increases neurogenesis. **Sleep** supports memory consolidation, immune function, and mood, and chronic sleep loss is linked to obesity and weakened immunity; teens generally need about 8 to 10 hours. Healthy diet and avoiding risky behaviors matter too. Models like the stages of change describe how people move from precontemplation to contemplation, preparation, action, and maintenance. Prevention of substance use works best when it combines education about risks, refusal skills, and support from family, school, and community; early intervention is more effective than late treatment.

Positive psychology, founded by Martin Seligman and colleagues, studies strengths and conditions for flourishing rather than only pathology. Topics include optimism, gratitude, resilience, and **subjective well-being**, a person's self-reported happiness and life satisfaction. Research findings on happiness: it is relatively stable over time, and the **adaptation-level phenomenon** (hedonic treadmill) means that people return to a baseline after good or bad events. **Relative deprivation** means we feel unhappy when comparing ourselves with others who have more. Money increases happiness mainly by lifting people out of poverty, and beyond a point, gains are small. The happiest people tend to have close relationships, a sense of purpose, regular exercise and sleep, and faith or community. **Flow**, described by Csikszentmihalyi, is a state of absorption in a challenging task that matches one's skill.

Mindfulness is nonjudgmental awareness of the present moment. Mindfulness-based stress reduction and meditation are associated with lower stress, reduced anxiety and depression, and improved attention, and brain studies show changes in prefrontal and amygdala activity. Other helpful practices include relaxation training, biofeedback (instruments reveal body states like muscle tension so people can control them), and spending time in nature.

Well-being research findings

Adaptation-level phenomenon: we return to a baseline after good or bad events.

Relative deprivation: unhappiness from comparing with those who have more.

Strong predictors of happiness: close relationships, purpose, exercise, sleep, community.

Flow: absorption in a task matched to skill.

A few practical points tie this together. First, health risks cluster: people who sleep poorly also tend to exercise less and cope less well, so interventions that target one habit often improve others. Second, social factors matter at every level, from a supportive friend to community resources and public policy, such as taxes on tobacco and school health programs. Third, change is a process, not an event, and relapse is a normal part of changing habits. Finally, because most findings are correlational, evaluate claims by asking about sample, control group, and alternative explanations, the same research habits you use throughout the course.

EXAMPLE 1: APPLY THE MODELS

A manager is always rushed, quick to anger, and cynical about coworkers. Predict a health risk and suggest two changes.

SOLUTION

Hostility and anger are linked to coronary heart disease and high blood pressure, so cardiac risk is the concern.

Change 1: anger management and cognitive reframing, to reduce cynicism.

Change 2: regular aerobic exercise and relaxation or mindfulness, to lower stress reactivity; building social support also helps.

EXAMPLE 2: WELL-BEING

A man wins a lottery and is delighted at first, but a year later reports a happiness level similar to before. Name the concept and give one reason.

SOLUTION

Adaptation-level phenomenon: we adjust to new circumstances and return to baseline.

He also compares himself to wealthier people (relative deprivation).

Lasting happiness depends more on relationships, purpose, and activity than on money.

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EXAMPLE 3: INTEGRATING FACTORS

Explain how biological, psychological, and social factors could together explain a teen's high blood pressure.

SOLUTION

Biological: family history and a reactive stress response.

Psychological: hostility, poor coping, and sleep loss.

Social: a stressful neighborhood, little social support, and smoking among peers; together they interact, showing the biopsychosocial model.

Common mistakes

Do not say that all Type A traits cause heart disease; hostility is the key. Happiness is not mostly determined by money or events. Mindfulness is not the same as relaxation; it is nonjudgmental attention to the present. Remember that correlational findings about health and personality do not prove causation.

Practice**SET A Check Your Understanding**

Answer each question in one to three sentences.

- Describe Type A and Type B personalities and which component of Type A predicts heart disease.
- What are the three components of hardiness?
- Give two benefits of aerobic exercise for mental and physical health.
- Define the adaptation-level phenomenon.
- What is mindfulness, and how might it help stress?
- State two elements of effective substance-use prevention.

SET B Exam-Style Multiple Choice

Choose the best answer.

- Which personality trait is the best predictor of coronary heart disease?
 - Impatience
 - Competitiveness
 - Time urgency
 - Introversion
 - Hostility
- A woman who sees setbacks as challenges, feels in control, and is committed to her goals is showing
 - hardiness
 - learned helplessness
 - Type A behavior
 - flow
 - tolerance
- Participants who recently moved into higher income report less happiness than expected because they compare themselves with wealthier neighbors. This reflects
 - spontaneous recovery
 - self-serving bias
 - relative deprivation
 - the foot-in-the-door effect
 - social facilitation
- Which activity most directly supports memory consolidation and immune function?
 - Caffeine use
 - Adequate sleep
 - Skipping meals
 - Screen time
 - Multitasking
- Which is the best summary of positive psychology?
 - Study of mental illness only
 - Exclusive focus on drug treatment
 - A rejection of scientific research
 - Study of strengths and conditions that help people flourish
 - An approach that ignores emotions

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SET C Apply and Extend

Respond in complete sentences, using specific terms from the lesson.

12. A school plans a program to improve student well-being. (a) Propose two activities based on research. (b) Explain how each activity influences health. (c) Name one limitation of evaluating the program with student self-reports.
13. A researcher finds that people with optimistic outlooks live longer. (a) Identify the type of study. (b) Provide two alternative explanations for the association. (c) Suggest a design that would better test causation.

6.9 Multiple-Choice Practice: Mental and Physical Health

Practice AP-style multiple-choice questions on disorders, treatment, stress, and health.

Choose the best answer for each question. Check your reasoning against the explanations, which also show why the most tempting wrong answer fails.

SET A Core Concepts

Choose the best answer.

1. Which combination best defines a psychological disorder?
(A) Rare, creative, and disliked (B) Illegal, harmful, and punished
(C) Deviant, distressing, and dysfunctional (D) Unusual, biological, and inherited
(E) Stressful, temporary, and learned
2. A therapist uses the DSM-5 to diagnose a client. The main purpose of this manual is to
(A) describe symptoms and criteria so diagnoses are reliable
(B) explain the biological causes of each disorder
(C) recommend an effective treatment for each diagnosis
(D) measure intelligence and personality
(E) define legal insanity
3. A woman has repeated unexpected attacks of racing heart and fear of dying, and now avoids driving because she fears another attack. This is most consistent with
(A) generalized anxiety disorder (B) specific phobia
(C) obsessive-compulsive disorder (D) panic disorder
(E) posttraumatic stress disorder
4. Which feature distinguishes bipolar disorder from major depressive disorder?
(A) Sadness lasting two weeks (B) Loss of appetite
(C) Thoughts of worthlessness (D) Sleep disturbance
(E) A manic or hypomanic episode
5. Hallucinations and delusions in schizophrenia are classified as
(A) negative symptoms (B) positive symptoms (C) dissociative symptoms
(D) compulsions (E) cognitive deficits
6. An antipsychotic drug such as haloperidol mainly acts by
(A) blocking dopamine receptors (B) blocking serotonin reuptake
(C) increasing GABA (D) replacing lithium
(E) stimulating norepinephrine
7. A therapist who focuses on unconditional positive regard and active listening belongs to which tradition?
(A) Psychoanalytic (B) Behavioral (C) Humanistic
(D) Biomedical (E) Cognitive

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SET B Applications and Data

Choose the best answer.

8. Researchers asked 200 adults about sleep and recorded the number of colds each had during winter. People sleeping under 6 hours had more colds. Which conclusion is justified?
- (A) Short sleep is associated with more colds, but causation is not established
 - (B) Short sleep causes colds
 - (C) Colds cause short sleep
 - (D) Sleep has no relation to colds
 - (E) Everyone should sleep 6 hours
9. A student fears dogs after being bitten and now avoids every dog. Avoidance is most directly maintained by
- (A) positive punishment
 - (B) extinction
 - (C) observational learning
 - (D) negative reinforcement
 - (E) spontaneous recovery
10. In Rosenhan's study, pseudopatients stopped showing symptoms after admission, yet staff treated their ordinary behavior as pathological. This most supports the concern that
- (A) hospitals admit too few patients
 - (B) diagnostic labels can bias perception
 - (C) antipsychotics are ineffective
 - (D) symptoms are always faked
 - (E) DSM criteria are too precise
11. A person with severe, treatment-resistant depression receives a brief electric current that induces a seizure while under anesthesia. This is
- (A) transcranial magnetic stimulation
 - (B) deep brain stimulation
 - (C) a lobotomy
 - (D) systematic desensitization
 - (E) electroconvulsive therapy
12. Which sequence correctly orders Selye's stages?
- (A) Resistance, alarm, exhaustion
 - (B) Exhaustion, alarm, resistance
 - (C) Alarm, resistance, exhaustion
 - (D) Alarm, exhaustion, resistance
 - (E) Resistance, exhaustion, alarm
13. A client keeps a thought record, tests the evidence for her beliefs, and practices facing feared situations as homework. Which therapy is this?
- (A) Psychoanalysis
 - (B) Cognitive-behavioral therapy
 - (C) Client-centered therapy
 - (D) Family therapy
 - (E) Aversive conditioning
14. A manager is competitive and rushed but warm and not cynical. According to current research on heart disease, her risk is
- (A) high because all Type A traits cause heart disease
 - (B) identical to that of a hostile person
 - (C) unrelated to stress
 - (D) not elevated by hostility because she lacks it
 - (E) lower only if she takes lithium

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SET C Exam-Level Stretch

Choose the best answer.

15. A study randomly assigns 100 patients with depression to receive an antidepressant or a placebo, with neither patients nor evaluators knowing who gets which. Both groups improve, but the drug group improves more. Which statement is best supported?
- (A) The placebo has no effect
 - (B) The drug has an effect beyond the placebo response
 - (C) The drug cures depression
 - (D) Expectation plays no role
 - (E) The study is correlational
16. A teen with a family history of depression develops depression only after a series of losses. Which model best explains this?
- (A) Operant conditioning
 - (B) Psychoanalytic
 - (C) Humanistic
 - (D) Social facilitation
 - (E) Diathesis-stress
17. A researcher claims, 'Exposure therapy works because it rewards the client for confronting fear.' A better explanation is that exposure
- (A) leads to extinction of the learned fear response
 - (B) provides insight into unconscious conflicts
 - (C) increases serotonin
 - (D) changes irrational beliefs only
 - (E) uses the placebo effect
18. People who experience trauma often show symptoms for a few weeks, but only some develop PTSD lasting more than a month. Which interpretation fits?
- (A) Trauma always causes PTSD
 - (B) PTSD is purely genetic
 - (C) Individual vulnerability and coping influence outcome
 - (D) Social support is irrelevant
 - (E) PTSD is the same as acute stress disorder
19. A graduate student under chronic stress shows high cortisol, frequent infections, and slow wound healing. The most likely explanation is that
- (A) cortisol boosts white blood cells without limit
 - (B) stress is only psychological
 - (C) infections cause stress
 - (D) stress hormones suppress immune function
 - (E) the parasympathetic system is overactive
20. Which research finding about happiness is best supported by the adaptation-level phenomenon?
- (A) Money guarantees lasting happiness
 - (B) Happiness is mostly determined by age
 - (C) Social comparison has no effect
 - (D) Personality never changes
 - (E) People return near a baseline after major events

6.10 Free-Response Practice: Mental and Physical Health

Practice Article Analysis and Evidence-Based questions on disorders, treatment, stress, and health.

Each question is scored by points for specific, accurate responses. Answer every part, use terms precisely, and apply concepts to the details in the scenario. The model answers name the point for each part.

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QUESTION 1 Article Analysis: Exercise and Anxiety

Read the research summary. Researchers recruited 120 college students with moderate anxiety. Using a coin flip, they assigned 60 to a 6-week program of supervised aerobic exercise three times a week and 60 to a waiting list. Neither group received other treatment. At week 6, anxiety was measured with a questionnaire completed by participants. The exercise group's average score dropped from 28 to 19, while the waiting-list group dropped from 28 to 26.

1. (a) Identify the independent variable and the dependent variable in the study.
2. (b) Explain one reason that random assignment strengthens the conclusion.
3. (c) Explain why the waiting-list group is important to interpreting the 19 versus 26 result.
4. (d) Describe one limitation of using self-report to measure anxiety and suggest a way to address it.

QUESTION 2 Evidence-Based Question: Depression

Use the evidence to respond. Source 1: Twin studies show that if one identical twin has major depression, the other twin develops it about 45 percent of the time, compared with about 20 percent for fraternal twins. Source 2: In a survey of 500 adults, those who reported at least one close confidant had lower depression scores than those who reported none. Source 3: Patients given SSRIs improved after about 4 weeks, but a placebo group also improved, though by less.

5. (a) Use Source 1 to explain a biological contribution to depression.
6. (b) Use Source 2 to describe a social contribution and explain why the finding cannot show causation.
7. (c) Use Source 3 to evaluate the effectiveness of SSRIs, and explain how SSRIs act on neurotransmitters.
8. (d) Explain how the diathesis-stress model integrates the three sources.

QUESTION 3 Article Analysis: Mindfulness and Stress

Read the summary. A researcher recruits volunteers from a meditation center and compares them with students from a local college. Volunteers who meditate daily score lower on a stress scale than students who do not. The researcher concludes that mindfulness meditation reduces stress.

9. (a) Identify the research method and explain why it limits the conclusion.
10. (b) Identify one confounding variable and explain how it could account for the result.
11. (c) Describe an improved design with random assignment and operationalize the dependent variable.
12. (d) Explain one physiological effect of chronic stress that the improved study could measure.

QUESTION 4 Evidence-Based Question: Treating Phobia

Respond using psychological concepts. A 20-year-old, Leah, has had an intense fear of elevators since being trapped in one at age 8. She now climbs stairs to her 12th-floor classes and feels panic when others use elevators.

13. (a) Explain how classical conditioning accounts for the origin of Leah's fear.
14. (b) Explain how operant conditioning maintains her avoidance.
15. (c) Describe how a behavior therapist would apply systematic desensitization to Leah's fear.
16. (d) Name another type of therapy and describe how it would approach Leah's problem.

Answers Chapter 6: Answers and Explanations

Answers for every practice problem, numbered to match. Read the explanation even when your answer is correct.

6.1 Defining and Classifying Psychological Disorders**SET A · CHECK YOUR UNDERSTANDING**

1. Deviance, distress, and dysfunction. A pattern should be atypical for its culture, cause suffering, and impair daily functioning. Clinicians generally want more than one D to be present.
2. Deviance is judged against cultural norms. Speaking to ancestors in a ritual, for example, may be normal in one culture and look like a symptom in another. Clinicians must consider context to avoid misdiagnosis.
3. Its purpose is reliable diagnosis through specific criteria for symptoms, duration, and impairment. It does not specify causes or recommend treatments.
4. The medical model treats disorders as illnesses with biological causes. The biopsychosocial approach holds that biological, psychological, and social-cultural factors interact, so it explains disorders more broadly.
5. A diathesis is a predisposition or vulnerability, such as a genetic risk. A stressor is an environmental challenge. In the diathesis-stress model, disorder tends to occur only when both are present.

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6. After admission as pseudopatients, confederates acted normally, but staff interpreted ordinary behavior such as note-taking as pathological and kept them about 19 days on average. The label shaped how behavior was perceived.

SET B · EXAM-STYLE MULTIPLE CHOICE

7. B. Deviance alone is not enough; with no distress and no impairment, and the practice being normal within her culture, no disorder is indicated. Choice A treats deviance as sufficient, the common error.
8. C. The DSM-5 sets diagnostic criteria for classification. It is not a theory of causes (A) or treatment guide (B), which is a frequent misconception.
9. D. The explanation integrates biological, psychological/social, and cultural factors. The medical model (A) would stop at the biological cause.
10. A. Rosenhan's results showed that a label can color how people interpret behavior. It does not show that mental illness is nonexistent (D), only that diagnosis can be biased.
11. C. Risk rises when vulnerability meets stress. A and B each propose a single cause, which the model rejects.

SET C · APPLY AND EXTEND

12. Model response. (a) 1 point: Cultures differ in how distress is expressed and what counts as normal, so Lee's physical complaints may be an expression of emotional distress; a clinician using only one culture's norms might miss or misdiagnose it. 1 point: Applying the three Ds in context, not by one standard, helps accuracy. (b) 1 point: A label can create stigma, bias how teachers and peers interpret Lee's ordinary behavior (as in Rosenhan), and may reduce help-seeking.
13. Model response. 1 point: biological factor, such as genetic vulnerability or hormonal changes. 1 point: psychological factor, such as perfectionism or low self-esteem. 1 point: social-cultural factor, such as media ideals of thinness or peer pressure. 1 point: the vulnerability (diathesis) leads to disorder when combined with stressors like dieting pressure or social comparison.

6.2 Anxiety, OCD, and Trauma-Related Disorders**SET A · CHECK YOUR UNDERSTANDING**

1. GAD is continuous, hard-to-control worry about many topics lasting months. Panic disorder involves sudden, unexpected attacks that peak within minutes, plus worry about future attacks.
2. Obsession: an intrusive fear that hands are contaminated. Compulsion: washing hands repeatedly. The ritual temporarily reduces anxiety, which reinforces it.
3. Biological preparedness is the evolved tendency to learn fears of certain stimuli, such as snakes or heights, more easily because they threatened survival. This explains why phobias of these are common compared with fears of modern hazards.
4. GABA is the main inhibitory neurotransmitter; it calms neural activity. Low GABA activity is associated with anxiety, and many anti-anxiety drugs boost it.
5. Re-experiencing (flashbacks, nightmares), avoidance of reminders, negative changes in mood and thinking, and heightened arousal or reactivity (hypervigilance, startle).
6. Avoiding the feared object removes anxiety, which rewards the avoidance. The person never experiences the situation safely, so the fear does not extinguish.

SET B · EXAM-STYLE MULTIPLE CHOICE

7. A. Fear of negative evaluation in social situations defines social anxiety disorder. A specific phobia (B) concerns a single object or situation, not scrutiny.
8. D. Symptoms that follow trauma and last over a month indicate PTSD. Acute stress disorder (C) lasts only up to a month.
9. E. Escaping or avoiding the stimulus removes aversive anxiety, strengthening avoidance. Choice D describes the origin through classical conditioning, not maintenance.
10. C. Repetitive behavior performed to reduce anxiety from an obsession is a compulsion.
11. B. Overactive orbitofrontal cortex and caudate circuits are linked to OCD. Choice C describes memory problems more typical of other conditions.

SET C · APPLY AND EXTEND

12. Model response. (a) 1 point: UCS = the bite (pain); CS = the dog; CR = fear. (b) 1 point: Fear spread from the biting dog to all dogs. (c) 1 point: Exposure (systematic desensitization) gradually presents dogs while he stays relaxed; 1 point: because he experiences no harm, the CS-fear link is extinguished and avoidance is no longer reinforced.
13. Model response. (a) 1 point: Many people experience trauma but few develop PTSD, so trauma alone is insufficient; vulnerability (diathesis) interacts with the stressor. (b) 1 point: biological, such as a more reactive amygdala or genetic risk. 1 point: cognitive, such as negative interpretation of the event or rumination on the memory.

6.3 Mood Disorders and Suicide**SET A · CHECK YOUR UNDERSTANDING**

1. MDD requires symptoms for at least 2 weeks, while persistent depressive disorder requires a chronic milder depressed mood for 2 years or more.
2. Bipolar disorder includes at least one manic or hypomanic episode of elevated or irritable mood and high energy. Major depression has no such episodes.
3. A person holds negative views of the self, the world or present experiences, and the future. These views shape interpretation of events and sustain depressed mood.

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4. It is passivity after experiencing repeated uncontrollable aversive events. In humans, a belief that one cannot affect outcomes produces hopelessness and withdrawal, parallel to depression.
5. Serotonin and norepinephrine are linked to depression, and the prefrontal cortex (or amygdala) shows altered activity.
6. Warning signs include talking about wanting to die or giving away possessions. A helpful response is to ask directly, listen without judgment, and connect the person to a crisis line or professional.

SET B · EXAM-STYLE MULTIPLE CHOICE

7. E. A chronic, milder depressed mood lasting two years or more is persistent depressive disorder. MDD (B) requires more intense episodes lasting at least two weeks.
9. C. Mania features elevated mood, high energy, racing thoughts, and reduced sleep need. Choice E describes depression.
11. B. Winter-pattern depression is linked to reduced daylight and its effect on circadian rhythms and melatonin and serotonin. It is not caused by trauma alone (E).
8. A. Passivity after uncontrollable negative events is learned helplessness. It was demonstrated by Seligman and relates to depression.
10. D. A prior attempt and hopelessness are well-established risk factors. Choice A is a myth; asking does not increase risk.

SET C · APPLY AND EXTEND

12. Model response. (a) 1 point: IV = explanatory style (optimistic vs pessimistic); DV = depression score. (b) 1 point: internal, stable, and global attributions for negative events. (c) 1 point: participants were not randomly assigned to style, so a third variable (e.g., genetics or stress) could explain results; correlation is not causation.
13. Model response. (a) 1 point for each of two: giving away possessions, withdrawing, talking about being a burden. (b) 1 point each: ask directly and listen without judgment; connect him with a trusted adult or crisis line (988) and do not leave him alone. (c) 1 point: biological, e.g., low serotonin or genetic risk. 1 point: social, e.g., loss of a relationship and isolation.

6.4 Schizophrenia, Personality, and Other Disorders

SET A · CHECK YOUR UNDERSTANDING

1. A delusion is a false belief, and a hallucination is a false sensory perception. Both are positive symptoms because they are added to normal behavior.
2. It proposes that overactivity of dopamine, especially at D2 receptors, contributes to positive symptoms. Evidence includes antipsychotics that block these receptors and amphetamine-induced psychosis.
3. Anorexia involves severe food restriction, fear of weight gain, and dangerously low weight. Bulimia involves binges followed by compensatory purging, usually with a typical weight.
4. Persistent disregard for others' rights with lack of remorse and manipulative or impulsive aggressive behavior. It is linked to low arousal and frontal-lobe differences.
5. Inattention, hyperactivity, and impulsivity across settings. Treatment includes stimulant medication and behavioral therapy.
6. Tolerance is needing larger amounts to get the same effect. Withdrawal is the physical and psychological distress when the substance is stopped.

SET B · EXAM-STYLE MULTIPLE CHOICE

7. B. Delusions and hallucinations are positive symptoms of schizophrenia. Choice C is wrong because dissociation involves memory and identity disruption.
9. D. Restriction, fear of weight gain, and distorted body image with low weight define anorexia nervosa. Bulimia (A) does not involve dangerously low weight.
11. B. ASD is defined by social communication difficulties plus restricted, repetitive behaviors. Hallucinations (A) point to psychosis.
8. C. Higher concordance in identical twins, who share all genes, supports heritability. Enlarged ventricles (A) show brain differences but not inheritance.
10. A. Memory loss for traumatic events beyond normal forgetting is dissociative amnesia. DID (E) requires distinct identities.

SET C · APPLY AND EXTEND

12. Model response. (a) 1 point: Patients will show greater dopamine activity than controls. (b) 1 point: Antipsychotics block D2 receptors and reduce positive symptoms, supporting the idea. (c) 1 point: The data are correlational; the difference could be a result of the illness, medication, or stress rather than the cause.
13. Model response. 1 point: Antisocial involves disregard for others, deceit, and lack of remorse. 1 point: Borderline involves unstable relationships and self-image with intense emotion and impulsivity. 1 point: A biological factor (low arousal, frontal-lobe differences, or genetic risk) or social factor (childhood abuse, inconsistent parenting) is named and linked to the disorder.

6.5 Biomedical Treatments

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SET A · CHECK YOUR UNDERSTANDING

1. They block dopamine D2 receptors. Positive symptoms such as hallucinations and delusions improve most, while negative symptoms respond less.
2. SSRIs block the reuptake of serotonin so more remains active in the synapse. The result is gradual mood improvement over several weeks.
3. They calm anxiety quickly by enhancing GABA, but tolerance and dependence develop and withdrawal can occur.
4. It is involuntary, repetitive movement (such as facial grimacing) that can follow long-term use of older antipsychotics.
5. TMS needs no anesthesia, causes no seizure or memory loss, and has milder side effects, such as scalp discomfort or headache.
6. Placebo groups show how much improvement results from expectation, and double-blind procedures prevent researcher and participant bias. Differences between groups can then be attributed to the drug.

SET B · EXAM-STYLE MULTIPLE CHOICE

7. D. Lithium is the classic mood stabilizer for bipolar disorder. Fluoxetine (B) treats depression and could even trigger mania in bipolar patients.
8. C. ECT passes electricity through the brain to produce a seizure. TMS (A) uses magnetic pulses and does not cause a seizure.
9. B. Antidepressants often need two to six weeks. Choice A draws a conclusion too early.
10. E. Increasing GABA, which inhibits neural firing, reduces anxiety and panic. Antipsychotics (A) target dopamine.
11. A. Contemporary psychosurgery is used only for extreme, treatment-resistant cases, unlike the widespread lobotomies of the past.

SET C · APPLY AND EXTEND

12. Model response. (a) 1 point: IV = drug versus placebo; DV = anxiety score (or symptoms). (b) 1 point: random assignment equalizes groups; 1 point: double-blind controls expectancy and experimenter bias. (c) 1 point: informed consent, monitoring side effects, or offering effective treatment to the placebo group afterward.
13. Model response. 1 point: ECT strength is rapid response in treatment-resistant cases. 1 point: ECT limitation is memory loss and possible relapse. 1 point: antidepressant strength is noninvasive, widely available, and effective for many. 1 point: antidepressant limitation is the delay of weeks, side effects, and relapse if stopped.

6.6 Psychotherapies**SET A · CHECK YOUR UNDERSTANDING**

1. The goal is insight into unconscious conflicts. Free association and dream interpretation are two main techniques.
2. It is accepting and valuing the client without judgment. Carl Rogers emphasized it in client-centered therapy.
3. The therapist pairs alcohol with a nausea-causing drug, so alcohol becomes a conditioned stimulus for nausea. The person then develops an aversion to drinking.
4. Repeated contact with the feared stimulus without harm extinguishes the learned association and ends reinforcing avoidance.
5. They target distorted or irrational thoughts. They teach clients to identify, challenge, and replace these thoughts with balanced ones.
6. A trusting bond makes clients more willing to engage, share, and practice skills. It is a strong predictor of positive outcome regardless of the approach.

SET B · EXAM-STYLE MULTIPLE CHOICE

7. A. Free association is a hallmark of Freud's psychoanalysis. Client-centered therapy (B) uses active listening rather than interpretation.
8. E. Imagining a hierarchy while relaxed is systematic desensitization. Flooding (A) involves intense immediate exposure.
9. D. Ellis argued that irrational beliefs, not the events themselves, cause distress. Rogers (C) emphasized acceptance.
10. C. People can improve without treatment, so therapy must be compared with a control group. The placebo effect (B) involves expectation from receiving an inert treatment, which the waiting list did not.
11. B. Psychiatrists are medical doctors and can prescribe. Most psychologists cannot prescribe.

SET C · APPLY AND EXTEND

12. Model response. (a) 1 point: Identifies the overgeneralized negative thought and tests it with evidence, then helps replace it with a balanced thought. (b) 1 point: Keeping a thought record or scheduling pleasant activities. (c) 1 point: Reflects feelings with empathy and unconditional positive regard without challenging the belief or directing the session.
13. Model response. (a) 1 point: It controls for spontaneous remission and passage of time. (b) 1 point each for two: random assignment, trained therapists following manuals, blind raters, adequate sample size. (c) 1 point: Common factors such as the therapeutic alliance, hope, and empathy.

6.7 Stress and Coping

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SET A · CHECK YOUR UNDERSTANDING

1. Primary appraisal evaluates whether an event is a threat, harm, or challenge. Secondary appraisal evaluates whether you have the resources to cope with it.
2. Alarm, resistance, exhaustion. In resistance, the body stays aroused to cope with continuing stress, though outward signs may diminish and vulnerability to illness grows.
3. Shelley Taylor proposed that many females respond to stress by nurturing others and seeking social support, rather than only fight or flight. Oxytocin may play a role.
4. Stress hormones such as cortisol suppress immune function, which slows healing, weakens vaccine responses, and raises susceptibility to infection.
5. Problem-focused: creating a schedule to finish assignments. Emotion-focused: talking to a friend or practicing relaxation to manage feelings about a situation that cannot be changed.
6. Believing you can influence events reduces threat appraisal and arousal, while uncontrollable stress is more damaging.

SET B · EXAM-STYLE MULTIPLE CHOICE

7. C. The adrenal cortex releases cortisol during sustained stress. Oxytocin (B) is linked to bonding and tend and befriend.
8. E. Prolonged stress that depletes resources leads to illness and breakdown. Resistance (B) is the stage of ongoing coping before depletion.
9. A. Seeking social comfort manages emotion when the situation cannot be changed. It is not denial (C) because she acknowledges the problem.
10. D. Stress depends on appraisal. Selye's GAS (B) assumes a similar physiological response to all stressors, so it cannot explain individual differences.
11. B. This field examines how psychological and neural processes interact with the immune system.

SET C · APPLY AND EXTEND

12. Model response. (a) 1 point: correlational (or quasi-experimental) because support was not manipulated. (b) 1 point: Students with more support will report fewer illnesses. (c) 1 point: Personality, sleep, or stress level could affect both support and health; without random assignment, a causal conclusion is not justified.
13. Model response. (a) 1 point: sympathetic nervous system; adrenaline (and cortisol). (b) 1 point: If she appraises the speech as a challenge and believes she has resources, stress is lower and performance may improve; a threat appraisal increases distress. (c) 1 point each: problem-focused such as rehearsing the speech; emotion-focused such as deep breathing or talking with a friend.

6.8 Health Psychology and Well-Being**SET A · CHECK YOUR UNDERSTANDING**

1. Type A people are competitive, hurried, and easily angered, while Type B people are relaxed. Hostility is the component most strongly linked to heart disease.
2. Commitment, a sense of control, and viewing change as a challenge rather than a threat. They buffer the harmful effects of stress.
3. It reduces heart disease risk and improves mood and anxiety. It also promotes brain health and sleep.
4. It is the tendency to adjust to a given level of stimulation or circumstances and return to a baseline level of happiness. It explains why lottery winners or accident victims often return near their prior well-being.
5. Mindfulness is nonjudgmental awareness of the present moment. It lowers physiological arousal, reduces rumination, and improves emotional regulation.
6. Early education about risks plus refusal skills training, together with supportive family, school, and community. Reducing availability also helps.

SET B · EXAM-STYLE MULTIPLE CHOICE

7. E. Research shows that the toxic element within Type A is hostility, particularly cynicism and anger. Time urgency (C) alone is a weaker predictor.
8. A. These are Kobasa's three components of hardiness. Flow (D) is an absorbed state of focused activity, not a trait.
9. C. Comparing oneself to those who have more produces relative deprivation, a key finding in well-being research.
10. B. Sleep supports consolidation and immunity. Caffeine (A) may keep you awake but does not help consolidation.
11. D. Positive psychology studies strengths, well-being, and flourishing, using scientific methods. It does not ignore problems (A) but adds balance.

SET C · APPLY AND EXTEND

12. Model response. (a) 1 point each: e.g., a daily exercise break and sleep education, or mindfulness practice and a gratitude journal. (b) 1 point: exercise lowers stress and improves mood, or sleep supports memory and immunity. (c) 1 point: self-reports can be biased by social desirability or expectations, so objective measures or a control group are needed.
13. Model response. (a) 1 point: correlational study. (b) 1 point each: healthier people may be more optimistic (reverse causation); a third variable such as income, social support, or genetics could cause both. (c) 1 point: random assignment to an optimism-training or control condition, then tracking health outcomes.

6.9 Multiple-Choice Practice: Mental and Physical Health

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SET A · CORE CONCEPTS

1. C. The three Ds: a pattern atypical for the culture, causing suffering, and impairing functioning. Being rare or disliked alone does not make a disorder.
2. A. The DSM lists diagnostic criteria for reliability. It does not state causes or treatments, which is why the 'explain causes' option is tempting but wrong.
3. D. Recurrent sudden attacks plus worry about more attacks define panic disorder. GAD is continuous worry without discrete attacks.
4. E. Mania or hypomania marks bipolar disorder. The other symptoms occur in major depression too.
5. B. They are added to normal experience, so they are positive symptoms. Negative symptoms are absences such as flat affect.
6. A. Traditional antipsychotics block D2 dopamine receptors. Blocking serotonin reuptake is how SSRI antidepressants work.
7. C. These are core techniques of Rogers's client-centered therapy. Psychoanalysis would interpret unconscious material instead.

SET B · APPLICATIONS AND DATA

8. A. This is a correlational design, so only an association can be claimed. Stating that sleep causes colds ignores third variables such as stress.
9. D. Avoiding dogs removes anxiety, which reinforces the avoidance. Extinction would require exposure without harm.
10. B. Labels shaped how staff interpreted behavior. The study does not address drug effectiveness.
11. E. ECT induces a seizure under anesthesia. TMS uses magnetic pulses and does not cause a seizure.
12. C. The general adaptation syndrome moves from alarm to resistance to exhaustion. Placing resistance first reverses the response to the initial mobilization.
13. B. Thought records and behavioral homework are hallmarks of CBT. Client-centered therapy is nondirective.
14. D. The harmful element of Type A is hostility. Claiming that all Type A traits are harmful is an outdated generalization.

SET C · EXAM-LEVEL STRETCH

15. B. Both groups improved, which shows a placebo response, and the extra improvement in the drug group indicates a drug effect. 'The placebo has no effect' ignores the control group's improvement.
16. E. A vulnerability (family history) combined with stress produced the disorder, which is the diathesis-stress model.
17. A. Facing the feared stimulus without harm extinguishes the conditioned fear. The conflicts option is a psychoanalytic idea.
18. C. The varying outcomes reflect interacting risk and protective factors. Saying trauma always causes PTSD contradicts the data.
19. D. Prolonged cortisol suppresses immune functioning. Describing stress as only psychological ignores its physiological effects.
20. E. We adapt to new circumstances. Believing money guarantees lasting happiness contradicts this.

6.10 Free-Response Practice: Mental and Physical Health**QUESTION 1 · ARTICLE ANALYSIS: EXERCISE AND ANXIETY**

1. (a) 1 point: IV = exercise program versus waiting list. 1 point: DV = anxiety questionnaire score.
2. (b) 1 point: Random assignment makes the groups equivalent on average, so differences such as motivation or initial severity are unlikely to explain the difference.
3. (c) 1 point: The waiting-list group controls for improvement due to time, spontaneous remission, or expectation; the 2-point drop in that group shows some change occurs anyway, so the larger 9-point drop is attributable to the exercise.
4. (d) 1 point: Self-reports can be biased by social desirability or expectation; 1 point: add an objective measure such as heart rate or cortisol, or blind raters using a clinical interview.

QUESTION 2 · EVIDENCE-BASED QUESTION: DEPRESSION

5. (a) 1 point: Higher concordance in identical twins (45 vs 20 percent) who share more genes suggests heritability. 1 point: Because it is below 100 percent, environment also matters.
6. (b) 1 point: Social support is associated with lower depression scores. 1 point: The survey is correlational; depression might reduce social contact (reverse causation) or a third variable might affect both.
7. (c) 1 point: SSRIs show a benefit beyond placebo, but placebo improvement indicates expectation plays a role. 1 point: SSRIs block reuptake of serotonin, leaving more in the synapse, with effects after weeks.
8. (d) 1 point: Genes provide a diathesis; stress (e.g., isolation) can trigger depression; support and treatment lower risk, so the disorder results from interacting factors.

QUESTION 3 · ARTICLE ANALYSIS: MINDFULNESS AND STRESS

9. (a) 1 point: The comparison uses existing groups (correlational/quasi-experimental). 1 point: Without random assignment, the groups may differ in other ways, so causation cannot be inferred.
10. (b) 1 point: e.g., people who choose meditation may already have lower stress, more free time, or different personality. 1 point: This difference, not meditation, could explain the scores.
11. (c) 1 point: Randomly assign volunteers to an 8-week mindfulness program or a control activity. 1 point: Operationalize stress by a scored stress questionnaire or a cortisol measurement before and after.
12. (d) 1 point: Elevated cortisol, blood pressure, or weakened immune response (e.g., slower wound healing or more colds).

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QUESTION 4 · EVIDENCE-BASED QUESTION: TREATING PHOBIA

13. (a) 1 point: UCS = being trapped (fear); CS = elevator; CR = fear of elevators; 1 point: the elevator became a conditioned stimulus through association.
14. (b) 1 point: Taking stairs removes anxiety, which is negative reinforcement. 1 point: She never learns elevators are safe, so extinction cannot occur.
15. (c) 1 point: Teach relaxation and build a hierarchy (looking at an elevator, standing in one with the door open, riding one floor, riding several floors). 1 point: Pair each step with relaxation, advancing as anxiety fades, which extinguishes the fear response.
16. (d) 1 point: e.g., cognitive therapy would challenge catastrophic beliefs about being trapped, or psychoanalysis would explore unconscious meaning; 1 point: connects approach to technique.

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Chapter 7: Deep Dives and Mixed Review.

7 sections with explanations and worked examples, then 106 practice problems. Answers and full explanations are at the end of the chapter.

7.1 Classic Studies in Brain, Memory, and Language Thought

Learn the research history behind brain function and memory, plus several terms that are easy to miss.

Some of the most testable ideas in psychology are not definitions but the stories of how researchers found things out. This lesson fills in the research history behind the brain, memory, and thinking, and tidies a few terms that students often miss: afferent and efferent neurons, substance P, parallel processing, linguistic relativity, and the heuristics research of Kahneman and Tversky.

How scientists first studied the brain. Before scanners, researchers relied on damage and stimulation. **Ablation** means surgically removing brain tissue in animals, and a **lesion** is any damage or destruction of tissue, either deliberate (a small electrical or chemical burn made to knock out one structure) or accidental (stroke, tumor, injury). If an animal can no longer do something after a lesion, the structure probably contributes to that function. The weakness is that a missing behavior does not prove the damaged region is the only region involved. **Electrical stimulation** works the other way: a mild current is applied to a spot and the researcher watches what the animal or patient does.

Technique	What it measures	Best for	Limit
EEG	Electrical activity of the cortex through scalp electrodes	Timing of brain waves, sleep stages, seizures	Poor location detail
CT scan	X-ray slices of structure	Showing tumors, strokes, damage	Structure only, radiation
MRI	Magnetic fields and radio waves	Detailed structure of soft tissue	Structure only
fMRI	Blood oxygen changes over time	Which regions are active during a task	Indirect, slow compared with neural firing
PET scan	Where a radioactive glucose tracer is used	Activity of regions	Needs injection, lower detail

Remember

Structure: CT and MRI. Function: EEG, PET, and fMRI.

Lesion or ablation tests whether a structure is NEEDED; stimulation tests what it can DO.

Neuroimaging shows correlation between activity and a task, not proof that a region causes the behavior.

Lashley and the search for the engram. In the 1920s and 1930s Karl Lashley trained rats to run mazes and then removed different amounts of cortex, hoping to locate the **engram**, the physical trace of a memory. He found that the location mattered little; the amount of cortex removed mattered more. He concluded that memory is spread across the cortex (the principle of mass action) and that other regions can partly take over for damaged ones (equipotentiality). Modern work refines this: memories are distributed networks, but certain structures do have specialized roles, such as the hippocampus for forming new explicit memories and the cerebellum for conditioned motor responses.

Penfield's stimulation studies. The neurosurgeon Wilder Penfield stimulated the exposed cortex of awake epilepsy patients (the brain has no pain receptors, so local anesthesia is enough). Stimulating motor cortex made body parts move, and stimulating somatosensory cortex produced tingling in specific body regions, which led to the mapping of the brain's body maps. Stimulating the temporal lobe sometimes triggered vivid experiences, but these were not reliable recordings of past events.

Sperry, Gazzaniga, and the split brain. For severe epilepsy, surgeons cut the corpus callosum. Roger Sperry and Michael Gazzaniga then flashed images to only one visual field. A word shown to the right visual field (left hemisphere) could be named aloud, but an object shown to the left visual field (right hemisphere) could not be named, though the left hand could pick it out. The left hemisphere is usually dominant for speech and the right for spatial tasks. Sperry shared a Nobel Prize in 1981.

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H.M. and Korsakoff syndrome. In 1953 surgeons removed much of Henry Molaison's hippocampus to stop seizures. He could no longer form new explicit memories (**anterograde amnesia**), though he kept most old memories, normal short-term memory, and the ability to learn skills such as mirror tracing without recalling practice sessions. This supported the distinction between explicit and implicit memory. **Korsakoff syndrome** is a different amnesia, caused by thiamine (vitamin B1) deficiency, most often in long-term heavy drinking. Patients lose many new memories and some old ones, and often **confabulate**, filling gaps with invented but sincere stories.

Neural communication terms. Sensory signals travel toward the brain on **afferent** neurons and motor commands travel away on **efferent** neurons (a memory aid: Afferent = Arrive, Efferent = Exit). **Substance P** is a neurotransmitter that carries pain signals; **endorphins** are released to inhibit them, which is why intense exercise can dull pain. **Parallel processing** is the simultaneous handling of many features at once, for example vision analyzing color, motion, shape, and depth together, while conscious effortful problem solving tends to be **serial**, one step at a time.

Key terms

Engram: the physical memory trace. Lashley: mass action and equipotentiality.

Anterograde amnesia: cannot form new memories (H.M.). Confabulation: sincere invented memories (Korsakoff).

Afferent = toward the brain; efferent = away. Substance P = pain; endorphins = pain relief.

Weak linguistic relativity is supported; linguistic determinism is not.

EXAMPLE 1: INTERPRET A LESION STUDY

Rats with damage to the hippocampus learn a maze as quickly as normal rats if the route is marked by a single light, but cannot learn it when they must use spatial cues around the room. Which conclusion is best supported, and what is one limitation?

SOLUTION

Conclusion: the hippocampus is needed for learning spatial layouts (explicit-type, place memory) but not for simple stimulus-response learning.

Reasoning: damaged rats still learn when habit learning is enough, so general motor and learning ability is intact; the deficit shows up only on the spatial task.

Limitation: lesions often damage nearby tissue and fibers, and animals may compensate, so the finding shows the hippocampus is necessary for this task, not that it is the only region involved. Results from rats may also not fully generalize to humans.

Language and thought, and shortcuts in judgment. The **linguistic relativity hypothesis** (Sapir and Whorf) says the language we speak influences how we think. The strong form, linguistic determinism (language fixes what thoughts are possible), is rejected: infants and people lacking a word still think about the concept. The weak form has support: speakers of languages with more words for blue distinguish shades of blue faster, and languages that use compass directions instead of left and right produce speakers with sharp spatial orientation. Daniel Kahneman and Amos Tversky founded research on **heuristics and biases**, showing that quick rules like availability and representativeness produce systematic errors; Kahneman received the 2002 Nobel Prize in economics for this work.

EXAMPLE 2: CLASSIFY THE CLAIM

A student says, 'Because the Hopi language has no past tense, Hopi speakers cannot think about the past.' Evaluate the claim using linguistic relativity.

SOLUTION

The claim states linguistic determinism, the strong version, which says language limits thought.

Evidence against it: people can think about and describe time through other grammatical means, and thought exists in infants before language.

A defensible weak-version claim would be that language habits may nudge attention or speed of categorization, which is measurable but modest.

Common mistakes

Do not say fMRI shows the brain 'lighting up' because neurons are firing electricity; it tracks blood oxygen. Do not say H.M. lost all memory: his implicit learning and old memories survived. Do not treat Lashley's work as proving memory is nowhere in particular; it showed memory is distributed, not located in one spot.

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Practice

SET A Check Your Understanding

Answer each question in one to three sentences.

1. Distinguish ablation from stimulation as a way to study brain function.
2. Why was Lashley unable to find a single engram in the rat cortex?
3. What type of memory could H.M. still form, and what does this show?
4. Explain how Korsakoff syndrome differs in cause from H.M.'s amnesia.
5. Which direction do afferent and efferent neurons carry signals?
6. Contrast the strong and weak forms of linguistic relativity.

SET B Exam-Style Multiple Choice

Choose the best answer.

7. A surgeon stimulates a spot on the exposed cortex of an awake patient and the patient's hand twitches. The stimulated area is most likely the
 - (A) primary motor cortex
 - (B) primary somatosensory cortex
 - (C) occipital lobe
 - (D) Wernicke's area
 - (E) hippocampus
8. Which technique would best show a researcher which brain regions are active while a person solves a puzzle?
 - (A) CT scan
 - (B) EEG alone for exact location
 - (C) fMRI
 - (D) Ablation
 - (E) Lesion in animals
9. After a split-brain operation, a word is flashed only to a patient's left visual field. The patient will most likely
 - (A) say the word aloud easily
 - (B) be unable to see anything
 - (C) report seeing a blank field and be able to write the word with the right hand
 - (D) forget the word immediately
 - (E) be unable to say the word but able to point to the object with the left hand
10. A man with a history of alcoholism cannot form new memories and fills gaps with made-up but sincere stories. This best fits
 - (A) Alzheimer's disease
 - (B) retrograde amnesia from a concussion
 - (C) dissociative amnesia
 - (D) Korsakoff syndrome
 - (E) infantile amnesia
11. Pain signals that reach the brain are transmitted partly by the neurotransmitter
 - (A) GABA
 - (B) substance P
 - (C) acetylcholine
 - (D) serotonin
 - (E) dopamine
12. Researchers find that speakers of a language with distinct words for light blue and dark blue tell those shades apart faster than speakers of English. This supports
 - (A) linguistic determinism
 - (B) Chomsky's language acquisition device
 - (C) the weak form of linguistic relativity
 - (D) the critical period hypothesis
 - (E) the heuristics of Kahneman and Tversky

SET C Apply and Extend

Respond in complete sentences using terms from the lesson.

13. A neuroscientist wants to know whether the amygdala is necessary for learning to fear a tone paired with a shock. (a) Describe a lesion study design. (b) Identify the independent and dependent variables. (c) Give one limit on the conclusion.
14. Explain how the cases of Lashley's rats and H.M. together lead to the modern view that memory is distributed but not equally spread.

7.2 Gender, Sexuality, and Lifespan Extremes

Learn how psychologists study gender and sexuality and review atypical development and aging.

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This lesson gathers topics that cut across units: how psychologists separate sex from gender, how they study sexuality and orientation, what changes at the start and end of the lifespan, and which early women shaped the field. Each appears on exams in both vocabulary and research-scenario form.

Sex, gender, and roles. **Sex** refers to biological characteristics: sex chromosomes, hormones such as testosterone and estrogen, and anatomy. **Gender identity** is a person's internal sense of being male, female, both, or neither. **Gender roles** are the behaviors and traits a culture expects of each gender, and **gender expression** is how a person outwardly presents. **Gender typing** is the process of acquiring a traditional role. Three theories explain it. **Social learning theory** (Bandura) says children imitate and are reinforced for gender-typed behavior. **Kohlberg's gender constancy** says children first label their own gender (about age 2 to 3), then understand that it is stable over time, and finally that it stays the same despite changes in clothes or activities (about ages 6 to 7). **Gender schema theory** (Sandra Bem) says children actively build mental categories for male and female and then filter experience through them, noticing and remembering schema-consistent information.

Key distinctions

Sex = biology. Gender identity = inner sense. Gender role = cultural expectation.

Bem: gender schemas organize what children notice; Bem also described androgyny, high levels of both masculine and female-typed traits.

Gender dysphoria is the distress that may accompany a mismatch between identity and assigned sex; a different gender identity is not itself a disorder.

Sexual behavior research. Alfred Kinsey used large interview surveys in the 1940s and 1950s to report how common varied sexual behaviors were. He proposed the **Kinsey scale** from 0 (exclusively heterosexual) to 6 (exclusively homosexual) to show that orientation exists on a continuum. His samples relied heavily on volunteers, so critics say they were not representative, a sampling bias problem. William Masters and Virginia Johnson recorded physiological responses of volunteers in a laboratory and described the **sexual response cycle**: excitement, plateau, orgasm, and resolution. Men also experience a **refractory period** after orgasm during which another orgasm is not possible. Their method was observational and their volunteers were also self-selected.

Sexual orientation is an enduring attraction to the same sex, the other sex, both, or neither. There is no evidence that parenting, early abuse, or a person's choice causes it. Research points to a mix of influences: identical twins show higher concordance than fraternal twins (though far from 100 percent, so genes do not fully explain it), prenatal hormone exposure, and the 'older brother effect', in which men with more older brothers are slightly more likely to be gay. The American Psychiatric Association removed homosexuality from its diagnostic manual in 1973. Attempts to change orientation through therapy have not been shown effective.

Researcher	Method	Main contribution	Weakness
Kinsey	Interviews, large sample	Showed varied behavior is common; Kinsey scale	Volunteer bias
Masters and Johnson	Lab observation of physiology	Four-stage sexual response cycle	Unrepresentative volunteers
Bem	Theory and Sex Role Inventory	Gender schema theory, androgyny	Schema effects vary by culture
Kohlberg	Child interviews	Gender identity, stability, constancy	Understates early learning

EXAMPLE 1: IDENTIFY THE THEORY

A 5-year-old insists that only boys can be doctors and forgets the picture of a woman surgeon when asked what happened in a story, but remembers a picture of a male nurse who was described as lost. Which theory explains the memory pattern and why?

SOLUTION

Gender schema theory (Bem) explains it.

The child has a schema that doctors are male, so schema-consistent information is noticed and stored, and inconsistent information is distorted or forgotten.

Social learning theory would stress imitation and reinforcement; Kohlberg would stress understanding of gender constancy, but neither explains selective memory as directly.

Emerging adulthood and aging. Jeffrey Arnett proposed **emerging adulthood** (roughly ages 18 to 25) as a distinct period in wealthy societies, marked by identity exploration, instability, self-focus, feeling in-between, and a sense of possibilities. It is a cultural product, not a universal biological stage. In late adulthood, **fluid intelligence** and processing speed decline while **crystallized intelligence** holds steady. Decline in memory is mainly in recall and speed, while recognition and implicit memory hold up. Dementia, including **Alzheimer's disease**, is a disease, not normal aging.

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Atypical development. Down syndrome results from an extra copy of chromosome 21 (trisomy 21), and the risk rises with the mother's age. It typically involves intellectual disability of varying degree and recognizable physical features. **Intellectual disability** is diagnosed when IQ is roughly 70 or below and adaptive behavior (everyday living, communication, social skills) is limited, with onset before adulthood. Severity is set by adaptive functioning, not IQ alone. Other genetic conditions include Klinefelter syndrome (XXY), Turner syndrome (a single X), and phenylketonuria (PKU, a recessive disorder preventable with a diet low in phenylalanine).

Women who shaped psychology. Mary Whiton Calkins completed the requirements for a Harvard doctorate but was refused the degree because she was a woman. She invented the paired-associate technique for memory research, developed a 'self psychology', and became the first woman president of the American Psychological Association (1905). **Margaret Floy Washburn** earned the first PhD in psychology awarded to a woman (1894) and later became APA president (1921); she studied animal behavior and wrote *The Animal Mind*.

EXAMPLE 2: EVALUATE A STUDY

A researcher advertises online for volunteers willing to describe their sexual behavior and finds that 60 percent report a behavior that the researcher calls 'typical.' Identify a flaw and explain the effect.

SOLUTION

Flaw: a volunteer sample, so people willing to discuss sex differ from the population (sampling bias).

Effect: results may overstate how common the behavior is, so the sample does not generalize.

Improvement: use random sampling from the population and anonymous responses to reduce social desirability bias.

Common mistakes

Do not use sex and gender as synonyms in an essay. Do not say Down syndrome is inherited in the usual sense; it usually results from an error in cell division. Do not write that Calkins earned a Harvard degree; Harvard refused to grant it.

Must know

Down syndrome = trisomy 21; intellectual disability = IQ about 70 or below plus adaptive deficits before adulthood.

Emerging adulthood (Arnett): 18 to 25, identity exploration.

Calkins: first woman APA president (1905). Washburn: first woman psychology PhD (1894).

Practice

SET A Check Your Understanding

Answer each question in one to three sentences.

1. Distinguish gender identity from gender role.
2. State the three steps in Kohlberg's account of gender constancy.
3. Why do critics question the representativeness of Kinsey's samples?
4. What are the four phases of the sexual response cycle and what is the refractory period?
5. Name two factors that research links to sexual orientation, and one that it does not support.
6. Explain the cause of Down syndrome.

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SET B Exam-Style Multiple Choice

Choose the best answer.

7. Which theory states that children actively organize information about males and females into mental categories?
(A) Psychoanalytic theory (B) Social learning theory (C) Evolutionary theory
(D) Gender schema theory (E) Behaviorism
8. A person who identifies as female though assigned male at birth is describing her
(A) sex chromosomes (B) gender role (C) gender identity
(D) sexual orientation (E) gender schema
9. Masters and Johnson are best known for
(A) a large interview survey of sexual behavior
(B) describing phases of the sexual response cycle
(C) proposing a 7-point orientation scale
(D) showing that orientation is chosen
(E) developing gender schema theory
10. Which statement about aging is best supported by research?
(A) Crystallized intelligence declines steadily after 30
(B) Dementia is a normal part of aging
(C) Recognition memory is lost before recall
(D) Social support has no health effect
(E) Fluid intelligence and processing speed decline while vocabulary holds up
11. Mary Whiton Calkins is known for
(A) being the first woman president of the APA (B) founding the first psychology laboratory
(C) creating the first IQ test (D) discovering classical conditioning
(E) proposing the hierarchy of needs
12. Intellectual disability is diagnosed when
(A) IQ is below 100
(B) a person has a chromosomal disorder
(C) a person is unable to read
(D) IQ is about 70 or below and adaptive functioning is limited, beginning before adulthood
(E) IQ is below the 25th percentile

SET C Apply and Extend

Respond in complete sentences using terms from the lesson.

13. A researcher asks 400 adults to complete a Sex Role Inventory and finds that adults scoring high on both masculine- and feminine-typed traits report greater flexibility in coping. (a) Name the concept for scoring high on both. (b) Identify the research design. (c) Explain why the study cannot show that this trait causes flexibility.
14. Compare social learning theory and gender schema theory as explanations of why a 6-year-old girl chooses a toy truck less often than a doll, and describe evidence that would favor each.

7.3 Culture, Work Motivation, and Expectations

Connect culture, workplace motivation, and expectations to social psychology and learning.

This lesson connects social psychology, motivation, and learning to culture and the workplace. The common thread is that beliefs and expectations, whether cultural, managerial, or personal, shape behavior in measurable ways.

Culture and the self. **Individualism** is a cultural orientation that values personal goals, independence, and self-expression; **collectivism** values group goals, interdependence, and harmony. Typical examples: individualism is more common in the United States, Australia, and Western Europe, while collectivism is more common in many East Asian, Latin American, and African societies. Geert Hofstede surveyed employees of one multinational company across dozens of countries and identified cultural dimensions, including individualism versus collectivism, **power distance** (acceptance of unequal power), **uncertainty avoidance**, masculinity versus femininity, and long-term versus short-term orientation. These are tendencies of whole societies, not descriptions of every person, and treating them as fixed traits creates stereotypes. Culture affects attribution too: people from individualistic cultures show the fundamental attribution error and the self-serving bias more strongly.

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Culture terms

Individualism: independent self, personal achievement. Collectivism: interdependent self, group loyalty.

A **social norm** is an unwritten rule for acceptable behavior. Sherif's autokinetic experiments showed that groups create norms; descriptive norms describe what people do, injunctive norms what they ought to do.

Cultural dimensions describe societies on average, not individuals.

Work and achievement motivation. Douglas McGregor described two managerial assumptions. **Theory X** assumes workers dislike work, avoid responsibility, and must be controlled with close supervision and punishment. **Theory Y** assumes workers find work natural, seek responsibility, and are self-motivated when they feel valued. Theory X managers rely on extrinsic motivation; Theory Y managers cultivate intrinsic motivation. David McClelland studied the **need for achievement** (nAch), the desire for significant accomplishment, using ambiguous pictures (Thematic Apperception Test). People high in nAch prefer moderately difficult tasks. Edwin Locke and Gary Latham found that specific, challenging goals improve performance more than vague ones ('do your best'), especially when feedback is given. **Industrial-organizational psychology** applies these ideas to selection, training, and leadership. The **overjustification effect** reminds managers that adding rewards to an already enjoyable task can reduce intrinsic motivation.

Idea	Who	Key claim	Workplace use
Theory X	McGregor	Workers need control	Strict supervision, rewards and punishment
Theory Y	McGregor	Workers seek responsibility	Autonomy, participation
Need for achievement	McClelland	Drive to excel at moderately hard tasks	Assign challenging but reachable goals
Goal setting	Locke and Latham	Specific hard goals raise performance	Clear targets plus feedback
Overjustification	Lepper and others	Reward can undermine enjoyment	Use rewards sparingly

EXAMPLE 1: MATCH THE MANAGEMENT STYLE

A supervisor says, 'People here only work when someone is watching, so I check each person's output hourly.' A different supervisor lets teams choose their schedules and sets quarterly goals together with them. Identify each style and predict a motivational difference.

SOLUTION

The first supervisor reflects Theory X: workers are assumed to be unmotivated and need control.

The second reflects Theory Y: workers are assumed to be self-directed; collaborative goal setting fosters intrinsic motivation.

Prediction: Theory Y practices tend to increase job satisfaction and intrinsic motivation; strict monitoring may produce compliance but can lower creativity and commitment.

Expectations create reality. In the Pygmalion study, Robert **Rosenthal** and Lenore Jacobson told elementary teachers that a test had identified certain pupils as about to 'bloom' intellectually. In fact the pupils were chosen at random. At the end of the year, the labeled pupils, especially in the younger grades, gained more on IQ measures. The result illustrates the **self-fulfilling prophecy**: an expectation leads to behavior (more attention, more warmth, more challenging material) that makes the expectation come true. The same pattern is called the experimenter expectancy effect in research, which is why double-blind designs are used. Critics noted that the original gains were modest and some replications failed.

Groups, identity, and helping. Social exchange theory (Thibaut and Kelley; Homans) proposes that people keep relationships when perceived rewards exceed costs, and when the outcome beats available alternatives. Henri Tajfel's work on **social identity theory** shows that people derive part of their self-concept from group membership. In his minimal group studies, people randomly assigned to meaningless groups still favored their own group, showing how easily **in-group favoritism** begins. The 1964 murder of Kitty Genovese in New York was reported as witnessed by 38 people who did nothing; later research found the story exaggerated, but it prompted Bibb Latane and John Darley to study the **bystander effect**: the presence of other people reduces each person's likelihood of helping, through diffusion of responsibility and pluralistic ignorance.

Two learning ideas to finish. Robert Rescorla showed that classical conditioning depends on **contingency**, not mere pairing: a tone becomes a conditioned stimulus only when it reliably predicts the unconditioned stimulus. A tone that is paired with a shock just as often as the shock occurs without the tone does not produce fear. In operant conditioning, a **primary reinforcer** satisfies a biological need without learning (food, water, warmth), while a **secondary (conditioned) reinforcer**, such as money, praise, or tokens, has acquired value by association with primary reinforcers.

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EXAMPLE 2: RESCORLA'S CONTINGENCY

In Group 1, a tone is followed by a shock every time, and no shocks occur at other times. In Group 2, a shock occurs just as often with the tone as without it. Which group will show greater conditioned fear of the tone and why?

SOLUTION

Group 1 will show more fear.

In Group 1 the tone reliably predicts the shock, so it carries information.

In Group 2 the tone predicts nothing because the shock is equally likely without it, so the tone does not become a useful signal even though pairing occurred.

Expectation effects

Self-fulfilling prophecy: expectation → behavior → confirmation (Rosenthal and Jacobson).

Bystander effect: more witnesses, less helping (diffusion of responsibility).

Contingency, not contiguity, drives conditioning (Rescorla).

Common mistakes

Do not assume every person from a collectivist culture acts collectively. Do not describe the Pygmalion effect as teachers lying; it is unintentional behavior driven by expectations. Do not confuse the bystander effect with apathy; people do help in clear emergencies when they are the only witness.

Practice**SET A Check Your Understanding**

Answer each question in one to three sentences.

1. Contrast individualism and collectivism in how the self is defined.
2. What are two Hofstede dimensions other than individualism versus collectivism?
3. How do Theory X and Theory Y differ?
4. Why are specific, challenging goals more effective than 'do your best'?
5. What happened in the Rosenthal and Jacobson study and what does it show?
6. Distinguish a primary from a secondary reinforcer, giving an example of each.

SET B Exam-Style Multiple Choice

Choose the best answer.

7. A manager believes that employees naturally seek responsibility and will work hard when given autonomy. This view is most consistent with
 - (A) Theory X
 - (B) drive-reduction theory
 - (C) the need for affiliation
 - (D) equity theory
 - (E) Theory Y
8. Tajfel's minimal group studies demonstrated that
 - (A) people favor their own group even when assigned arbitrarily
 - (B) groups require long histories to form loyalty
 - (C) obedience declines in groups
 - (D) conformity requires a unanimous majority
 - (E) prejudice is learned only from parents
9. Rescorla's research on classical conditioning showed that conditioning depends mainly on
 - (A) how often the CS and US occur together regardless of other events
 - (B) the intensity of the CR
 - (C) the time since extinction
 - (D) how well the CS predicts the US
 - (E) the age of the learner

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10. A student is told by a school counselor that a classmate is 'gifted.' The teacher then calls on the classmate more often and the classmate's grades rise. This is an example of
- (A) the fundamental attribution error (B) the self-fulfilling prophecy
(C) cognitive dissonance (D) the foot-in-the-door effect
(E) the halo effect only
11. Which statement about the Kitty Genovese case is most accurate?
- (A) It proved that people never help strangers
(B) It was an experiment on obedience
(C) It inspired Latane and Darley to study the bystander effect
(D) It showed that group size increases helping
(E) It disproved diffusion of responsibility
12. Which of the following is a secondary reinforcer?
- (A) Water for a thirsty rat (B) A warm blanket on a cold day
(C) A gold star on a worksheet (D) Food for a hungry dog
(E) Relief from pain

SET C Apply and Extend

Respond in complete sentences using terms from the lesson.

13. A company in a collectivist society introduces a plan that rewards the top individual salesperson each month. Sales fall. (a) Explain with a cultural concept why this may have failed. (b) Suggest a modification. (c) Explain one limit on generalizing from this single company.
14. Design a double-blind experiment to test whether teacher expectations affect student achievement, and explain how it avoids the experimenter expectancy effect.

7.4 Somatic, Dissociative, and Personality Disorders in Depth

Sharpen the contrasts among lookalike disorders and review biological details of mood and thought disorders.

Exam questions about disorders usually give a short case and ask you to name the diagnosis. The hardest ones involve lookalike pairs: physical complaints without a medical cause, disorders of identity and memory, personality patterns, and brain diseases that mimic psychological problems. This lesson sharpens those contrasts.

Somatic symptom and related disorders. These involve physical symptoms or health worries that cause distress and impairment. (The older name, somatoform disorders, still appears in older sources.) In **somatic symptom disorder** a person has one or more distressing bodily symptoms, such as pain or fatigue, plus excessive thoughts, feelings, or behaviors about them, such as constant doctor visits. The symptoms are real to the person; what defines the disorder is the disproportionate reaction. In **illness anxiety disorder** a person has few or no symptoms but is preoccupied with having or catching a serious illness and checks, researches, or avoids. In **conversion disorder** (functional neurological symptom disorder) a person loses motor or sensory function, such as paralysis, blindness, or seizures, without a neurological explanation, and examination shows signs inconsistent with known disease. Historically conversion was explained as anxiety converted into a physical symptom. Two lookalikes are not these disorders because the person is deliberately faking: **malinger** (faking symptoms for an external reward such as avoiding work) and **factitious disorder** (faking illness to take on the sick role).

Disorder	Core feature	Example
Somatic symptom disorder	Real symptoms plus disproportionate worry	Months of fatigue and daily doctor visits despite normal tests
Illness anxiety disorder	Fear of illness with few symptoms	Constant checking for cancer after a harmless mole
Conversion disorder	Loss of function with no neurological cause	Sudden blindness before a feared event; normal eye tests
Malingering	Fake symptoms for gain	Claiming back pain to avoid jury duty

Dissociative disorders involve disruption in memory, identity, or awareness. **Dissociative amnesia** is inability to recall important personal information, usually about a traumatic event, that exceeds normal forgetting (it can include travel or wandering, once called fugue). **Dissociative identity disorder** involves two or more distinct identities and gaps in memory. **Depersonalization/derealization disorder** involves feeling detached from oneself or the world as if in a dream. Many cases follow severe childhood trauma, and dissociation is understood as a way of escaping overwhelming experience. Skeptics argue some DID cases are shaped by suggestion in therapy and media; the diagnosis remains debated.

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Do not confuse

Dissociative amnesia: personal memory gaps. Organic amnesia: brain injury or disease.

Conversion disorder: function lost without medical explanation. Malingering: deliberately faked.

Multiple personalities in DID are not the same as schizophrenia, which involves psychosis, not split identities.

Personality disorders are enduring, inflexible patterns of inner experience and behavior that deviate from cultural expectations, begin by adolescence or early adulthood, and cause distress or impairment. Clusters group them: **Cluster A (odd or eccentric)** paranoid, schizoid, schizotypal; **Cluster B (dramatic, emotional, erratic)** antisocial, borderline, narcissistic, histrionic; **Cluster C (anxious)** avoidant, dependent, obsessive-compulsive personality. **Borderline** personality disorder features unstable relationships, self-image, and emotions, impulsivity, and intense fear of abandonment; Marsha Linehan's dialectical behavior therapy (DBT) is an effective treatment. **Narcissistic** personality disorder features grandiosity, need for admiration, and lack of empathy. **Antisocial** personality disorder (diagnosed at 18 or older, usually with conduct problems before 15) features disregard for others' rights, deceit, and lack of remorse; some research finds low physiological arousal and reduced frontal function.

EXAMPLE 1: DIAGNOSE THE CASE

A 22-year-old has intense, short-lived friendships in which she alternately idealizes and rejects friends, harms herself when she fears being left, and describes feeling 'empty.' Which disorder and cluster fit, and which therapy is well supported?

SOLUTION

Diagnosis: borderline personality disorder, because of unstable relationships, fear of abandonment, self-harm, and emptiness.

Cluster: B (dramatic and emotional).

Therapy: dialectical behavior therapy, which teaches emotion regulation and distress tolerance.

Mood and thought disorders: two biological details. **Seasonal affective disorder (SAD)** is a depressive pattern that recurs at the same time each year, most often in winter when daylight is short; it is treated with bright-light therapy, which resets the circadian rhythm, as well as psychotherapy or antidepressants. The **dopamine hypothesis** of schizophrenia says that excess activity at dopamine receptors produces positive symptoms. It is supported by the effect of antipsychotic drugs that block dopamine receptors and the fact that amphetamines, which increase dopamine, can produce psychotic symptoms. It is incomplete: it explains positive symptoms better than negative ones, and glutamate and brain structure (enlarged fluid-filled ventricles, reduced frontal-lobe activity) also matter. Risk factors include genes (identical twin concordance about 50 percent) and prenatal stress or infection.

Neurocognitive (organic) disorders. An older term, organic disorders, refers to problems caused by brain damage or disease rather than psychological factors. **Delirium** is a sudden, fluctuating confusion and attention problem that usually reverses once its cause (infection, medication, withdrawal) is treated. **Major neurocognitive disorder** (dementia) is a gradual, usually irreversible decline in memory and thinking. **Alzheimer's disease** is the most common cause, marked by protein plaques and tangles, loss of acetylcholine-producing neurons, and early memory loss. **Parkinson's disease** involves loss of dopamine-producing neurons that control movement, producing tremor. **Huntington's disease** is caused by a single dominant gene, with onset in midlife.

EXAMPLE 2: DISTINGUISH DELIRIUM AND DEMENTIA

An 81-year-old hospital patient became confused and sleepy over two days after a urinary infection, and the confusion changes hour by hour. Her family reports normal memory last week. Delirium or dementia?

SOLUTION

Delirium, because of the rapid onset (days), fluctuating course, and clear medical cause.

Dementia develops gradually over months or years and does not fluctuate this way.

Treating the infection should reverse delirium; dementia is typically progressive.

Personality disorder clusters

A (odd): paranoid, schizoid, schizotypal.

B (dramatic): antisocial, borderline, narcissistic, histrionic.

C (anxious): avoidant, dependent, obsessive-compulsive.

Memory aid: A = Away from reality, B = Boundary problems and drama, C = Cautious and fearful.

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Exam tip

When a case says 'no medical explanation,' decide whether the person is sincere (somatic symptom, illness anxiety, conversion) or deliberately deceiving (malingering, factitious). When you see sudden onset and fluctuation, think delirium; when you see slow loss of memory, think dementia.

Practice**SET A Check Your Understanding**

Answer each question in one to three sentences.

1. Distinguish somatic symptom disorder from illness anxiety disorder.
2. Why is a person who loses the use of an arm with normal nerve tests described as having conversion disorder rather than malingering?
3. List the three personality disorder clusters and their labels.
4. Describe two core features of antisocial personality disorder.
5. Explain how the dopamine hypothesis is supported and one limit.
6. How does delirium differ from dementia?

SET B Exam-Style Multiple Choice

Choose the best answer.

7. A man cannot remember his name, family, or the events of the past week after witnessing a violent crime. Medical tests are normal. The most likely diagnosis is
(A) dissociative amnesia (B) conversion disorder (C) Alzheimer's disease
(D) illness anxiety disorder (E) delirium
8. A woman checks her body for lumps every day and visits doctors repeatedly although exams have found no illness. She has almost no symptoms. This best fits
(A) somatic symptom disorder (B) illness anxiety disorder
(C) conversion disorder (D) panic disorder
(E) borderline personality disorder
9. Bright-light therapy is most appropriate for
(A) bipolar mania (B) schizophrenia
(C) conversion disorder (D) antisocial personality disorder
(E) seasonal affective disorder
10. An employee fakes a back injury to collect compensation. This is best described as
(A) conversion disorder (B) somatic symptom disorder
(C) malingering (D) factitious disorder imposed on another
(E) dissociative fugue
11. Which condition involves loss of dopamine-producing neurons that control movement?
(A) Alzheimer's disease (B) Huntington's disease (C) delirium
(D) Parkinson's disease (E) narcolepsy
12. Which pair is correctly matched?
(A) Cluster A: borderline (B) Cluster B: avoidant (C) Cluster B: narcissistic
(D) Cluster C: schizoid (E) Cluster A: histrionic

SET C Apply and Extend

Respond in complete sentences using terms from the lesson.

13. A 35-year-old suddenly becomes unable to walk the day before she must testify against her abuser. Neurological tests show no damage. (a) Name the most likely diagnosis. (b) Explain one reason it is not malingering. (c) Describe one psychological treatment.
14. Explain the dopamine hypothesis and evaluate it using two pieces of evidence.

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7.5 Therapy Delivery, Stress Biology, and Health

Learn how mental health care is delivered, how stress is measured, and how it affects the immune system.

Two themes finish the clinical and health units: how treatment is delivered to people and communities, and how stress physically affects health. Both feature named studies and distinctions that appear often in multiple-choice items.

More on psychodynamic technique. In psychoanalysis, **resistance** is the patient's blocking of anxiety-laden material (changing the subject, missing sessions). **Interpretation** is the analyst's explanation of the meaning of resistance, dreams, or slips. **Transference** is the patient's redirection of feelings toward important figures, such as parents, onto the therapist, so that old relationship patterns appear in the room and can be examined. Transference is a feature of psychodynamic therapy, not behavior therapy.

Group and family formats. **Group therapy** treats several clients together. Advantages: lower cost, the discovery that others share your problems (universality), feedback from peers, and a chance to practice social skills. Disadvantages: less individual attention and a risk that confidentiality is breached. **Self-help (support) groups**, like Alcoholics Anonymous, are led by peers instead of professionals.

Family therapy treats the family as a system in which one member's symptoms may reflect patterns of communication, so the therapist works to change roles and interactions rather than blaming an individual.

Deinstitutionalization and community care. Until the mid-1900s many people with severe mental illness lived for years in large state hospitals. After antipsychotic drugs appeared in the 1950s (chlorpromazine), and with the Community Mental Health Act of 1963 in the United States, patients were moved out of institutions, a trend called **deinstitutionalization**. The intent was care in community mental health centers close to home. In practice, funding for community services fell short, and many people with severe illness ended up homeless, in jails, or without treatment. **Community psychology** therefore emphasizes **prevention**: **primary prevention** reduces new cases by changing conditions (prenatal care, anti-bullying programs, stress management in schools), **secondary prevention** detects and treats early (screening for depression), and **tertiary prevention** reduces disability and relapse in people already ill (rehabilitation, supported housing).

Level	Aim	Example
Primary	Prevent new cases	School program on coping skills
Secondary	Early detection and quick treatment	Depression screening at a clinic
Tertiary	Limit disability and relapse	Job training for people recovering from schizophrenia

Treatment delivery

Transference: feelings for others redirected to the therapist (psychodynamic).

Deinstitutionalization: moving patients out of hospitals; promise of community care often unmet.

Prevention levels: primary = stop it starting; secondary = catch it early; tertiary = reduce its effects.

Measuring stress. In 1967 Thomas **Holmes** and Richard **Rahe** built the Social Readjustment Rating Scale (SRRS), listing life events with 'life change units' based on how much readjustment they required, for example death of a spouse (about 100), marriage (about 50), and change of residence (about 20). Summing events over the past year predicted illness: higher totals carried higher risk. Critics point out that the scale is correlational, includes positive events, and ignores how a person appraises an event; Richard Lazarus found that **daily hassles** (traffic, deadlines) predict health problems at least as well as major events.

EXAMPLE 1: SCORE AND INTERPRET

In a year a person gets married (50), suffers a personal injury (53), has trouble with the boss (23), and moves to a new home (20). Total the life change units and explain what the total means and what limits it.

SOLUTION

Add: $50 + 53 + 23 + 20 = 146$ life change units.

Meaning: more units mean more readjustment demand, and in the original research higher totals correlated with higher chances of illness.

Limits: the scale is correlational, ignores appraisal and coping resources, and treats a joyful event like a threatening one equally; the values are averages from a particular era.

Stress and the immune system. **Psychoneuroimmunology** studies how psychological, neural, endocrine, and immune processes interact. Chronic stress raises cortisol, which suppresses immune functioning. Janice Kiecolt-Glaser found that small wounds healed more slowly in caregivers of relatives with dementia and in students during exams than in less stressed people. Sheldon Cohen exposed volunteers to cold viruses and found that those reporting more life stress were more likely to develop colds. Stress does not cause infection directly but lowers resistance. Shelley Taylor argued that the stress response is not only fight-or-flight: especially among females, stress can prompt **tend-and-befriend**, nurturing offspring and seeking social support, aided by oxytocin.

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Weight and well-being. **Set point theory** holds that the body defends a biologically programmed weight range through hunger signals and metabolism, controlled partly by the hypothalamus and hormones such as leptin (from fat cells, signals fullness) and ghrelin (from the stomach, signals hunger). This is one reason dieters regain lost weight. In the study of happiness, **hedonic well-being** refers to pleasure, positive emotion, and satisfaction, while **eudaimonic well-being** refers to meaning, purpose, personal growth, and using one's strengths. Positive psychology (Martin Seligman, Mihaly Csikszentmihalyi) studies both, including the state of **flow**, total absorption in a challenging task matched to one's skills.

EXAMPLE 2: DESIGN A STRESS STUDY

A researcher wants to test whether stress slows wound healing. Describe a design and name the independent and dependent variables.

SOLUTION

Design: recruit healthy volunteers, randomly assign half to a stress condition (public speaking and math tasks before healing) and half to a calm condition, then make a standard small wound.

IV: stress condition. DV: days to heal, measured by raters who do not know the condition.

Random assignment supports a causal conclusion; a correlational study of caregivers could not rule out confounds such as sleep or diet.

Stress and health

Holmes and Rahe: life change units predict illness; daily hassles (Lazarus) may predict better.

Psychoneuroimmunology: chronic stress → cortisol → weaker immune response (Kiecolt-Glaser, Cohen).

Tend-and-befriend (Taylor): nurture and affiliate under stress.

Hedonic = pleasure; eudaimonic = meaning and growth.

Common mistakes

Do not say stress causes colds; say it reduces immune resistance. Do not claim deinstitutionalization failed because drugs failed; the core failure was missing community services. Do not mix up hedonic (pleasure) and eudaimonic (meaning) well-being.

Practice

SET A Check Your Understanding

Answer each question in one to three sentences.

1. What is transference and why is it useful in psychodynamic therapy?
2. Give two advantages and one disadvantage of group therapy.
3. What was deinstitutionalization and what went wrong?
4. Match each prevention example to its level: (a) anti-bullying program, (b) depression screening, (c) supported housing after hospitalization.
5. State one criticism of the Social Readjustment Rating Scale.
6. What does set point theory predict about long-term dieting?

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SET B Exam-Style Multiple Choice

Choose the best answer.

7. A patient begins to treat her therapist with the same anger she felt toward her father. A psychodynamic therapist would call this
(A) resistance (B) transference
(C) projection by the therapist (D) free association
(E) reaction formation
8. Which finding is most closely associated with Kiecolt-Glaser?
(A) Stressed caregivers' wounds healed more slowly
(B) Optimists have higher IQ scores
(C) Type A individuals have lower blood pressure
(D) Positive events are the only stressors
(E) Women never show fight-or-flight
9. A city funds a program teaching parenting skills to expectant parents to reduce child abuse before it occurs. This is
(A) secondary prevention (B) tertiary prevention (C) deinstitutionalization
(D) primary prevention (E) aversive conditioning
10. Which statement about the tend-and-befriend response is most accurate?
(A) It is the third stage of the general adaptation syndrome
(B) It occurs only in men
(C) It replaces the sympathetic response
(D) It lowers immune functioning
(E) It involves nurturing and seeking social support, linked to oxytocin
11. A person reports that volunteering at a shelter gives her a sense of purpose even though it is not always enjoyable. This best illustrates
(A) hedonic well-being (B) adaptation level (C) eudaimonic well-being
(D) relative deprivation (E) the set point
12. Which hormone from fat cells signals that the body has enough stored energy?
(A) Ghrelin (B) Leptin (C) Insulin (D) Cortisol (E) Oxytocin

SET C Apply and Extend

Respond in complete sentences using terms from the lesson.

13. A hospital system closes a psychiatric ward and refers patients to a clinic that has a two-year waiting list. (a) Name the movement this reflects. (b) Describe one predictable negative outcome. (c) Propose a secondary-prevention step.
14. Design a study to test whether social support buffers the effect of stress on immune function and explain why random assignment of support is preferable to a survey.

7.6 Mixed Review Multiple Choice

Practice 20 questions drawn from all five units, weighted toward commonly missed topics.

Twenty questions mix all five units, with extra weight on topics students often miss: research design, statistics, neural communication, memory, conditioning, social influence, and disorders. Answer each, then read the explanation, which also shows why the best distractor fails.

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SET A Core Concepts

Choose the best answer.

1. A researcher randomly assigns 80 students to sleep 5 or 8 hours, then measures reaction time. Which is the dependent variable?
(A) Reaction time (B) Hours of sleep (C) Student age
(D) Random assignment (E) The sample of 80
2. A distribution of salaries has a few extremely high values. Which statement is correct?
(A) Mean is less than median (B) Mean equals median
(C) Mode is greater than mean (D) Mean is greater than median
(E) Standard deviation is zero
3. The refractory period of a neuron is the time
(A) when the neuron fires at maximum speed
(B) before the threshold is reached
(C) when neurotransmitters are released
(D) when the myelin sheath is formed
(E) after firing when it cannot fire again immediately
4. Which of the following is processed in parallel in the visual system?
(A) Only color
(B) Only language
(C) Color, motion, shape, and depth simultaneously
(D) Only depth
(E) Only motion after color
5. A student remembers a list better when studying and testing in the same room. This illustrates
(A) context-dependent memory (B) state-dependent memory (C) proactive interference
(D) the spacing effect (E) retroactive interference
6. A pigeon pecks a key at a steady high rate with short pauses after each reward, receiving food after a set number of pecks. Which schedule?
(A) Variable-ratio (B) Fixed-ratio (C) Fixed-interval
(D) Variable-interval (E) Continuous reinforcement
7. A child who first says 'goed' and 'foots' is showing
(A) telegraphic speech (B) babbling
(C) holophrastic speech (D) overgeneralization of grammar rules
(E) a phoneme error

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SET B Applications and Data

Choose the best answer.

8. An experiment finds that people who drink coffee score higher on an alertness test, $p = .03$. Which statement is the best interpretation?
- (A) The result has a 3% chance of being true
 - (B) Coffee improves alertness for everyone
 - (C) If there were no real effect, a result this large would occur about 3% of the time
 - (D) The effect is large
 - (E) The study proves causation even without random assignment
9. A study shows that children who watch more violent TV are more aggressive, $r = +.35$. Which conclusion is justified?
- (A) The variables are positively related, but causation is not established
 - (B) Violent TV causes aggression
 - (C) Aggression causes violent TV viewing
 - (D) The variables are unrelated
 - (E) Aggression decreases as TV viewing rises
10. A woman's amnesia began after an accident and she cannot form new memories, though she remembers her childhood. This is
- (A) retrograde amnesia
 - (B) infantile amnesia
 - (C) source amnesia
 - (D) dissociative amnesia
 - (E) anterograde amnesia
11. In Milgram's original study, about 65 percent of participants delivered what they believed was the maximum shock. Which factor increased obedience in later variations?
- (A) The experimenter being absent
 - (B) The experimenter being nearby and in a prestigious setting
 - (C) Participants being in a different room from the experimenter
 - (D) The victim being in the same room
 - (E) Seeing other participants refuse
12. A person is told that people who got a flu shot are less likely to be ill and then says, 'My neighbor got sick after her shot, so shots do not work.' This reasoning is mainly an example of
- (A) algorithmic thinking
 - (B) functional fixedness
 - (C) convergent thinking
 - (D) availability heuristic with an anecdote
 - (E) hindsight bias
13. A teenager who assumes that everyone is watching her and judging her appearance is displaying, in Elkind's terms, the
- (A) personal fable
 - (B) object permanence
 - (C) imaginary audience
 - (D) conservation error
 - (E) assimilation
14. Which patient is most likely to be treated with lithium?
- (A) A person with panic disorder
 - (B) A person with specific phobia
 - (C) A person with antisocial personality
 - (D) A person with narcolepsy
 - (E) A person with bipolar disorder

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SET C Exam-Level Stretch

Choose the best answer.

15. A researcher compares the memory of 20-year-olds and 70-year-olds on one day and finds a difference. A limitation of this design is
 - (A) participant attrition
 - (B) lack of a control group
 - (C) order effects
 - (D) cohort effects
 - (E) the placebo effect
16. A student states that she did poorly on a test because the exam was unfair, but says her friend failed because he was lazy. This is best explained by
 - (A) the halo effect
 - (B) self-serving bias and the actor-observer difference
 - (C) cognitive dissonance
 - (D) the false-consensus effect
 - (E) the just-world hypothesis
17. In classical conditioning, repeatedly presenting the conditioned stimulus without the unconditioned stimulus will lead to
 - (A) extinction
 - (B) acquisition
 - (C) spontaneous recovery
 - (D) generalization
 - (E) discrimination
18. A therapist asks a client to imagine a feared spider while relaxed, moving through a hierarchy from least to most frightening. This technique is
 - (A) aversive conditioning
 - (B) flooding
 - (C) token economy
 - (D) free association
 - (E) systematic desensitization
19. A hospital finds that patients on a new antidepressant improve more than patients on placebo, but patients who guess they got the real drug improve more regardless of group. This most directly suggests a role for
 - (A) random sampling
 - (B) the Flynn effect
 - (C) expectancy effects
 - (D) operational definitions
 - (E) the replication crisis
20. Which sequence of Erikson's stages is correct from infancy through adolescence?
 - (A) Trust, autonomy, initiative, industry, identity
 - (B) Autonomy, trust, industry, initiative, identity
 - (C) Identity, industry, initiative, autonomy, trust
 - (D) Trust, initiative, autonomy, identity, industry
 - (E) Initiative, trust, autonomy, industry, identity

7.7 Mixed Free-Response Clinic

Practice four free-response questions that cross units.

These four mixed questions cross units, as the real free-response section does. Each part earns one point for a specific, accurate, applied answer; restating the question or giving a definition without applying it earns nothing. Write your own answer first, then compare with the model.

QUESTION 1 Article Analysis: Napping and Memory

Read the summary. Researchers recruited 90 college students and randomly assigned 45 to take a 90-minute nap and 45 to watch a video after studying a list of 40 word pairs. Participants did not know the study's hypothesis. Eight hours later, all were tested on the pairs. The nap group recalled a mean of 31 pairs ($SD = 4$), the video group a mean of 26 ($SD = 5$). The difference was statistically significant, $p < .01$. All participants were students at one university.

1. (a) Identify the independent variable and the dependent variable.
2. (b) State a hypothesis the researchers could have tested and operationally define the dependent variable.
3. (c) Explain what $p < .01$ means in this study.
4. (d) Explain one limitation to generalizing the results and one memory process (encoding, storage, or retrieval) that sleep might help.

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QUESTION 2 Evidence-Based Question: Why People Help

Use the evidence. Source 1: In an experiment, a participant alone in a room heard a staged emergency and helped 85 percent of the time; with four other people present, 31 percent helped. Source 2: In interviews, participants who did not help said they assumed someone else would respond. Source 3: A survey of 300 adults found that those who volunteered regularly reported higher empathy scores.

5. (a) Use Source 1 to describe the bystander effect.
6. (b) Use Source 2 to explain the concept of diffusion of responsibility.
7. (c) Use Source 3 to explain why the findings cannot show that empathy causes volunteering.
8. (d) Explain how one factor, such as empathy or social norms, can increase helping.

QUESTION 3 Article Analysis: Praise and Persistence

Read the summary. A researcher gave 60 fifth graders an easy puzzle. Using a random number table, she assigned 30 to be told 'You must be smart' and 30 to be told 'You must have worked hard.' All were then offered a choice between an easy puzzle and a harder one. Of the effort-praise group, 22 chose the harder puzzle; of the intelligence-praise group, 10 chose the harder one. Puzzle difficulty and time were the same for both groups.

9. (a) Identify the type of design and explain how random assignment strengthens it.
10. (b) Calculate the percentage of each group that chose the harder puzzle.
11. (c) Using a concept from motivation or learning, explain why effort praise may lead to more challenge-seeking.
12. (d) Identify one ethical concern and one way to address it.

QUESTION 4 Evidence-Based Question: Treating Anxiety

Use the evidence. Source 1: Adults with social anxiety disorder were randomly assigned to cognitive behavioral therapy (CBT), an SSRI, or a waiting list. After 12 weeks, 55 percent of the CBT group, 50 percent of the SSRI group, and 15 percent of the waiting list group improved. Source 2: Six months after treatment ended, relapse was lower in CBT (15 percent) than SSRI (45 percent). Source 3: Twin studies show that anxiety disorders have a concordance of about 40 percent in identical twins and 15 percent in fraternal twins.

13. (a) Use Source 1 to evaluate how effective CBT is, and explain the purpose of the waiting-list group.
14. (b) Use Source 2 to compare CBT and SSRI treatment over time and explain one reason for the difference.
15. (c) Use Source 3 to explain a biological contribution to anxiety and why the data show it is not the only cause.
16. (d) Explain how an SSRI affects a neurotransmitter.

Answers Chapter 7: Answers and Explanations

Answers for every practice problem, numbered to match. Read the explanation even when your answer is correct.

7.1 Classic Studies in Brain, Memory, and Language Thought**SET A · CHECK YOUR UNDERSTANDING**

1. Ablation removes or destroys tissue and checks which abilities are lost, testing whether a structure is needed. Stimulation applies a mild current and checks what behavior or sensation appears, testing what a region can produce.
2. Removing cortex from many different locations produced similar deficits that depended mostly on how much was removed. Memories are distributed across networks, and surviving areas can partly take over, so no single spot held the trace.
3. H.M. could improve at skills such as mirror tracing even though he could not remember practicing. This shows that implicit procedural memory depends on systems other than the hippocampus, which is needed for new explicit memories.
4. H.M.'s amnesia came from surgical removal of the hippocampus. Korsakoff syndrome comes from thiamine deficiency, usually after prolonged heavy drinking, and often includes confabulation.
5. Afferent neurons carry sensory information toward the central nervous system. Efferent neurons carry motor commands away from the central nervous system to muscles and glands.
6. The strong form, linguistic determinism, says language determines what people can think. The weak form says language influences habits of attention and categorization. Evidence supports only the weak form.

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SET B · EXAM-STYLE MULTIPLE CHOICE

7. A. Stimulating motor cortex produces movement. Somatosensory cortex would produce a sensation such as tingling rather than a twitch.
8. C. fMRI tracks blood oxygen changes and shows active regions during a task. CT shows only structure, and EEG has poor location detail.
9. E. The left visual field projects to the right hemisphere, which has little speech ability but can direct the left hand. Saying the word aloud would be right for the right visual field.
10. D. Confabulation with long-term heavy drinking points to Korsakoff syndrome from thiamine deficiency. Alzheimer's is a progressive degenerative disease with a gradual course, not this alcohol-related picture.
11. B. Substance P carries pain information; endorphins inhibit it. Serotonin is more tied to mood and sleep.
12. C. Language influenced speed of discrimination but did not make it impossible, which is the weak form. Linguistic determinism overstates the finding.

SET C · APPLY AND EXTEND

13. Model response. (a) 1 point: Randomly assign rats to amygdala-lesion or sham-surgery groups, then pair a tone with shock and later play the tone alone. (b) 1 point: IV = lesion or sham surgery; DV = amount of freezing (fear response) to the tone. (c) 1 point: Lesions may damage nearby fibers, or other regions may produce fear, so the result shows the amygdala is involved for this task but may not generalize to humans.
14. Model response. 1 point: Lashley showed removal of cortex anywhere harmed maze memory in proportion to amount, so memories are not stored in one spot. 1 point: H.M. showed that the hippocampus has a specific role in forming new explicit memories, while implicit skills survive. 1 point: Together they support the view that memory is stored in networks across the brain but that structures differ in function.

7.2 Gender, Sexuality, and Lifespan Extremes**SET A · CHECK YOUR UNDERSTANDING**

1. Gender identity is a person's internal sense of their gender. A gender role is the set of behaviors a culture expects of people of a given gender, so identity is personal while role is social.
2. Children first label their own gender, then understand that gender is stable over time, and finally understand that it stays the same despite changes in appearance or activities.
3. Many participants were volunteers, who may differ from the general population in openness about sex. A non-random sample limits generalizing the frequencies he reported.
4. The phases are excitement, plateau, orgasm, and resolution. The refractory period is the time after orgasm in men when another orgasm is not possible.
5. Supported influences include genetics (twin studies) and prenatal hormones. The research does not support the claim that parenting style or conscious choice determines orientation.
6. Down syndrome results from three copies of chromosome 21 instead of two (trisomy 21), usually from an error in cell division, with higher risk at older maternal ages.

SET B · EXAM-STYLE MULTIPLE CHOICE

7. D. Bem's gender schema theory stresses active mental categories. Social learning theory emphasizes imitation and reinforcement rather than internal categories.
8. C. Gender identity is the internal sense of one's own gender. Sexual orientation concerns whom a person is attracted to, which is a separate dimension.
9. B. They observed physiological responses in the laboratory. The interview survey and the 0-to-6 scale belong to Kinsey.
10. E. Fluid abilities decline and crystallized knowledge stays stable. Dementia is a disease, not normal aging.
11. A. Calkins was APA president in 1905 and invented the paired-associate method. Wundt, not Calkins, founded the first laboratory.
12. D. Diagnosis requires both low IQ and adaptive deficits with early onset. IQ alone is not enough, and a chromosomal disorder does not always cause it.

SET C · APPLY AND EXTEND

13. Model response. (a) 1 point: androgyny (Bem). (b) 1 point: a correlational study using a survey or self-report inventory, with no manipulation of variables. (c) 1 point: correlation does not show causation; a third variable such as education or personality could explain both, and the direction of the relationship is unknown.
14. Model response. 1 point: Social learning theory says she imitates same-gender models and is rewarded for gender-typed play. 1 point: Gender schema theory says she has built a schema labeling trucks as for boys and dolls as for girls and prefers schema-consistent toys. 1 point: Evidence for social learning would be that she plays with trucks more after seeing a rewarded same-sex model; evidence for schema theory would be that she remembers gender-consistent pictures better.

7.3 Culture, Work Motivation, and Expectations**SET A · CHECK YOUR UNDERSTANDING**

1. In individualistic cultures the self is defined by personal traits, goals, and achievements. In collectivist cultures the self is defined by relationships and duties to the family or group.
2. Examples are power distance, which is acceptance of unequal power, and uncertainty avoidance, which is discomfort with ambiguity. Masculinity versus femininity and long-term versus short-term orientation are also dimensions.
3. Theory X assumes workers dislike work and need control, so managers use close supervision and extrinsic rewards. Theory Y assumes workers seek responsibility and are self-motivated.

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4. Specific hard goals direct attention, increase effort and persistence, and make feedback meaningful. Vague goals provide no standard to check progress against.
5. Teachers were falsely told that randomly chosen pupils would bloom, and those pupils gained more on IQ measures. It shows that expectations can produce a self-fulfilling prophecy through teacher behavior.
6. A primary reinforcer meets a biological need without learning, such as food. A secondary reinforcer has learned value through association with primary reinforcers, such as money or praise.

SET B · EXAM-STYLE MULTIPLE CHOICE

7. E. McGregor's Theory Y assumes self-motivated workers. Theory X assumes the opposite, which is the tempting contrast.
9. D. Contingency, meaning predictiveness, is key, not raw pairing. Frequency of co-occurrence can be high without conditioning if the US also occurs alone.
11. C. The case prompted bystander research, even though the original media account was exaggerated. Group size reduces helping, not increases it.
8. A. Random, meaningless categories were enough to produce in-group favoritism. Long histories are not needed.
10. B. Expectation changed teacher behavior, which produced the expected outcome. The halo effect alone does not involve the outcome matching the expectation.
12. C. A gold star has value only through learning. Food and water satisfy needs directly, so they are primary.

SET C · APPLY AND EXTEND

13. Model response. (a) 1 point: In collectivist cultures people define themselves by the group, so public individual competition can threaten harmony and conflict with the norm of cooperation. (b) 1 point: Reward team performance or share credit. (c) 1 point: One company may not represent the culture, and cultural dimensions describe averages, not every person.
14. Model response. 1 point: Randomly assign students to groups and tell teachers (falsely, with ethical debriefing) that one group is likely to improve; the IV is teacher expectation and the DV is performance on a standardized test. 1 point: The test is scored by raters who do not know group assignment. 1 point: Blind scoring prevents the raters' own expectations from influencing results, and random assignment makes groups equivalent.

7.4 Somatic, Dissociative, and Personality Disorders in Depth**SET A · CHECK YOUR UNDERSTANDING**

1. In somatic symptom disorder a person has real bodily symptoms and reacts to them with excessive worry and behaviors. In illness anxiety disorder there are few or no symptoms but the person is preoccupied with having a serious illness.
2. In conversion disorder the loss of function is real to the person and not deliberately produced. Malingering involves consciously faking symptoms for an external reward.
3. Cluster A is odd or eccentric, Cluster B is dramatic, emotional, or erratic, and Cluster C is anxious or fearful.
4. Features include a pervasive disregard for the rights of others, deceitfulness, impulsivity, aggression, and lack of remorse. Diagnosis requires age 18 or older and evidence of earlier conduct problems.
5. Antipsychotic drugs block dopamine receptors and relieve positive symptoms, and amphetamines can cause psychotic symptoms. A limit is that it explains negative symptoms poorly and other chemicals like glutamate and brain structure are involved.
6. Delirium comes on quickly, fluctuates, and usually reverses when its medical cause is treated. Dementia develops gradually and is typically irreversible and progressive.

SET B · EXAM-STYLE MULTIPLE CHOICE

7. A. Extensive loss of personal memory after trauma with no medical cause suggests dissociative amnesia. Delirium would involve confusion and attention problems with a medical cause.
9. E. Light therapy resets circadian rhythms in winter-pattern depression. It is not used for mania, which it might worsen.
11. D. Parkinson's disease involves dopamine neuron loss and tremor. Alzheimer's involves acetylcholine and plaques.
8. B. Preoccupation with illness with minimal symptoms is illness anxiety disorder. Somatic symptom disorder requires significant bodily symptoms.
10. C. Conscious faking for an external reward is malingering. Factitious disorder involves the sick role itself, not external gain.
12. C. Narcissistic personality disorder is dramatic, Cluster B. Borderline is also Cluster B and avoidant is Cluster C.

SET C · APPLY AND EXTEND

13. Model response. (a) 1 point: conversion disorder (functional neurological symptom disorder). (b) 1 point: The symptom is not under voluntary control or produced for external gain; the person sincerely experiences paralysis. (c) 1 point: Cognitive behavioral therapy or psychotherapy addressing the stress, or physical rehabilitation that reduces the symptom.
14. Model response. 1 point: Excess activity at dopamine receptors is said to cause positive symptoms like hallucinations and delusions. 1 point: Supporting evidence: antipsychotics block dopamine receptors and reduce positive symptoms, and amphetamines can induce psychosis. 1 point: Limitation: negative symptoms respond poorly to dopamine blockers, and glutamate and brain structure differences also contribute.

7.5 Therapy Delivery, Stress Biology, and Health

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SET A · CHECK YOUR UNDERSTANDING

1. Transference is the patient's redirection of feelings about important people onto the therapist. It lets the therapist observe and interpret old relationship patterns as they appear in therapy.
2. Advantages are lower cost and the support and feedback of peers who share similar problems. A disadvantage is less individual attention and weaker guarantees of confidentiality.
3. It was the movement of patients from large psychiatric hospitals to community care beginning in the 1950s and 1960s. Community services were underfunded, so many patients became homeless or incarcerated.
4. (a) Primary, because it prevents new cases. (b) Secondary, because it finds problems early. (c) Tertiary, because it reduces disability and relapse.
5. It is correlational and treats all people's appraisal of events as equal. It also includes positive events as stressors and ignores coping resources, and daily hassles may predict health better.
6. It predicts that the body defends its programmed weight range by increasing hunger and slowing metabolism, so lost weight is often regained.

SET B · EXAM-STYLE MULTIPLE CHOICE

7. B. Redirecting feelings from a parent to the therapist is transference. Resistance is blocking of material, not redirection of feelings.
8. A. Wound healing in stressed caregivers links stress to immune function. Cohen's cold virus study is the commonly confused study, but it measured infection rather than wound healing.
9. D. The program prevents new cases, which is primary prevention. Secondary prevention targets early detection.
10. E. Taylor proposed that stress can lead to nurturing and affiliation, especially in females. It is not a stage of GAS.
11. C. Meaning and purpose define eudaimonic well-being. Hedonic well-being emphasizes pleasure.
12. B. Leptin signals fullness and reduces appetite. Ghrelin signals hunger and is the tempting opposite.

SET C · APPLY AND EXTEND

13. Model response. (a) 1 point: deinstitutionalization. (b) 1 point: Patients without community care may relapse, become homeless, or be jailed. (c) 1 point: Screen patients for early warning signs in primary care or schools and provide rapid referral.
14. Model response. 1 point: Randomly assign stressed volunteers to a condition with a supportive friend present or alone during a stressful task, then measure immune markers or illness rate; IV = presence of support; DV = immune measure. 1 point: Random assignment equates groups on personality and stress history. 1 point: A survey would be correlational and could not rule out third variables such as personality or sleep.

7.6 Mixed Review Multiple Choice**SET A · CORE CONCEPTS**

1. A. The DV is the outcome measured, reaction time. Hours of sleep is the manipulated IV, the tempting wrong choice.
2. D. A positively skewed distribution has a mean pulled upward by outliers. The median resists outliers, so the mean exceeds it.
3. E. Right after an action potential the neuron resets and cannot fire again at once. Release of neurotransmitter occurs at the terminal buttons, not during the reset.
4. C. Parallel processing handles multiple features at once. Serial processing is one step at a time, as in effortful problem solving.
5. A. Matching the physical environment at encoding and retrieval helps recall, which is context-dependent memory. State-dependent memory concerns internal states like mood.
6. B. Reward after a fixed number of responses with post-reinforcement pauses is a fixed-ratio schedule. Variable-ratio produces steady responding with few pauses.
7. D. Applying regular rules to irregular words reflects learning of rules. Telegraphic speech uses short two-word phrases.

SET B · APPLICATIONS AND DATA

8. C. The p-value is the probability of data this extreme if the null hypothesis were true. It is not the probability the result is true and it does not show effect size.
9. A. A moderate positive correlation shows association only; a third variable or reversed direction remains possible.
10. E. Inability to form new memories after the damage is anterograde. Retrograde would erase memories from before the injury.
11. B. Proximity and legitimacy of the authority increased obedience. Absence of the experimenter and dissenting peers reduced obedience.
12. D. A vivid single case overrides base-rate data, which is the availability heuristic. Hindsight bias concerns believing one knew an outcome after the fact.
13. C. The imaginary audience is the belief that others are constantly observing you. The personal fable is the belief that one is unique and invulnerable.
14. E. Lithium stabilizes mood in bipolar disorder. Antianxiety drugs, not lithium, are used for panic.

SET C · EXAM-LEVEL STRETCH

15. D. A cross-sectional study confounds age with generation, so the difference may reflect cohort differences. Attrition is a problem of longitudinal designs.
16. B. She attributes her failure to the situation and his to disposition, which is the actor-observer difference and a self-serving pattern. Dissonance involves reducing conflict between beliefs and actions.
17. A. Without the US the CR weakens, which is extinction. Spontaneous recovery is its later partial reappearance.
18. E. Pairing relaxation with graded exposure is systematic desensitization based on counterconditioning. Flooding exposes at full intensity from the start.
19. C. Belief about treatment influences outcomes, which is expectancy or placebo effect. The other terms do not address belief about treatment.

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20. A. The order is trust vs mistrust, autonomy vs shame, initiative vs guilt, industry vs inferiority, identity vs role confusion. Swapping autonomy and initiative is the most common error.

7.7 Mixed Free-Response Clinic

QUESTION 1 · ARTICLE ANALYSIS: NAPPING AND MEMORY

1. (a) 1 point: IV = nap versus video (activity after studying). 1 point: DV = number of word pairs recalled.
2. (b) 1 point: Students who nap after studying will recall more word pairs than students who do not. 1 point: DV operationalized as the count of correct pairs out of 40 on the test.
3. (c) 1 point: If there were no real effect of napping, a difference this large would occur by chance less than 1 percent of the time, so the result is statistically significant. (It does not give the size of the effect.)
4. (d) 1 point: Limitation: sample was students at one university, so results may not generalize to other ages or settings. 1 point: Sleep may aid consolidation (storage) by strengthening new connections, with the hippocampus replaying information.

QUESTION 2 · EVIDENCE-BASED QUESTION: WHY PEOPLE HELP

5. (a) 1 point: Helping fell from 85 percent to 31 percent when others were present; the presence of others reduces each person's chance of helping.
6. (b) 1 point: Participants assumed someone else would help, so each felt less personal responsibility; responsibility was spread across people.
7. (c) 1 point: Survey data are correlational; volunteering could increase empathy, or a third variable like religiosity could cause both.
8. (d) 1 point: Empathy, or a norm of social responsibility, leads people to help even when others are present, or seeing a model who helps increases helping.

QUESTION 3 · ARTICLE ANALYSIS: PRAISE AND PERSISTENCE

9. (a) 1 point: Experiment (random assignment, manipulated IV). 1 point: Random assignment equates the groups on average on prior ability and motivation, so differences can be attributed to praise.
10. (b) 1 point: Effort praise $22/30 = 73$ percent; intelligence praise $10/30 = 33$ percent.
11. (c) 1 point: Effort praise encourages a growth mindset and intrinsic motivation, so children see ability as improvable and welcome challenge; intelligence praise can create fear of failure.
12. (d) 1 point: Children may feel discouraged by the manipulation; address through parental consent, debriefing, and ending with positive feedback.

QUESTION 4 · EVIDENCE-BASED QUESTION: TREATING ANXIETY

13. (a) 1 point: CBT worked (55 percent improved versus 15 percent on the waiting list), similar to the SSRI. 1 point: The waiting list controls for improvement over time and expectations.
14. (b) 1 point: Relapse was lower with CBT (15 percent) than with the SSRI (45 percent). 1 point: CBT teaches coping skills that last after treatment ends, while medication effects stop when it stops.
15. (c) 1 point: Identical twins show higher concordance than fraternal twins, suggesting genetic influence. 1 point: Concordance is far below 100 percent, so environment and experience also contribute.
16. (d) 1 point: SSRIs block reuptake of serotonin, leaving more serotonin in the synapse.

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E1 Practice Exam 1

A full-length practice test that mirrors the AP Psychology exam: 75 multiple-choice questions and 2 free-response questions.

Section I has 75 multiple-choice questions to be completed in 70 minutes and counts for two-thirds of your score. Section II has two free-response questions, an Article Analysis Question and an Evidence-Based Question, to be completed in 50 minutes total and counts for one-third. Work under timed conditions, then check every explanation, including those for questions you answered correctly.

Section	Questions	Time	Weight
I: Multiple Choice	75	70 minutes	66.7%
II: Article Analysis Question (7 points)	1	About 20 minutes	16.7%
II: Evidence-Based Question (7 points)	1	About 30 minutes	16.7%

Scoring guide: each correct multiple-choice answer earns 1 raw point (no penalty for guessing), so Section I is worth 75 points. Multiply each free-response raw score (0 to 7) by about 2.7 to place it on the same 150-point scale. Total composite points of roughly 105 or more point toward a 5, about 85 to 104 toward a 4, and about 65 to 84 toward a 3. These bands are approximate and vary from year to year.

SECTION I, PART 1 Multiple Choice, Questions 1-19

Choose the best answer for each question. Questions 1 through 19.

- A researcher randomly assigns 60 volunteers to either a sleep-restriction group or a normal-sleep group and then compares scores on a memory test. In this study, the independent variable is
 - whether participants were sleep restricted or slept normally
 - the score on the memory test
 - the 60 volunteers
 - the random assignment procedure
 - the time of day of testing
- A psychologist reports that the correlation between hours of social media use and loneliness is $+0.45$. Which conclusion is best supported?
 - Social media use causes loneliness.
 - Loneliness causes people to use social media more.
 - There is no relationship between the two variables.
 - Higher social media use is associated with higher loneliness, but causation cannot be inferred.
 - The correlation shows that 45 percent of lonely people use social media.
- Which sampling method gives every member of the target population an equal chance of being selected?
 - Random assignment
 - Convenience sampling
 - Stratified assignment
 - Random sampling
 - Naturalistic observation
- A study finds that participants who received a placebo improved as much as those who received a new drug. This most directly suggests that the drug's apparent effect may be due to
 - experimenter bias in sampling
 - the hindsight bias
 - participants' expectations
 - the use of a correlational design
 - the law of large numbers

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5. Which statement about a normal distribution is accurate?
(A) The mean is always higher than the median.
(B) Most scores fall far above the mean.
(C) The distribution has two distinct peaks.
(D) Scores are always spread evenly across every value.
(E) The mean, median, and mode are approximately equal.
6. Before participating in a study of conformity, volunteers are told they may leave at any time and that their data will remain confidential. These procedures illustrate
(A) debriefing
(B) deception
(C) a double-blind procedure
(D) random sampling from the population
(E) informed consent and confidentiality
7. A set of exam scores is 70, 72, 72, 75, 99. Compared with the median, the mean of this set is
(A) higher, because of the outlier
(B) lower, because of the outlier
(C) identical
(D) impossible to determine
(E) equal to the mode
8. A neuron that is at rest has a
(A) negative charge inside relative to outside
(B) positive charge inside relative to outside
(C) membrane that is open to all sodium ions
(D) charge identical to its action potential
(E) continuously carrying an action potential
9. Which neurotransmitter is most closely associated with voluntary muscle movement and is also involved in learning and memory?
(A) Dopamine
(B) Serotonin
(C) Acetylcholine
(D) GABA
(E) Norepinephrine
10. A drug that blocks the reuptake of serotonin would most likely
(A) decrease serotonin activity in the synapse
(B) increase serotonin activity in the synapse
(C) destroy serotonin receptors
(D) stop neurons from firing at all
(E) It converts serotonin into dopamine.
11. After a stroke, a patient can understand speech but speaks slowly with effort and omits small words, though her meaning is clear. Which area was most likely damaged?
(A) Wernicke's area
(B) Hippocampus
(C) Occipital lobe
(D) Broca's area
(E) Auditory cortex
12. Which brain structure is most important for forming new explicit memories?
(A) Cerebellum
(B) Hippocampus
(C) Amygdala
(D) Thalamus
(E) Pons
13. The part of the nervous system that mobilizes the body for "fight or flight" is the
(A) parasympathetic nervous system
(B) somatic nervous system
(C) central nervous system
(D) sympathetic nervous system
(E) the enteric nervous system
14. A person who experiences a blow to the back of the head and then reports blurry vision most likely injured the
(A) temporal lobe
(B) parietal lobe
(C) frontal lobe
(D) cerebellum
(E) occipital lobe
15. Which of the following hormones is most directly associated with the body's long-term stress response, increasing blood sugar?
(A) Melatonin
(B) Oxytocin
(C) Insulin
(D) Cortisol
(E) Leptin
16. In the retina, the cells responsible for vision in dim light and located mostly in the periphery are the
(A) cones
(B) rods
(C) ganglion cells
(D) bipolar cells
(E) the receptors of the blind spot

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17. A person looks at a bright red square for 30 seconds and then at a white wall, seeing a green afterimage. This phenomenon is best explained by the
- (A) trichromatic theory alone (B) place theory
(C) gate-control theory (D) frequency theory
(E) opponent-process theory
18. Which sleep stage is characterized by rapid eye movements, vivid dreaming, and a brain wave pattern similar to wakefulness?
- (A) Stage N2 (B) REM sleep
(C) Stage N3 (D) Stage N1
(E) Alpha waves of relaxed wakefulness
19. A child sees a dog with four legs and fur and then calls a cat "doggie." According to Piaget, the child has most clearly engaged in
- (A) accommodation (B) object permanence (C) assimilation
(D) conservation (E) centration

SECTION I, PART 2 Multiple Choice, Questions 20–38

Choose the best answer for each question. Questions 20 through 38.

20. Which of the following is the strongest example of the depth cue of linear perspective?
- (A) A nearby object blocking part of a far one
(B) Retinal images from two eyes differing slightly
(C) Railroad tracks appearing to converge in the distance
(D) Smaller objects looking more distant
(E) Texture gradient, as detail grows finer with distance
21. After many exposures to a bell paired with food, a dog salivates to the bell alone. The salivation to the bell is the
- (A) unconditioned response (B) unconditioned stimulus (C) conditioned stimulus
(D) neutral stimulus (E) conditioned response
22. A parent gives a child a cookie every time the child cleans her room, and room cleaning increases. This is an example of
- (A) positive reinforcement (B) negative reinforcement (C) positive punishment
(D) negative punishment (E) extinction
23. A slot machine pays out after an unpredictable number of pulls. Which schedule is this, and why does it produce persistent responding?
- (A) Variable ratio, because rewards are unpredictable and tied to responses
(B) Fixed ratio, because rewards come after a set count
(C) Variable interval, because rewards depend on time
(D) Fixed interval, because rewards follow a schedule
(E) Continuous reinforcement, because every response is rewarded
24. A child watches an adult hit a doll and later hits the doll when alone. This best illustrates
- (A) classical conditioning (B) latent learning (C) operant shaping
(D) insight learning (E) observational learning
25. A student remembers the first and last items on a grocery list better than the middle ones. This is the
- (A) serial position effect (B) spacing effect
(C) misinformation effect (D) encoding specificity principle
(E) the testing effect
26. Which technique best improves long-term retention of textbook material?
- (A) Rereading the chapter several times in one night
(B) Highlighting key sentences
(C) Studying only in one location
(D) Cramming the material the night before
(E) Testing yourself over spaced sessions

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27. A witness who is asked how fast cars were going when they "smashed" into each other recalls broken glass that was not there. This illustrates
- (A) proactive interference
 - (B) the misinformation effect
 - (C) the spacing effect
 - (D) flashbulb memory
 - (E) source amnesia
28. Forgetting a new phone number because of the old one you used for years is an example of
- (A) retroactive interference
 - (B) decay
 - (C) repression
 - (D) proactive interference
 - (E) motivated forgetting
29. A person who can recall a word's starting letter and syllable count but not the word itself is experiencing
- (A) anterograde amnesia
 - (B) the self-reference effect
 - (C) automatic processing
 - (D) the tip-of-the-tongue phenomenon
 - (E) the false-memory effect
30. Someone decides that plane crashes are common because vivid news reports easily come to mind. This reasoning reflects the
- (A) representativeness heuristic
 - (B) anchoring effect
 - (C) confirmation bias
 - (D) the framing effect
 - (E) availability heuristic
31. A student who has only used a hammer to open a paint can later cannot think of using it as a paperweight. This is
- (A) mental set
 - (B) functional fixedness
 - (C) algorithmic thinking
 - (D) divergent thinking
 - (E) confirmation bias
32. Chomsky argued that humans are born with a
- (A) need for reinforcement to learn grammar
 - (B) blank slate for language
 - (C) preference for imitation over grammar
 - (D) a language ability that appears only after formal schooling
 - (E) biological predisposition to acquire language
33. In an intelligence test, a score is considered reliable when
- (A) it measures what it is intended to measure
 - (B) it is based on a large national sample
 - (C) it predicts future performance
 - (D) it has face value to those who take it
 - (E) it produces consistent results across repeated testing
34. Which of the following best describes Spearman's g?
- (A) Eight distinct intelligences
 - (B) Three types of intelligence including creative
 - (C) A general intelligence factor underlying performance on many tasks
 - (D) The ability to perceive emotion
 - (E) Cattell's fluid-crystallized model
35. Crystallized intelligence is best illustrated by
- (A) knowing vocabulary and historical facts
 - (B) solving an unfamiliar puzzle
 - (C) quickly spotting visual patterns
 - (D) remembering a string of digits
 - (E) creating original ideas without prior knowledge
36. A toddler insists on putting on his own shoes and says "no" to help. According to Erikson, he is working through the crisis of
- (A) trust versus mistrust
 - (B) autonomy versus shame and doubt
 - (C) initiative versus guilt
 - (D) identity versus role confusion
 - (E) generativity versus stagnation

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37. In Ainsworth's Strange Situation, an infant who is distressed when the caregiver leaves but quickly calms and seeks contact on return is classified as
- (A) anxious-ambivalent (B) securely attached (C) avoidant
(D) disorganized (E) imprinted
38. A 5-year-old believes that a tall thin glass holds more juice than a short wide glass after the juice is poured from one to the other. This child lacks
- (A) object permanence (B) abstract thought (C) theory of mind
(D) egocentrism (E) conservation

SECTION I, PART 3 Multiple Choice, Questions 39–57

Choose the best answer for each question. Questions 39 through 57.

39. Vygotsky's concept of the zone of proximal development refers to
- (A) a critical period for language
(B) the difference between what a child can do alone and with help
(C) the stage of concrete operations
(D) the amount of schema change a child can tolerate
(E) the amount of time a child needs to move between stages
40. Kohlberg's conventional level of moral reasoning is best illustrated by a person who obeys a law because
- (A) he fears being punished (B) it satisfies his own needs
(C) it reflects universal ethical principles (D) it is the law and society depends on rules
(E) he believes a social contract can be changed
41. Which of the following is a teratogen?
- (A) Alcohol consumed during pregnancy (B) Folic acid supplements
(C) Prenatal vitamins (D) Regular prenatal checkups
(E) Regular prenatal exercise
42. A study following the same group of people from age 10 to age 60 is a
- (A) cross-sectional study (B) case study (C) naturalistic observation
(D) a twin study (E) longitudinal study
43. In a conformity study, participants gave an obviously wrong answer after confederates did so. The research method most clearly resembles
- (A) Milgram's obedience experiment (B) Asch's line judgment experiment
(C) Zimbardo's prison study (D) Bandura's Bobo doll study
(E) Festinger and Carlsmith's experiment
44. A group of friends brainstorms and ends up adopting a riskier plan than any member favored individually. This is
- (A) group polarization (B) social loafing (C) the bystander effect
(D) deindividuation (E) the spotlight effect
45. After an emergency, no one in a large crowd helps because each person assumes someone else will. This best illustrates
- (A) the foot-in-the-door effect (B) cognitive dissonance
(C) diffusion of responsibility (D) the fundamental attribution error
(E) the halo effect
46. A person who agrees to a small request and then agrees to a much larger one is displaying the
- (A) door-in-the-face phenomenon (B) foot-in-the-door phenomenon
(C) mere exposure effect (D) just-world phenomenon
(E) the lowball technique
47. A manager assumes an employee was late because she is lazy, ignoring a major traffic accident. This is the
- (A) self-serving bias (B) false consensus effect
(C) actor-observer effect (D) fundamental attribution error
(E) the illusory correlation

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48. A student who smokes believes smoking is harmful and then decides the health risks are exaggerated. This reduces
(A) reciprocity (B) deindividuation
(C) cognitive dissonance (D) groupthink
(E) the self-fulfilling prophecy
49. According to Maslow's hierarchy, which level sits immediately below esteem needs?
(A) Belonging and love (B) Self-actualization (C) Cognitive needs
(D) Transcendence (E) Safety needs
50. According to the Yerkes-Dodson law, optimal performance on a very difficult task such as a hard final exam occurs at
(A) very high arousal (B) no arousal
(C) lower arousal levels (D) constant arousal regardless of difficulty
(E) arousal set at the level best for easy tasks
51. The James-Lange theory of emotion states that
(A) emotion and arousal occur simultaneously
(B) cognitive appraisal alone determines emotion
(C) emotion causes no body change
(D) emotions are inherited reflexes unrelated to the body
(E) physiological arousal precedes the emotional experience
52. A personality theorist argues that personality is best described by five broad dimensions that remain relatively stable across adulthood. This is the
(A) Big Five trait approach (B) psychodynamic approach
(C) humanistic approach (D) social-cognitive approach
(E) Maslow's hierarchy of needs
53. Which of Freud's structures operates on the reality principle?
(A) Id (B) Superego (C) Ego
(D) Preconscious (E) libido
54. A therapist emphasizes unconditional positive regard and empathic listening. This therapist most likely follows the
(A) behavioral perspective (B) psychoanalytic perspective
(C) cognitive-behavioral perspective (D) humanistic perspective
(E) the biomedical perspective
55. A person washes her hands 40 times a day despite knowing it is excessive, feeling relief only briefly. This pattern best fits
(A) generalized anxiety disorder (B) panic disorder
(C) obsessive-compulsive disorder (D) social anxiety disorder
(E) illness anxiety disorder
56. A person experiences two weeks of depressed mood, loss of interest, fatigue, and sleep problems. The most likely diagnosis is
(A) bipolar I disorder (B) major depressive disorder
(C) persistent depressive disorder (D) schizophrenia
(E) adjustment disorder
57. Delusions, hallucinations, and disorganized speech are classified as
(A) negative symptoms of schizophrenia (B) symptoms of bipolar disorder
(C) positive symptoms of schizophrenia (D) symptoms of dissociative amnesia
(E) somatic symptoms

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67. Which research method gives the researcher the greatest control over variables?
(A) Experiment (B) Survey (C) Naturalistic observation
(D) Case study (E) archival research
68. The term "operational definition" refers to
(A) a precise statement of how a variable is measured or manipulated
(B) the hypothesis of a study
(C) the statistical result
(D) the sample of a study
(E) a theoretical explanation of the findings
69. The hindsight bias is best described as
(A) seeking evidence that confirms one's beliefs
(B) overestimating one's own abilities
(C) believing after the fact that one would have predicted the outcome
(D) preferring information that is easy to recall
(E) the illusion of control
70. Neuroplasticity is evidenced when
(A) neurons cannot regenerate
(B) undamaged brain areas take over functions after injury
(C) the brain stops forming connections in adulthood
(D) memory is stored in one location
(E) the brain's inability to compensate for damage
71. An fMRI scan is most useful for researchers who want to
(A) record the brain's electrical waves with electrodes on the scalp
(B) see which brain regions are active during a task
(C) view the brain's structure only
(D) damage specific brain tissue
(E) a lesion study
72. The endocrine system differs from the nervous system in that it
(A) releases hormones through the bloodstream, acting more slowly
(B) acts only through neurotransmitters
(C) controls only reflexes
(D) has no link to the brain
(E) uses only electrical signals
73. A person with damage to the amygdala would most likely have difficulty
(A) forming new explicit memories
(B) coordinating movement
(C) regulating body temperature
(D) recognizing fear in others and responding to threats
(E) producing speech
74. Which of the following is an example of an intrinsic motivation?
(A) Practicing guitar to earn money (B) Learning guitar because playing is enjoyable
(C) Practicing to avoid a parent's anger (D) Learning guitar to win a trophy
(E) Studying to earn a scholarship
75. Which of the following best illustrates the cocktail party effect?
(A) Failing to see a gorilla in a video while counting passes
(B) Seeing a still image as motion
(C) Judging an object's size from its distance
(D) Hearing your name across a noisy room
(E) noticing a change in a scene only after an interruption

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SECTION II, QUESTION 1 Article Analysis: Mindfulness and Test Anxiety

Read the study summary and answer the questions. A school psychologist recruited 80 high school juniors who volunteered for a program about test anxiety. She randomly assigned 40 students to a four-week mindfulness-breathing course (10 minutes daily) and 40 students to a waiting list that received no training. Before the course and again after it, all students completed a 40-item test-anxiety questionnaire (higher scores mean more anxiety). The mean anxiety score of the mindfulness group fell from 31 to 22, while the waiting-list group's mean went from 30 to 29. The psychologist reported that the difference between groups after training was statistically significant ($p < .01$) and concluded that mindfulness reduces test anxiety. The students and the psychologist who administered the questionnaire both knew who was in the training group.

76. (a) Identify the research method used in the study.
77. (b) State the operational definition of the dependent variable.
78. (c) Explain what the p value of less than .01 indicates about the results.
79. (d) Identify one limitation of the study's design that could threaten the conclusion that mindfulness caused the drop in anxiety, and explain how the limitation matters.
80. (e) Describe one change to the procedure that would address the limitation you identified in (d).
81. (f) Explain how the sample affects the extent to which the results can be generalized to all teenagers.
82. (g) Apply the sympathetic nervous system to explain one physiological symptom of test anxiety, and explain how a calming technique would affect it.

SECTION II, QUESTION 2 Evidence-Based Question: Does Social Media Harm Adolescents?

Use the three sources to write a short argument that answers the question: To what extent is social media use related to adolescent depression and well-being? Source 1 (longitudinal survey): 6,000 teens were surveyed each year for four years. Teens who spent more than five hours a day on social media at age 13 had higher depression scores at age 17 ($r = +.28$), even after statistical control for earlier depression scores. Source 2 (experiment): 140 college students were randomly assigned to limit social media to 30 minutes a day or to use it as usual for three weeks. The limited-use group showed a modest but significant decrease in loneliness and depression scores compared with the usual-use group. Source 3 (interview study): 30 teens who live far from relatives described using social media to maintain friendships and feel supported; most said it made them feel less isolated, though several said comparing themselves with others made them feel worse.

83. (a) State a defensible thesis that responds to the question and takes a position using evidence.
84. (b) Use evidence from Source 1 to support your thesis and explain what type of relationship it shows and its limits.
85. (c) Use evidence from Source 2 to support your thesis and explain why its design permits a stronger conclusion about causation.
86. (d) Use evidence from Source 3 and connect it to a psychology concept (for example, social comparison or belonging) to qualify your argument, and note one limit of the evidence.

Key Practice Exam 1: Answers and Explanations

Complete solutions. Free-response keys show the scoring breakdown.

E1 Practice Exam 1**SECTION I, PART 1 · MULTIPLE CHOICE, QUESTIONS 1-19**

1. A. The independent variable is the factor the researcher manipulates, here sleep condition. The memory score is the dependent variable, so it is the tempting wrong answer.
3. D. Random sampling selects participants from the population so each member has an equal chance. Random assignment, the best distractor, places already-chosen participants into groups.
5. E. A normal curve is symmetric and bell-shaped, so the three measures of central tendency coincide. A skewed distribution is the one where the mean is pulled away from the median.
7. A. The median is 72 while the mean is 77.6; the extreme score of 99 pulls the mean upward. The median resists outliers.
9. C. Acetylcholine drives skeletal muscle contraction at the neuromuscular junction and supports memory. Dopamine is linked to reward and movement disorders, a common mix-up.
11. D. Damage to Broca's area in the frontal lobe produces nonfluent speech with intact comprehension. Wernicke's damage produces fluent but meaningless speech.
2. D. A positive correlation shows the variables rise together; it cannot show direction of causation or rule out a third variable. The claim that use causes loneliness overreaches.
4. C. Improvement from an inert pill reflects expectations (the placebo effect). Experimenter bias would be addressed by a double-blind design, not by a placebo comparison alone.
6. E. Informing participants of their rights and protecting their data are core ethical safeguards. Debriefing happens after the study and explains its true purpose.
8. A. At rest a neuron is polarized at about -70 mV inside. Sodium channels open during the action potential, not at rest.
10. B. Blocking reuptake leaves more transmitter in the cleft, increasing its effect. This is how SSRIs work.
12. B. The hippocampus consolidates new explicit memories. The amygdala adds emotional tone but does not form the memory.

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- 13. D. The sympathetic division arouses the body in stress; the parasympathetic division calms it.
- 15. D. Cortisol, released from the adrenal cortex, raises blood glucose during sustained stress. Melatonin regulates sleep.
- 17. E. Opponent-process cells fatigue on one member of a pair (red) and rebound toward the other (green). Trichromatic theory explains receptor level coding.
- 19. C. Fitting a new experience into an existing schema is assimilation. Accommodation would involve creating a new schema for cats.

SECTION I, PART 2 · MULTIPLE CHOICE, QUESTIONS 20-38

- 20. C. Converging parallel lines signal distance. Interposition is the overlapping cue, and binocular disparity is the two-eye difference.
- 22. A. A pleasant stimulus is added after the behavior and the behavior increases. Negative reinforcement would remove an aversive stimulus.
- 24. E. Bandura's Bobo doll study showed that people learn by watching models. No direct reinforcement of the child was needed.
- 26. E. Retrieval practice and distributed study outperform rereading and highlighting. Massed rereading creates an illusion of mastery.
- 28. D. Old information interfering with new learning is proactive. Retroactive interference works the other direction.
- 30. E. Judging frequency by how easily examples come to mind is the availability heuristic. Representativeness judges by resemblance to a prototype.
- 32. E. Chomsky proposed an innate language acquisition capacity, sometimes called universal grammar. Skinner emphasized reinforcement.
- 34. C. Spearman proposed a general factor from the positive correlations among mental tests. Gardner proposed multiple intelligences.
- 36. B. Toddlers seeking independence confront autonomy versus shame and doubt. Initiative versus guilt appears in the preschool years.
- 38. E. Failure to see that quantity stays the same despite changes in appearance marks the preoperational stage. Object permanence develops in infancy.

SECTION I, PART 3 · MULTIPLE CHOICE, QUESTIONS 39-57

- 39. B. Tasks just beyond independent ability but achievable with guidance define the ZPD. Scaffolding is the support provided.
- 41. A. Alcohol can cause fetal alcohol syndrome. A teratogen is any agent that harms the developing embryo or fetus.
- 43. B. Asch used unanimous confederates giving incorrect line judgments to study conformity. Milgram studied obedience to an authority.
- 45. C. Responsibility is spread across observers, reducing the chance any one acts. This is the bystander effect.
- 47. D. Overemphasizing dispositional causes and underestimating situational ones is the fundamental attribution error.
- 49. A. Maslow's order is physiological, safety, belonging, esteem, self-actualization. Belonging precedes esteem.
- 51. E. The theory says we feel afraid because we notice our racing heart. The Cannon-Bard theory proposes simultaneous arousal and feeling.
- 53. C. The ego mediates between id impulses and reality. The id follows the pleasure principle.
- 55. C. Intrusive obsessions with repetitive compulsions characterize OCD. Generalized anxiety is diffuse worry without rituals.

- 14. E. The primary visual cortex is in the occipital lobe at the back of the brain.
- 16. B. Rods are highly sensitive to low light and do not detect color. Cones are concentrated in the fovea.
- 18. B. REM sleep is called paradoxical because the brain is active while the body's major muscles are paralyzed. Stage N3 shows slow delta waves.

- 21. E. Salivation to the learned bell is the CR; salivation to food is the UR. The bell itself is the CS, the best distractor.
- 23. A. Variable-ratio schedules produce high, steady response rates and resist extinction. Variable interval depends on elapsed time, not number of responses.
- 25. A. Primacy and recency produce the serial position curve. The spacing effect concerns distributed study.
- 27. B. Misleading wording after the event altered the memory (Loftus). Proactive interference involves old information disrupting new.
- 29. D. Partial retrieval of a known word is the tip-of-the-tongue state, a retrieval failure rather than an encoding failure.
- 31. B. Seeing an object only in its usual function is functional fixedness. A mental set concerns reusing a previously successful strategy.
- 33. E. Consistency is reliability. Measuring what it claims to measure is validity.
- 35. A. Crystallized intelligence reflects accumulated knowledge and tends to hold or grow with age. Fluid intelligence supports novel reasoning.
- 37. B. Secure infants use the caregiver as a secure base and are soothed on reunion. Ambivalent infants stay upset and resist comfort.
- 40. D. Conventional reasoning centers on social order and approval. Fear of punishment is preconventional; universal principles are postconventional.
- 42. E. Tracking the same individuals across time is longitudinal. Cross-sectional studies compare different age groups at one time.
- 44. A. Group discussion strengthens members' initial leanings, here toward risk. Social loafing is reduced effort in groups.
- 46. B. Compliance with a small request increases compliance with a larger one. In door-in-the-face, a large request comes first.
- 48. C. Changing a belief to resolve inconsistency between attitude and behavior reduces dissonance (Festinger).
- 50. C. Difficult tasks are best performed at lower arousal while easy tasks do better at higher arousal. Too much arousal impairs complex performance.
- 52. A. Openness, conscientiousness, extraversion, agreeableness, and neuroticism form the Big Five. Trait approaches describe stable patterns.
- 54. D. Rogers' client-centered therapy stresses acceptance and empathy. Psychoanalysis focuses on unconscious conflict.
- 56. B. Symptoms lasting at least two weeks fit major depression. Persistent depressive disorder requires a milder mood lasting two years or longer.

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57. C. Positive symptoms add abnormal experiences; negative symptoms are deficits such as flat affect.

SECTION I, PART 4 · MULTIPLE CHOICE, QUESTIONS 58-75

58. D. Systematic desensitization uses counterconditioning of anxiety. Aversive conditioning pairs a stimulus with an unpleasant outcome.
60. A. The body first mobilizes, then copes, and finally wears down. The order matters.
62. C. Random assignment equalizes groups on average, supporting causal inference. Random sampling supports generalization.
64. E. Double-blind procedures reduce both participant expectations and experimenter bias. Single-blind involves only participants.
66. C. A p value below .05 indicates statistical significance, meaning the result is unlikely to be due to chance. It does not measure effect size.
68. A. Defining anxiety as the score on a specific scale is an operational definition, enabling replication.
70. B. The brain reorganizes in response to experience or damage. Plasticity is greatest in childhood but continues.
72. A. Hormones travel via blood and have longer-lasting effects than neural messages.
74. B. Intrinsic motivation comes from the activity itself. Money, trophies, and avoiding anger are extrinsic. Overjustification research shows rewards can undermine intrinsic interest.
59. D. Psychiatrists hold a medical degree. Most psychologists cannot prescribe.
61. D. Directly addressing the stressor is problem-focused. Calming emotions is emotion-focused coping.
63. E. Twin studies compare concordance in identical and fraternal twins to estimate heritability.
65. C. Standard deviation measures variability around the mean. A larger value means more spread.
67. A. Only experiments manipulate the independent variable and control extraneous factors.
69. C. "I knew it all along" is hindsight bias. Confirmation bias is searching for supporting evidence.
71. B. fMRI tracks blood-oxygen levels as a measure of activity. An EEG records electrical activity.
73. D. The amygdala processes fear and emotional significance. The hippocampus forms explicit memories.
75. D. Selective attention lets you filter a stream of sound and still detect personally relevant stimuli. Inattention blindness is the gorilla video.

SECTION II, QUESTION 1 · ARTICLE ANALYSIS: MINDFULNESS AND TEST ANXIETY

76. Scoring: 1 point. Experiment. The researcher manipulated the independent variable (training versus no training) and randomly assigned participants to groups.
77. Scoring: 1 point. The dependent variable, test anxiety, was operationally defined as the score on the 40-item test-anxiety questionnaire, where higher scores mean greater anxiety.
78. Scoring: 1 point. It means that a difference this large between the groups would be very unlikely (less than 1 percent) if chance alone, rather than the training, were responsible. It is not the probability that the program works and does not show the effect is large.
79. Scoring: 1 point. Acceptable answers: the lack of a placebo or attention control, so improvement may reflect expectations; or no blinding, so participant expectations and experimenter bias may influence questionnaire responses. A complete answer links the flaw to an alternative explanation, such as students reporting less anxiety because they expected the program to help.
80. Scoring: 1 point. Give the waiting-list group a placebo activity of equal length (for example, light stretching) and use a double-blind procedure in which the person scoring or administering the questionnaire does not know group membership. Also acceptable: measure actual test performance or physiological indicators.
81. Scoring: 1 point. The students were volunteers from a single school who were interested in the program, so they may be more motivated than typical teenagers; random sampling from all teenagers was not used, which limits generalization even though random assignment supports the causal claim.
82. Scoring: 2 points (1 for each part). Anxiety triggers sympathetic arousal, causing symptoms such as a pounding heart, sweaty palms, or rapid breathing. Slow, mindful breathing activates the parasympathetic nervous system, which lowers heart rate and returns the body toward its resting state.

SECTION II, QUESTION 2 · EVIDENCE-BASED QUESTION: DOES SOCIAL MEDIA HARM ADOLESCENTS?

83. Scoring: 1 point. Acceptable: a claim that responds to the question, such as: heavy social media use is modestly associated with and may contribute to adolescent depression, although its effects depend on how it is used. A thesis that only restates the question or merely says 'it depends' earns no credit.
84. Scoring: 2 points. 1 point: accurately uses Source 1 ($r = +.28$, higher use at 13 linked to depression at 17, controlling for earlier depression). 1 point: explains that this is a modest positive correlation; the longitudinal design shows the order of events and the statistical control rules out some alternatives, but it cannot prove causation because a third variable or reverse causation could remain.
85. Scoring: 2 points. 1 point: accurately uses Source 2 (random assignment, limited versus usual use, lower loneliness and depression). 1 point: explains that random assignment and manipulation of the independent variable support a causal inference, while noting the effect was modest and the sample of college students limits generalization to teens.
86. Scoring: 2 points. 1 point: accurately uses Source 3 (support and belonging for distant friends, but social comparison for some). 1 point: links the evidence to a concept and states a limit, such as the small, self-report interview sample that cannot be generalized and is vulnerable to social desirability, so social media may be helpful and harmful depending on use.

E2 Practice Exam 2

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Section I has 75 multiple-choice questions to be completed in 70 minutes and counts for two-thirds of your score. Section II has two free-response questions, an Article Analysis Question and an Evidence-Based Question, to be completed in 50 minutes total and counts for one-third. Work under timed conditions, then check every explanation, including those for questions you answered correctly.

Section	Questions	Time	Weight
I: Multiple Choice	75	70 minutes	66.7%
II: Article Analysis Question (7 points)	1	About 20 minutes	16.7%
II: Evidence-Based Question (7 points)	1	About 30 minutes	16.7%

Scoring guide: each correct multiple-choice answer earns 1 raw point (no penalty for guessing), so Section I is worth 75 points. Multiply each free-response raw score (0 to 7) by about 2.7 to place it on the same 150-point scale. Total composite points of roughly 105 or more point toward a 5, about 85 to 104 toward a 4, and about 65 to 84 toward a 3. These bands are approximate and vary from year to year.

SECTION I, PART 1 Multiple Choice, Questions 1-19

Choose the best answer for each question. Questions 1 through 19.

- A researcher surveys 1,000 adults chosen at random from a national registry about their sleep habits. The main strength of this sampling approach is that it
 - establishes cause and effect
 - allows results to be generalized to the population
 - controls for the placebo effect
 - eliminates the need for operational definitions
 - a nonrandom volunteer sample
- Which of the following is a negative correlation?
 - As height rises, weight rises
 - As study time rises, grades rise
 - As temperature rises, ice cream sales rise
 - As the number of pets rises, the amount of shedding rises
 - As hours of TV rise, grades fall
- A study reports $r = -.82$ between hours of sleep and number of errors on a task. Compared with $r = +.30$, this relationship is
 - weaker, because it is negative
 - impossible, because correlations cannot be negative
 - stronger, because it is closer in magnitude to 1
 - equal in strength
 - stronger, because negative correlations are always strong
- A researcher records how children play at recess without interfering. This method is
 - a survey
 - an experiment
 - a case study
 - naturalistic observation
 - a laboratory experiment
- Researchers want to test whether caffeine affects reaction time. Which variable is the dependent variable?
 - Amount of caffeine
 - The participants' ages
 - The room temperature
 - The time of day of testing
 - Reaction time
- A confound in an experiment is
 - the group receiving a placebo
 - an uncontrolled variable that varies with the independent variable
 - the measurement of the outcome
 - the random selection of participants
 - the random assignment of participants to groups
- A psychologist finds that a sample of IQ scores has a mean of 100 and standard deviation of 15. About 68 percent of scores fall between
 - 70 and 130
 - 90 and 110
 - 55 and 145
 - 85 and 115
 - 100 and 115

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8. The primary reason an Institutional Review Board reviews a proposed study is to
(A) ensure statistical significance
(B) guarantee random sampling
(C) select the dependent variable
(D) protect participants from harm
(E) verify that the results are statistically significant
9. A research team replicates a study several times and gets similar results each time. This increases confidence in the finding because
(A) replication proves the theory is true
(B) replication eliminates sampling bias
(C) replication creates a correlation
(D) It removes the need for a control group
(E) replication shows the result is reliable
10. Which approach to psychology emphasizes unconscious drives and early childhood experience?
(A) Psychodynamic
(B) Behavioral
(C) Cognitive
(D) Evolutionary
(E) Humanistic
11. Which part of the neuron receives messages from other neurons?
(A) Dendrites
(B) Axon terminals
(C) Myelin sheath
(D) Soma membrane only
(E) Nodes of Ranvier
12. Multiple sclerosis, which disrupts muscle control, involves degeneration of the
(A) dendrites
(B) myelin sheath
(C) neurotransmitter receptors only
(D) cell body
(E) synaptic vesicles
13. The "all-or-none" principle means that
(A) a neuron either fires completely or not at all
(B) stronger stimuli produce bigger action potentials
(C) all neurons fire at once
(D) neurons never fire without a stimulus
(E) Neurons fire only when the cell body is damaged
14. Parkinson's disease is linked to the loss of neurons that produce
(A) dopamine
(B) serotonin
(C) endorphins
(D) acetylcholine
(E) GABA
15. Endorphins are best described as
(A) hormones from the pancreas
(B) natural painkilling neurotransmitters
(C) stimulants that raise heart rate
(D) chemicals that cause hunger
(E) excitatory transmitters that cause muscle contraction
16. A drug that mimics a neurotransmitter and activates its receptor is a(n)
(A) antagonist
(B) reuptake inhibitor
(C) hormone
(D) agonist
(E) a neuromodulator hormone
17. Damage to which part of the brain would most likely produce poor balance and uncoordinated voluntary movement?
(A) Medulla
(B) Hypothalamus
(C) Corpus callosum
(D) Cerebellum
(E) Thalamus
18. Which structure regulates hunger, thirst, and body temperature and controls the pituitary gland?
(A) Thalamus
(B) Hypothalamus
(C) Reticular formation
(D) Hippocampus
(E) Amygdala

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19. A patient whose corpus callosum has been severed sees a spoon only in the left visual field. She is likely to
- (A) name it easily
 - (B) name it but not pick it up
 - (C) be unable to name it but able to pick it out with the left hand
 - (D) show no response at all
 - (E) describe it aloud but be unable to see it

SECTION I, PART 2 Multiple Choice, Questions 20-38

Choose the best answer for each question. Questions 20 through 38.

20. The prefrontal cortex is most associated with
- (A) planning and judgment
 - (B) balance
 - (C) basic reflexes
 - (D) visual processing
 - (E) emotional memory formation
21. A person's difficulty understanding the position of her body in space following damage to the top of her brain suggests damage to which lobe?
- (A) Occipital
 - (B) Parietal
 - (C) Temporal
 - (D) Frontal
 - (E) Cerebellum
22. Absolute threshold is defined as
- (A) the smallest difference between stimuli noticed half the time
 - (B) the minimum stimulus needed to detect it 50 percent of the time
 - (C) the point at which a stimulus is no longer sensed
 - (D) the maximum stimulus a sense can detect
 - (E) the intensity at which a stimulus is detected every time
23. According to Weber's law, the just noticeable difference between two stimuli is
- (A) a constant amount for all intensities
 - (B) unrelated to intensity
 - (C) always one unit
 - (D) a constant proportion of the original stimulus
 - (E) determined only by the person's attention
24. After being in a dark room for several minutes you begin to see better. This is
- (A) sensory adaptation to constant stimulation only
 - (B) the Purkinje effect
 - (C) dark adaptation
 - (D) signal detection
 - (E) the Purkinje shift only
25. Which sense is the only one that bypasses the thalamus before reaching the cortex?
- (A) Smell
 - (B) Taste
 - (C) Touch
 - (D) Hearing
 - (E) Vision
26. Gate-control theory explains
- (A) how sound pitch is encoded
 - (B) how pain signals can be blocked by competing input
 - (C) how color is perceived
 - (D) how balance is maintained
 - (E) how taste combinations are blended
27. When you perceive a friend as the same height whether she is near or far, you demonstrate
- (A) shape constancy
 - (B) color constancy
 - (C) size constancy
 - (D) apparent motion
 - (E) stereopsis
28. Seeing a series of stationary lights flashing in sequence as movement is the
- (A) stroboscopic afterimage
 - (B) Muller-Lyer illusion
 - (C) figure-ground effect
 - (D) phi phenomenon
 - (E) the autokinetic effect

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29. Top-down processing is evident when
(A) a neuron responds to a vertical line
(B) light is converted to signals in the retina
(C) sound waves vibrate the eardrum
(D) the cornea bends incoming light
(E) you read a sentence with a missing letter and still understand it
30. A person falls asleep and wakes up at 3 a.m. each night, unable to return to sleep. Cognitive-behavioral therapy for insomnia would most likely emphasize
(A) sleeping pills nightly
(B) napping long during the day
(C) staying in bed longer
(D) Taking long naps in the afternoon
(E) consistent sleep schedules and reducing time worrying in bed
31. A person suddenly falls into REM sleep during the day and loses muscle control. This is symptomatic of
(A) sleep apnea (B) insomnia (C) night terrors
(D) narcolepsy (E) REM rebound
32. Which of the following is a stimulant?
(A) Alcohol (B) Heroin (C) Valium
(D) Barbiturates (E) Caffeine
33. Using a long list of procedures to solve a problem that guarantees a solution is an
(A) heuristic (B) insight (C) algorithm
(D) prototype (E) an analogy
34. A robin is judged a better example of a bird than a penguin. This reflects the use of
(A) algorithms (B) insight (C) prototypes
(D) semantic networks only (E) a schema
35. A framing effect occurs when
(A) people respond differently to the same information presented as gains versus losses
(B) a person fixates on the first number heard
(C) a person seeks only supportive evidence
(D) a person relies on easily recalled examples
(E) Functional fixedness
36. Babbling in infants typically begins at about
(A) 12 months (B) 18 months (C) 24 months (D) 30 months (E) 4 months
37. A toddler says "I goed to the park." This error demonstrates
(A) telegraphic speech (B) a speech disorder
(C) phonemic confusion (D) overgeneralization of grammar rules
(E) holophrase use
38. A study finds that short-term memory typically holds about
(A) 20 items (B) three items
(C) unlimited items (D) seven items, plus or minus two
(E) about 12 items

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SECTION I, PART 3 Multiple Choice, Questions 39-57

Choose the best answer for each question. Questions 39 through 57.

39. Remembering how to ride a bike without conscious effort is an example of
(A) procedural memory (B) episodic memory (C) semantic memory
(D) working memory (E) declarative memory
40. Context-dependent memory is demonstrated when
(A) a student recalls better when in the same mood
(B) a student remembers the first words
(C) a student forgets because of new learning
(D) a student recalls better after rhyming cues
(E) a student recalls information better in the room where she learned it
41. Anterograde amnesia is the inability to
(A) recall memories from before an injury (B) recall memories of childhood
(C) form new memories after an injury (D) recall skills
(E) learn any new skills
42. Which memory strategy involves linking items to places along a familiar route?
(A) Chunking (B) Acronym (C) Peg-word
(D) Rehearsal (E) Method of loci
43. The Flynn effect refers to
(A) declining scores over time
(B) differences between the sexes
(C) stability of IQ in adulthood
(D) rising average intelligence test scores over generations
(E) gaps between groups
44. Stereotype threat is a(n)
(A) inherited difference in ability
(B) test bias in questions
(C) advantage in a self-fulfilling prophecy
(D) fear of confirming a negative stereotype that can lower performance
(E) an instance of the hindsight bias
45. An IQ test given to a 10-year-old yields a mental age of 12. By the original ratio formula, her IQ is
(A) 120 (B) 83 (C) 100 (D) 22 (E) 112
46. Which developmental theorist proposed that infants develop attachment through contact comfort rather than feeding?
(A) Skinner (B) Harlow (C) Piaget (D) Kohlberg (E) Vygotsky
47. Teens who think everyone is watching them show adolescent
(A) egocentrism (B) object permanence (C) conservation
(D) centration (E) Animism
48. Which parenting style is high in warmth and high in demands, with clear rules explained to the child?
(A) Authoritarian (B) Permissive (C) Neglectful
(D) Authoritative (E) Collectivist
49. Pavlov discovered that after extinction a conditioned response may reappear after a rest period. This is
(A) generalization (B) discrimination
(C) acquisition (D) higher-order conditioning
(E) spontaneous recovery
50. A child who fears all furry animals after being frightened by a rabbit shows
(A) discrimination (B) generalization
(C) extinction (D) higher-order conditioning
(E) Spontaneous recovery

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51. Taste aversion after a stomach illness following a certain food demonstrates
(A) operant punishment
(B) biological preparedness in classical conditioning
(C) latent learning
(D) shaping
(E) spontaneous recovery
52. A teenager does the dishes to stop her parents' nagging. Her dish washing increases. This is
(A) positive reinforcement (B) positive punishment (C) negative reinforcement
(D) negative punishment (E) operant extinction
53. A parent takes away a teen's phone after a curfew violation. This is
(A) positive punishment (B) negative reinforcement (C) negative punishment
(D) positive reinforcement (E) extinction
54. A trainer rewards successive approximations of a dolphin's desired behavior. This is
(A) shaping (B) extinction (C) chaining
(D) modeling (E) latent learning
55. Tolman's rats that had explored a maze without reward quickly ran it once food was provided, showing
(A) classical conditioning (B) latent learning (C) insight
(D) modeling (E) insight learning
56. A person has an immediate fear when she hears a dentist's drill. For her, the drill sound is a(n)
(A) unconditioned stimulus (B) unconditioned response (C) neutral stimulus
(D) a reinforcer (E) conditioned stimulus
57. In Milgram's original obedience study, about 65 percent of participants
(A) refused at the start (B) delivered the maximum shock
(C) stopped at 150 volts (D) were unaffected
(E) all of them stopped at the first protest

SECTION I, PART 4 Multiple Choice, Questions 58-75

Choose the best answer for each question. Questions 58 through 75.

58. In Zimbardo's Stanford prison study, participants quickly adopted guard and prisoner roles, illustrating the power of
(A) attachment (B) classical conditioning (C) selective attention
(D) attachment bonds (E) social roles
59. Social loafing is more likely when
(A) the task is meaningful
(B) the group is small
(C) members are rewarded individually
(D) individual contributions cannot be identified
(E) the task is highly challenging to each member
60. The self-serving bias leads a student to
(A) credit success to ability and blame failure on the test
(B) see others as responsible for success
(C) blame herself for all outcomes
(D) attribute behavior to circumstances
(E) blame personal flaws for failure and credit luck for success
61. The mere exposure effect states that
(A) attractiveness is the main factor in liking
(B) people like those unlike themselves
(C) repeated exposure to a stimulus increases liking
(D) familiar items are boring
(E) novel stimuli are always preferred

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62. According to the contact hypothesis, prejudice is reduced when groups
- (A) compete for resources
 - (B) avoid each other
 - (C) work together on a shared goal with equal status
 - (D) are separated
 - (E) have unequal power
63. The central route to persuasion is most effective when the audience is
- (A) motivated and able to think about the message
 - (B) distracted
 - (C) unfamiliar with the topic
 - (D) tired
 - (E) strongly emotional but uninformed
64. A person who assumes that people living in poverty must have done something to deserve it is displaying
- (A) the false consensus effect
 - (B) the spotlight effect
 - (C) the halo effect
 - (D) the just-world phenomenon
 - (E) the self-serving bias
65. Bandura's concept of reciprocal determinism holds that
- (A) behavior, personal factors, and environment influence one another
 - (B) behavior is determined by the environment alone
 - (C) traits determine behavior
 - (D) unconscious drives determine behavior
 - (E) Personal factors determine behavior independent of environment
66. A person who believes she controls what happens to her and attributes outcomes to her own actions has an
- (A) external locus of control
 - (B) fixed mindset
 - (C) internal locus of control
 - (D) learned helplessness
 - (E) an authoritarian personality
67. The projective test in which people interpret inkblots was developed by
- (A) Cattell
 - (B) Rorschach
 - (C) Eysenck
 - (D) Maslow
 - (E) Murray
68. Self-determination theory identifies three needs:
- (A) safety, esteem, and love
 - (B) autonomy, competence, and relatedness
 - (C) achievement, power, and affiliation
 - (D) trust, autonomy, and initiative
 - (E) need for achievement, power, and affiliation
69. A person with an anxiety disorder who avoids elevators, planes, and crowds because she fears being unable to escape likely has
- (A) a specific phobia of heights
 - (B) social anxiety only
 - (C) agoraphobia
 - (D) OCD
 - (E) panic disorder
70. A client experiences extreme mood swings, with periods of elevated energy and little need for sleep alternating with depression. This is
- (A) major depressive disorder
 - (B) schizophrenia
 - (C) bipolar disorder
 - (D) dissociative identity disorder
 - (E) borderline personality disorder
71. A therapy in which a person identifies and changes distorted automatic thoughts is
- (A) psychoanalysis
 - (B) exposure therapy
 - (C) client-centered therapy
 - (D) interpersonal therapy
 - (E) cognitive therapy

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72. The biopsychosocial model of mental disorders assumes that
- (A) disorders result from the interplay of biology, psychology, and social factors
 - (B) disorders are only biological
 - (C) disorders are only learned
 - (D) disorders result from unconscious conflicts only
 - (E) disorders can be treated only with medication
73. Electroconvulsive therapy is most often used for
- (A) mild anxiety
 - (B) specific phobias
 - (C) severe depression that has not responded to other treatments
 - (D) insomnia
 - (E) chronic pain
74. Which of the following is an example of an emotion-focused coping strategy?
- (A) Practicing the speech
 - (B) Asking the teacher for the schedule
 - (C) Hiring a tutor
 - (D) Making a list of tasks
 - (E) Meditating to calm down before a presentation
75. A person worries about a presentation, so she takes a breath, finds that her pulse slows, and she feels calmer. This is the activation of the
- (A) sympathetic nervous system
 - (B) somatic system
 - (C) reticular formation
 - (D) the endocrine system
 - (E) parasympathetic nervous system

SECTION II, QUESTION 1 Article Analysis: Sleep and Memory

Read the study summary and answer the questions. A researcher studied whether sleep after learning helps memory. Sixty undergraduates studied a list of 40 unrelated word pairs in the evening. By a coin-flip procedure, half were allowed a normal night of sleep in the lab and half were kept awake all night in the lab. After a recovery night, all students were tested on the word pairs by recall. The sleep group recalled a mean of 31 pairs and the sleep-deprived group a mean of 22 pairs. Researchers who scored the tests did not know which condition each student had been in. Participants signed consent forms stating that the study involved staying awake or sleeping, but they were not told the specific hypothesis until the study was over.

76. (a) Identify the independent variable in this study.
77. (b) Explain how random assignment strengthens the conclusion.
78. (c) Identify the type of blinding used and explain its purpose.
79. (d) Describe one ethical consideration in the study and one way the researcher addressed it.
80. (e) Describe one conclusion that the data support and one conclusion that they do not support.
81. (f) Explain the role of the hippocampus in how sleep might affect new memories.
82. (g) Explain how the study results could be affected by the serial position effect or by interference, and one way to prevent it.

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SECTION II, QUESTION 2 Evidence-Based Question: Does Punishment or Reinforcement Work Better?

Use the three sources to write a short argument answering the question: How effective is punishment compared with positive reinforcement for changing children's behavior? Source 1 (classroom experiment): Teachers in 12 randomly selected classrooms praised and gave small privileges for on-task behavior, while teachers in 12 other classrooms used reprimands for off-task behavior. After eight weeks, on-task behavior rose by 25 percent in the praise classrooms and by 6 percent in the reprimand classrooms, and the gains in the praise classrooms lasted longer. Source 2 (observational study): Researchers observed families and found that children who were frequently spanked showed more aggressive behavior toward peers one year later. Source 3 (case report): A parent of a toddler who runs into the street used a firm 'no' with immediate removal from the yard every time. The behavior stopped within a week.

83. (a) State a defensible thesis that responds to the question.
84. (b) Use evidence from Source 1 to support your thesis and apply an operant conditioning concept.
85. (c) Use evidence from Source 2 to support or qualify your thesis and explain why causal conclusions are limited, or relevant social learning.
86. (d) Use evidence from Source 3 to qualify your argument and identify one limitation of that evidence.

Key Practice Exam 2: Answers and Explanations

Complete solutions. Free-response keys show the scoring breakdown.

E2 Practice Exam 2**SECTION I, PART 1 · MULTIPLE CHOICE, QUESTIONS 1-19**

1. B. Random sampling produces a representative sample, supporting generalization. Only random assignment in an experiment supports causal claims.
3. C. Strength depends on absolute value, not sign. A coefficient of .82 is stronger than .30.
5. E. The dependent variable is the outcome measured. Caffeine is the independent variable; age and temperature are controls.
7. D. In a normal distribution about 68 percent of scores fall within one standard deviation of the mean. Two standard deviations (70 to 130) cover about 95 percent.
9. E. Repeated consistent results support reliability. Science cannot prove a theory definitively.
11. A. Dendrites receive signals; the axon carries them away. The myelin sheath speeds conduction.
13. A. Action potentials are the same size regardless of stimulus strength; intensity is coded by firing rate.
15. B. Endorphins are opioid-like and reduce pain. Heroin mimics them as an agonist.
17. D. The cerebellum coordinates movement and balance. The medulla controls breathing and heart rate.
19. C. Left visual field information goes to the right hemisphere, which lacks language but controls the left hand. This is split-brain research.
2. E. In a negative correlation, one variable increases as the other decreases. Choices describing both rising are positive.
4. D. Observing behavior in its real setting without manipulation is naturalistic observation. It has high realism but little control.
6. B. A confounding variable offers an alternative explanation for the results. A placebo group is a control.
8. D. IRBs weigh risks and benefits and enforce ethical guidelines, such as informed consent.
10. A. Freud's psychodynamic theory stresses unconscious conflicts. Behaviorists study observable behavior.
12. B. MS damages the insulating myelin, slowing neural transmission.
14. A. Dopamine-producing neurons in the substantia nigra degenerate, causing tremors and rigid movement. Acetylcholine problems are tied to Alzheimer's.
16. D. Agonists activate receptors; antagonists block them.
18. B. The hypothalamus maintains homeostasis. The thalamus relays most sensory information to the cortex.

SECTION I, PART 2 · MULTIPLE CHOICE, QUESTIONS 20-38

20. A. The frontal lobe's prefrontal region supports executive functions. Phineas Gage's injury is a classic case.
22. B. The absolute threshold is detection at least half the time. The just noticeable difference is the difference threshold.
24. C. Receptors regain sensitivity in the dark. Sensory adaptation usually refers to declining response to unchanging stimulation.
26. B. Rubbing a bumped shin can reduce pain by closing the spinal gate to pain signals.
28. D. Apparent motion from sequential lights is the phi phenomenon.
30. E. CBT-I builds sleep hygiene and addresses thoughts. Napping can worsen nighttime sleeplessness.
21. B. The parietal lobe contains the somatosensory cortex and handles spatial processing.
23. D. You can notice a 2 percent change in weight regardless of baseline. Larger baselines need larger changes.
25. A. Olfactory signals go directly to the olfactory bulb and limbic system.
27. C. Perceptual constancy preserves size despite changing retinal image size.
29. E. Prior knowledge and expectations guide perception. Bottom-up processing starts with the raw sensory input.
31. D. Narcolepsy involves sudden REM intrusions and cataplexy. Sleep apnea involves breathing pauses.

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- 32. E. Caffeine and nicotine speed up neural activity. Alcohol and benzodiazepines are depressants, heroin an opioid.
- 34. C. A prototype is the best, most typical example of a category. Penguins deviate from it.
- 36. E. Babbling appears around four months, one-word speech around 12 months, and two-word speech around 24 months.
- 38. D. Miller's magic number is 7 plus or minus 2. Chunking increases how much can be retained.

SECTION I, PART 3 · MULTIPLE CHOICE, QUESTIONS 39-57

- 39. A. Skills and habits are stored in implicit procedural memory. Episodic memories are events from personal experience.
- 41. C. HM could not form new explicit memories after hippocampal removal but could learn new motor skills.
- 43. D. Raw IQ scores have increased over decades, leading to periodic renorming of tests.
- 45. A. $\text{IQ} = \text{mental age} \div \text{chronological age} \times 100$, so $12 \div 10 \times 100 = 120$.
- 47. A. Elkind described the imaginary audience and personal fable in adolescence.
- 49. E. The CR reappears following a pause, showing extinction suppresses rather than erases learning.
- 51. B. Garcia showed that organisms readily link taste with illness even with long delays, indicating evolutionary preparedness.
- 53. C. A desirable stimulus is removed to reduce a behavior. Positive punishment would add something aversive.
- 55. B. Learning occurred without reinforcement and appeared when motivation arose. Tolman proposed cognitive maps.
- 57. B. Milgram found that most participants obeyed up to the highest voltage when pressed by an authority.

SECTION I, PART 4 · MULTIPLE CHOICE, QUESTIONS 58-75

- 58. E. Assigned roles shaped behavior, though the study has faced criticism about demand characteristics.
- 60. A. We attribute our successes to our dispositions and our failures to situations.
- 62. C. Sherif's Robbers Cave study showed that superordinate goals reduce conflict.
- 64. D. Believing the world is fair leads to blaming victims.
- 66. C. Rotter described people differing in perceived control. Learned helplessness involves feeling that actions have no effect.
- 68. B. Deci and Ryan say motivation thrives when these needs are met.
- 70. C. Manic episodes with depressive episodes indicate bipolar disorder.
- 72. A. This integrative model is used widely in clinical psychology.
- 74. E. Managing feelings rather than the stressor is emotion-focused coping.

SECTION II, QUESTION 1 · ARTICLE ANALYSIS: SLEEP AND MEMORY

- 76. Scoring: 1 point. The independent variable was the sleep condition: normal sleep versus staying awake all night.
- 77. Scoring: 1 point. Random assignment makes the groups equivalent on average in characteristics such as ability and motivation before the manipulation, so differences in recall can be attributed to the sleep condition rather than to preexisting differences.
- 78. Scoring: 1 point. A single-blind procedure for the scorers (the people scoring the tests did not know condition). It prevents experimenter bias from influencing how answers are scored. (Participants could not be blinded because they knew whether they slept.)
- 79. Scoring: 1 point. Informed consent (students agreed to the procedure) and debriefing at the end after the hypothesis was disclosed. Acceptable alternatives: allowing withdrawal, monitoring the safety of sleep-deprived students, or minimal deception. The answer must tie the consideration to what the researcher did.
- 80. Scoring: 1 point. Supported: sleep after learning improved recall compared with sleep deprivation (31 versus 22 pairs). Not supported: that sleep improves memory in all populations or for all material, because the sample was college students tested on word pairs; the study also cannot show how long the benefit lasts.

- 33. C. Algorithms are step-by-step methods that guarantee correct solutions. Heuristics are quicker shortcuts that may err.
- 35. A. Surgery described as 90 percent survival is judged more favorably than 10 percent mortality. This is framing.
- 37. D. Applying regular past-tense rules to irregular verbs shows the child is learning rules, not just imitating.
- 40. E. Matching retrieval cues to the learning environment improves recall. Mood-dependent memory involves emotional state.
- 42. E. The method of loci uses spatial locations to cue lists. Peg-word associates items to numbered rhymes.
- 44. D. Steele and Aronson showed that concerns about confirming a stereotype can depress test performance.
- 46. B. Harlow's monkeys preferred a soft cloth mother to a wire mother that held the milk.
- 48. D. Baumrind found authoritative parenting linked to the best outcomes. Authoritarian parents demand obedience with little warmth.
- 50. B. Responding to stimuli similar to the original CS is generalization. Discrimination distinguishes between them.
- 52. C. Removing an aversive stimulus increases the behavior. Punishment decreases behavior.
- 54. A. Shaping reinforces gradual steps toward the target behavior.
- 56. E. After pairing with pain, the drill sound alone triggers fear and so is a learned cue.
- 59. D. Anonymity in a group reduces effort. Identifiability and personal responsibility reduce it.
- 61. C. Familiarity breeds fondness, one reason that proximity predicts friendship.
- 63. A. Strong arguments persuade people who process carefully. The peripheral route relies on cues such as attractiveness.
- 65. A. It is a core idea of the social-cognitive perspective. Internal locus of control also falls under this view.
- 67. B. The Rorschach inkblot test is projective; critics question its reliability and validity.
- 69. C. Agoraphobia involves fear of situations where escape would be difficult.
- 71. E. Beck's cognitive therapy targets negative thinking patterns, especially in depression.
- 73. C. ECT can quickly relieve treatment-resistant depression.
- 75. E. The parasympathetic division restores calm after arousal.

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81. Scoring: 1 point. The hippocampus consolidates new explicit memories, and sleep, especially slow-wave and REM sleep, is thought to help the hippocampus transfer and strengthen information for long-term storage.
82. Scoring: 1 point. The order of items in the list could affect recall, since items at the beginning and end are better remembered; randomizing or counterbalancing the order of word pairs across participants would prevent the effect from favoring a group. Interference from new material could be reduced by controlling daytime activities.

SECTION II, QUESTION 2 · EVIDENCE-BASED QUESTION: DOES PUNISHMENT OR REINFORCEMENT WORK BETTER?

83. Scoring: 1 point. Acceptable: positive reinforcement is generally more effective and has longer-lasting effects than punishment, although mild immediate punishment can stop dangerous behavior in specific cases. The thesis must take a position beyond restating the question.
84. Scoring: 2 points. 1 point: accurate evidence (25 versus 6 percent gains, longer lasting, randomly selected classrooms). 1 point: correct operant concept, such as positive reinforcement strengthening on-task behavior while punishment (positive punishment by reprimand) only suppresses behavior and does not teach an alternative.
85. Scoring: 2 points. 1 point: accurate evidence (frequent spanking associated with later aggression). 1 point: explanation, for example the observational nature means a correlation without random assignment, so aggressive children might elicit more spanking or a third factor could play a role; or social learning theory predicts that children imitate aggressive models.
86. Scoring: 2 points. 1 point: accurate evidence (immediate removal stopped the dangerous behavior within a week) with a qualification that punishment can work when it is immediate, consistent, and paired with safety. 1 point: a limitation such as a single case, no control group, and no way to generalize, or possible simultaneous changes.

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Appendix: Reference.

Who's who, studies, statistics formulas, glossary, and a skills checklist for last-minute review.

R.1 Who's Who, Studies, and Stats Formulas

A one-stop reference for the people and studies you must recognize, the statistics you must be able to calculate and interpret, and a decision table for identifying research designs.

Use this reference after you finish each chapter. On the exam you rarely need to recall a first name; you need to link a surname or study description to its main idea. The table below is organized roughly from foundations through development, cognition, social psychology, and health.

Psychologist or study	Contribution to know
Wilhelm Wundt	Opened the first psychology laboratory (1879); structuralism and introspection
William James	Functionalism; wrote Principles of Psychology; James-Lange theory of emotion
Mary Whiton Calkins	First woman president of the American Psychological Association; paired-associate technique in memory
Margaret Floy Washburn	First woman to earn a psychology PhD; animal behavior research
G. Stanley Hall	Founded the American Psychological Association; pioneered the study of adolescence
Max Wertheimer	Gestalt psychology; the whole differs from the sum of its parts
Sigmund Freud	Psychoanalysis; unconscious, id/ego/superego, psychosexual stages, defense mechanisms
Carl Jung	Collective unconscious and archetypes; introversion and extraversion
Alfred Adler	Inferiority complex and striving for superiority
Karen Horney	Challenged Freud on women; basic anxiety and social influences
John B. Watson	Founded behaviorism; Little Albert conditioned fear
B. F. Skinner	Operant conditioning, reinforcement schedules, shaping, Skinner box
Ivan Pavlov	Classical conditioning in dogs; conditioned and unconditioned stimuli
Edward Thorndike	Law of effect; puzzle boxes
Albert Bandura	Social learning theory; Bobo doll study; observational learning; reciprocal determinism; self-efficacy
Edward Tolman	Cognitive maps and latent learning in rats
Wolfgang Kohler	Insight learning in chimpanzees
Robert Rescorla	Classical conditioning depends on how well the CS predicts the US
Garcia and Koelling	Taste aversion; biological preparedness in conditioning
Abraham Maslow	Hierarchy of needs; self-actualization; humanistic psychology
Carl Rogers	Client-centered therapy; unconditional positive regard; congruence
Jean Piaget	Stages of cognitive development: sensorimotor, preoperational, concrete operational, formal operational
Lev Vygotsky	Sociocultural theory; zone of proximal development; scaffolding
Erik Erikson	Eight psychosocial stages from trust vs. mistrust to integrity vs. despair
Lawrence Kohlberg	Preconventional, conventional, and postconventional moral reasoning; Heinz dilemma
Carol Gilligan	Critiqued Kohlberg; ethic of care

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Psychologist or study	Contribution to know
Harry Harlow	Rhesus monkey attachment studies; contact comfort
Mary Ainsworth	Strange Situation; secure, avoidant, ambivalent attachment styles
John Bowlby	Attachment theory
Diana Baumrind	Parenting styles: authoritative, authoritarian, permissive
Konrad Lorenz	Imprinting in geese
Noam Chomsky	Language acquisition device; universal grammar
Benjamin Whorf	Linguistic relativity hypothesis
Hermann Ebbinghaus	Forgetting curve; nonsense syllables; spacing effect
Elizabeth Loftus	Misinformation effect; eyewitness memory reconstruction
Atkinson and Shiffrin	Three-stage (information-processing) model of memory
Alan Baddeley	Working memory model
George Miller	Magical number seven, plus or minus two; chunking
Craik and Lockhart	Levels of processing
Charles Spearman	General intelligence (g)
Louis Thurstone	Seven primary mental abilities
Howard Gardner	Multiple intelligences
Robert Sternberg	Triarchic theory: analytical, creative, practical; triangular theory of love
Alfred Binet	First practical intelligence test; mental age
Lewis Terman	Stanford-Binet; IQ; longitudinal study of gifted children
David Wechsler	Wechsler scales (WAIS, WISC)
Raymond Cattell	Fluid and crystallized intelligence
Claude Steele	Stereotype threat
Carol Dweck	Fixed vs. growth mindset
Paul Broca and Carl Wernicke	Language areas of the brain: speech production and comprehension
Roger Sperry and Michael Gazzaniga	Split-brain research; hemispheric specialization
Phineas Gage	Case of frontal lobe damage changing personality
Henry Molaison (H. M.)	Hippocampus removal; anterograde amnesia; explicit vs. implicit memory
Hubel and Wiesel	Feature detectors in the visual cortex
Hering	Opponent-process theory of color vision
Young and Helmholtz	Trichromatic theory of color vision
Ernst Weber and Gustav Fechner	Just noticeable difference; psychophysics
James Olds and Peter Milner	Pleasure centers in the brain
Walter Cannon	Cannon-Bard theory; fight-or-flight
Hans Selye	General adaptation syndrome: alarm, resistance, exhaustion
Richard Lazarus	Cognitive appraisal theory of emotion and stress
Stanley Schachter and Jerome Singer	Two-factor theory of emotion
Paul Ekman	Universal facial expressions of basic emotions
Robert Yerkes and John Dodson	Yerkes-Dodson law: moderate arousal gives best performance
Henry Murray	Thematic Apperception Test; need for achievement

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Psychologist or study	Contribution to know
Hermann Rorschach	Inkblot projective test
Gordon Allport	Trait theory; cardinal, central, and secondary traits
Raymond Cattell (traits)	16 personality factors
Costa and McCrae	Big Five: openness, conscientiousness, extraversion, agreeableness, neuroticism
Hans Eysenck	Biological traits: extraversion and neuroticism
Walter Mischel	Person-situation debate; delay of gratification (marshmallow) studies
Julian Rotter	Locus of control
Martin Seligman	Learned helplessness; positive psychology
Solomon Asch	Conformity with line judgments
Stanley Milgram	Obedience to authority with shock generator
Philip Zimbardo	Stanford prison experiment; role and situation effects
Muzafer Sherif	Robbers Cave study; superordinate goals reduce prejudice
Leon Festinger	Cognitive dissonance; social comparison
Henri Tajfel	Social identity theory; in-group bias
John Darley and Bibb Latane	Bystander effect and diffusion of responsibility
Kitty Genovese case	Prompted research on bystander intervention
Norman Triplett	Social facilitation in cyclists
Irving Janis	Groupthink
Elliot Aronson	Jigsaw classroom; reducing prejudice
Lee Ross	Fundamental attribution error
Harold Kelley	Attribution theory: consensus, distinctiveness, consistency
Fritz Heider	Attribution theory; dispositional vs. situational
Robert Zajonc	Mere exposure effect; social facilitation
Thomas Holmes and Richard Rahe	Social Readjustment Rating Scale
Friedman and Rosenman	Type A and Type B personality and heart disease
Rosenhan	On Being Sane in Insane Places; labeling in psychiatric diagnosis
Aaron Beck	Cognitive therapy; cognitive triad for depression
Albert Ellis	Rational-emotive behavior therapy
Joseph Wolpe	Systematic desensitization
Fritz Perls	Gestalt therapy
Dorothea Dix	Reform of mental hospital conditions
Philippe Pinel	Humane treatment of patients with mental illness
Eric Kandel	Neural basis of learning in sea slugs (Aplysia); long-term potentiation work
Gordon Bower	Mood-congruent memory

Fast associations that earn points

Obedience = Milgram. Conformity = Asch. Prison roles = Zimbardo. Bystander effect = Darley and Latane.
 Attachment = Harlow (contact comfort), Ainsworth (Strange Situation), Bowlby (theory).
 Operant = Skinner and Thorndike. Classical = Pavlov and Watson. Observational = Bandura.
 Misinformation effect = Loftus. Forgetting curve = Ebbinghaus. Working memory = Baddeley.

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Statistics reference. AP Psychology does not require heavy computation, but you should be able to calculate simple descriptive statistics and interpret significance, correlation, and the normal curve.

Measure	Formula or rule	How to interpret
Mean	sum of scores divided by number of scores	Average; pulled toward outliers
Median	middle score when ordered (average the two middle scores if the count is even)	Best typical value for skewed data
Mode	most frequent score	Only measure for categories; a set can have no mode or several
Range	highest score minus lowest score	Simple spread; affected by outliers
Variance (population)	average of the squared deviations: sum of $(x - \text{mean})^2$ squared, divided by N	Spread in squared units
Standard deviation	square root of the variance	Typical distance of scores from the mean; larger means more variable
Z-score	$(\text{score} - \text{mean}) / \text{standard deviation}$	Number of standard deviations from the mean
Normal curve rule	68% within 1 SD, 95% within 2 SD, 99.7% within 3 SD	Applies to normal distributions only
Percentile	percent of scores at or below a given score	Rank, not a percent correct
Correlation coefficient r	ranges from -1.00 to +1.00	Sign is direction, size is strength; zero means no linear relationship
Percent change	$(\text{new} - \text{old}) / \text{old} \times 100$	Relative change
Statistical significance	$p < .05$ (typical cutoff)	Result unlikely due to chance alone; not proof, not size
Mental age IQ (historic)	$(\text{mental age} / \text{chronological age}) \times 100$	Original ratio IQ; modern tests use deviation scores with mean 100

WORKED EXAMPLE 1: DESCRIPTIVE STATISTICS

Five students score 4, 6, 8, 10, and 12 on a quiz. Find the mean, median, mode, range, and population standard deviation.

SOLUTION

Mean = $(4 + 6 + 8 + 10 + 12) / 5 = 40 / 5 = 8$.

Median = 8 (the middle score of the ordered list). Mode: none, because no score repeats. Range = $12 - 4 = 8$.

Deviations from the mean: -4, -2, 0, 2, 4. Squared: 16, 4, 0, 4, 16. Sum = 40.

Population variance = $40 / 5 = 8$. Standard deviation = square root of 8, which is about 2.83. (For a sample, divide by $n - 1 = 4$, giving variance 10 and SD about 3.16.)

WORKED EXAMPLE 2: Z-SCORES AND THE NORMAL CURVE

IQ scores have a mean of 100 and a standard deviation of 15. (a) Find the z-score of an IQ of 130. (b) About what percent of people score between 85 and 115? (c) An IQ of 70 is how many SDs below the mean?

SOLUTION

(a) $z = (130 - 100) / 15 = 2.0$, so the score is 2 standard deviations above the mean, near the 98th percentile (about 97.7).

(b) 85 is 1 SD below and 115 is 1 SD above the mean, so about 68 percent of people score in that range.

(c) $z = (70 - 100) / 15 = -2.0$, two SDs below the mean; about 2 percent of scores fall below this point.

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WORKED EXAMPLE 3: PERCENT CHANGE

In an experiment, the treatment group's average depression score fell from 40 to 28. The control group's fell from 40 to 36. Compare the percent changes.

SOLUTION

Treatment: $(28 - 40) / 40 = -12 / 40 = -0.30$, a 30 percent decrease.

Control: $(36 - 40) / 40 = -4 / 40 = -0.10$, a 10 percent decrease.

The treatment group improved 20 percentage points more than the control group, so the treatment looks beneficial if the difference is statistically significant.

Interpreting correlations

Rough guide: .00 to .30 weak, .30 to .70 moderate, above .70 strong (ignore the sign when judging strength).

Positive: variables rise together. Negative: one rises as the other falls. Zero: no linear pattern.

A correlation never alone proves causation. Look for third variables and reversed direction.

Research design decision table. Work through the questions from top to bottom when a scenario asks what kind of study it is or what conclusion is allowed.

Question to ask	If yes	If no
Did the researcher manipulate an independent variable?	Go to next question	Correlational, quasi-experimental, survey, case study, or observation: no cause-and-effect claim
Were participants randomly assigned to conditions?	True experiment: causal conclusion allowed	Quasi-experiment: groups may differ; be cautious about cause
Was there a control or comparison group?	Baseline exists for comparison	Weak design: change could be due to time or expectations
Do participants know their condition (placebo/demand effects)?	Use single-blind or double-blind procedures	Blinding already present: biases reduced
Was the sample selected randomly from the population?	Findings can be generalized to that population	Limited generalizability (volunteer or convenience sample)
Are the variables operationally defined and measured consistently?	Replicable, with reliability and construct validity	Vague terms; results hard to interpret or replicate
Did the study follow ethical guidelines?	Informed consent, confidentiality, debriefing, IRB approval	Ethical violation; identify which protection is missing

Bias or threat	Meaning	Common control
Placebo effect	Improvement due to expectation of treatment	Placebo control group
Experimenter bias	Researcher expectations influence results	Double-blind procedure
Demand characteristics	Participants guess the purpose and change behavior	Deception (with debriefing) or blinding
Social desirability bias	Giving answers that look good	Anonymous surveys
Selection bias	Groups differ before treatment	Random assignment
Sampling bias	Sample does not represent population	Random or stratified sampling
Attrition	Participants drop out nonrandomly	Track and compare dropouts
Confounding variable	Another factor varies with the IV	Hold constant; random assignment

Exam tip

When a prompt says 'identify' or 'name', give the term. When it says 'explain' or 'describe', add how it applies to the scenario with a because-statement. Define the term correctly and name the specific variable or group in the stimulus.

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R.2 Glossary and Skills Checklist

A glossary of the key terms from all six chapters, followed by a chapter-by-chapter checklist of skills to master.

Use the glossary for quick review. A term you can define but cannot apply is not yet mastered, so test yourself by writing an original example for each term.

Term	Definition
Absolute threshold	Minimum stimulus energy detected 50% of the time
Accommodation	Piaget: changing a schema to fit new information; also the lens changing shape to focus
Action potential	Brief electrical impulse that travels down an axon
Afferent neuron	Sensory neuron carrying information toward the CNS
Agonist	Drug or chemical that mimics or enhances a neurotransmitter
Amygdala	Limbic structure central to fear and emotional memory
Antagonist	Drug or chemical that blocks a neurotransmitter
Anterograde amnesia	Inability to form new long-term memories
Assimilation	Piaget: fitting new information into existing schemas
Attachment	Emotional bond between infant and caregiver
Attribution	Explanation of the cause of behavior
Authoritative parenting	High warmth plus firm limits; linked to good outcomes
Availability heuristic	Judging likelihood by how easily examples come to mind
Axon	Neuron fiber that sends signals away from the cell body
Basal ganglia	Structures involved in voluntary movement and habit
Behaviorism	Approach studying only observable behavior
Bias blind spot	Belief that others are more biased than oneself
Big Five	Openness, conscientiousness, extraversion, agreeableness, neuroticism
Binocular cues	Depth cues needing both eyes, such as retinal disparity
Bystander effect	Individuals are less likely to help when others are present
Cerebellum	Hindbrain structure for balance, coordination, and procedural memory
Chunking	Grouping items into meaningful units to expand working memory
Circadian rhythm	24-hour biological cycle
Classical conditioning	Learning by associating a neutral stimulus with an unconditioned stimulus
Cognitive dissonance	Tension from inconsistent thoughts or actions, reduced by changing attitudes
Cognitive map	Mental representation of space
Confirmation bias	Favoring information that supports existing beliefs
Conformity	Adjusting behavior to match group standards
Confounding variable	Uncontrolled factor that could explain results
Construct validity	Whether a test measures the intended concept
Control group	Comparison group that does not receive the treatment
Corpus callosum	Band of fibers connecting the hemispheres
Correlation	Statistical relationship between two variables
Critical period	Window in which exposure is needed for normal development
Cross-sectional study	Compares people of different ages at one time

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Term	Definition
Crystallized intelligence	Accumulated knowledge and skills
Debriefing	Explaining the purpose of a study after participation
Deindividuation	Loss of self-awareness in groups
Dendrite	Branch receiving signals into a neuron
Dependent variable	Outcome measured in a study
Depressants	Drugs that slow neural activity, such as alcohol
Diffusion of responsibility	Reduced personal responsibility when others are present
Discrimination	Unjustified negative behavior toward a group
Dissociative identity disorder	Presence of two or more distinct identities
Double-blind	Neither participants nor researchers know group assignment
Echoic memory	Brief auditory sensory memory
Ego	Freud: reality-oriented part of personality
Encoding	Getting information into memory
Endocrine system	Glands that release hormones
Episodic memory	Memory for personal events
External validity	Extent to which findings generalize
Extinction	Decline of a conditioned response when the US stops following the CS
Fixed-ratio schedule	Reinforcement after a set number of responses
Fluid intelligence	Reasoning and novel problem solving
Flynn effect	Rise in average IQ scores over generations
Foot-in-the-door	Small request first increases compliance with a larger one
Functional fixedness	Seeing objects only in their usual use
Fundamental attribution error	Overestimating dispositions and underestimating situations in others' behavior
Gate-control theory	Spinal gate that can block pain signals
Generalized anxiety disorder	Persistent, excessive worry
Gestalt	Perceiving organized wholes
Glial cells	Support cells that nourish and insulate neurons
Group polarization	Group discussion strengthens initial leanings
Groupthink	Desire for harmony overrides realistic appraisal
Heritability	Proportion of variation in a population due to genetic differences
Heuristic	Mental shortcut
Hippocampus	Brain structure for forming explicit memories
Homeostasis	Maintaining a stable internal state
Hypothalamus	Regulates hunger, thirst, temperature, and the pituitary
Hypothesis	Testable prediction
Iconic memory	Brief visual sensory memory
Id	Freud: instinctual drives operating on the pleasure principle
Implicit memory	Unconscious memory, such as skills and priming
In-group bias	Favoring one's own group

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Term	Definition
Independent variable	Factor manipulated by the researcher
Informed consent	Participants agree after learning what the study involves
Insight	Sudden realization of a problem solution
Internal validity	Extent to which the IV caused the DV
Intrinsic motivation	Desire to act for its own sake
Kinesthesia	Sense of body position and movement
Latent learning	Learning not shown until reinforcement makes it useful
Law of effect	Rewarded behaviors tend to be repeated
Learned helplessness	Passivity after uncontrollable aversive events
Limbic system	Network involved in emotion and memory
Locus of control	Belief about whether outcomes are controlled internally or externally
Long-term potentiation	Strengthened synapses with repeated stimulation; basis of learning
Longitudinal study	Follows the same people over time
Major depressive disorder	Persistent low mood or loss of interest with other symptoms
Mean, median, mode	Measures of central tendency
Melatonin	Hormone regulating sleep
Misinformation effect	Memory distortion from misleading information
Mnemonic	Memory aid
Monocular cues	Depth cues requiring one eye, such as linear perspective
Myelin	Fatty sheath that speeds neural transmission
Naturalistic observation	Watching behavior in its natural setting
Negative reinforcement	Removing an aversive stimulus to increase behavior
Neurogenesis	Formation of new neurons
Neuroplasticity	Brain's ability to reorganize
Neurotransmitter	Chemical messenger between neurons
Norm	Standard of behavior or standardization sample score pattern
Obedience	Following orders from an authority
Observational learning	Learning by watching others
Obsessive-compulsive disorder	Unwanted thoughts and repetitive behaviors
Operant conditioning	Learning through consequences
Operational definition	Precise description of how a variable is measured or manipulated
Parasympathetic	Calms the body after arousal
Peripheral nervous system	Nerves outside brain and spinal cord
Placebo	Inert treatment that can produce effects through expectation
Positive punishment	Adding an aversive stimulus to decrease behavior
Prejudice	Unjustified attitude toward a group
Priming	Activation of associations that influence later responses
Proactive interference	Old learning blocks new learning
Proprioception	Sense of body position

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Term	Definition
Prosopagnosia	Inability to recognize faces
Random assignment	Placing participants into groups by chance
Reliability	Consistency of results
REM sleep	Sleep stage with vivid dreams and muscle paralysis
Retrieval cue	Stimulus that helps recall
Retroactive interference	New learning blocks old
Schema	Mental framework for organizing information
Self-efficacy	Belief in one's ability to succeed
Self-serving bias	Taking credit for success, blaming failure on situations
Semantic memory	General knowledge
Sensation	Detecting stimulus energy
Serial position effect	Better recall of first and last items in a list
Signal detection theory	Detection depends on stimulus and decision criteria
Social facilitation	Better performance on easy tasks when others watch
Social loafing	Less effort in a group task
Somatic nervous system	Controls voluntary muscles
Spacing effect	Better learning with distributed practice
Stereotype	Generalized belief about a group
Stimulants	Drugs that speed neural activity
Sympathetic	Mobilizes the body for action
Synapse	Gap between neurons
Tolerance	Diminishing effect of a drug over time
Transduction	Converting stimulus energy to neural signals
Validity	Whether a test measures what it claims
Variable-ratio schedule	Reinforcement after an unpredictable number of responses
Working memory	Active processing of short-term information
Zone of proximal development	Range of tasks a learner can do with help

Look-alike terms to keep apart

Sensation detects energy; perception interprets it.

Negative reinforcement removes something unpleasant to increase behavior; punishment decreases behavior.

Assimilation fits new information into a schema; accommodation changes the schema.

Reliability is consistency; validity is accuracy.

Random sampling affects generalizability; random assignment affects causal conclusions.

Skills checklist. Mark each row when you can perform every listed skill from memory.

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Chapter	I can do this without notes
Ch 1: Foundations and Research Methods	Match each perspective to its core idea; identify method, IV, DV, and confounds in a scenario; interpret mean, SD, r, and p; list ethical protections; explain random sampling vs. random assignment
Ch 2: Biological Bases	Label neuron parts and the action potential sequence; compare nervous system divisions; name brain regions and functions; explain neurotransmitters and drug effects; describe sleep stages; trace sensory pathways and thresholds
Ch 3: Cognition	Apply Gestalt and depth cues; explain memory stages and forgetting; use heuristics and biases; describe language acquisition theories; compare intelligence theories and test properties
Ch 4: Development and Learning	Order Piaget, Erikson, and Kohlberg stages; compare attachment and parenting styles; distinguish classical, operant, and observational learning; identify reinforcement schedules
Ch 5: Social Psychology and Personality	Explain classic social studies; distinguish attribution errors and biases; compare personality theories; apply motivation and emotion theories
Ch 6: Mental and Physical Health	Classify disorders by DSM category; compare therapies; explain the stress response and coping; apply biopsychosocial reasoning
Section II skills	Write AAQ responses with labeled parts; build an EBQ thesis with source evidence, reasoning, and limitation

Exam tip

Before the exam, cover the definition column of the glossary and say each definition aloud. Circle every term you missed and write a one-line example for it. Repeat after a day to space your practice.

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