

FULL-LENGTH PRACTICE TESTS 7 - ANSWERS AND EXPLANATIONS

English

TIME: 35 Minutes—50 Questions

DIRECTIONS: In the five passages that follow, certain words and phrases are underlined and numbered. In the answer choices, you will find alternatives for each underlined part. Choose the best alternative, or select "NO CHANGE" if the original version is correct.

You will also find questions preceded by numbers in brackets [like this]. These questions ask about a section of the passage or the passage as a whole, such as organization, adding or deleting sentences, or overall effectiveness. These questions do not refer to a bolded portion.

For each question, choose the best answer and fill in the corresponding oval on your answer document.

Important: Read each complete passage before answering its questions. Many questions require you to read several sentences beyond the question to determine the correct answer.

PASSAGE I

The Art of Watchmaking

In a small workshop tucked away on a quiet street in Geneva, master watchmaker Philippe Moreau continues a tradition, that has (1) endured for centuries. Unlike mass-produced timepieces, handcrafted mechanical watches require patience, precision, and an attention to detail that borders on the obsessive. (2) Each component must be carefully shaped and fitted by hand, a process that can take months or even years to complete.

Moreau's workshop contains hundreds of specialized tools, some dating back to the (3) 18th century. These delicate instruments allow him to work with components smaller than a grain of rice. "The smallest spring in a watch," he explains, "is thinner than a human hair." (4) If your hand shakes even slightly, months of work can be ruined."

The process begins with the movement the watches internal mechanism. (5) This intricate assembly of gears, springs, and levers must work together with perfect precision. Moreau starts by selecting the highest quality materials: brass for the (6) plates, steel for the gears, and ruby for the bearings. [7]

Creating a single gear requires (8) multiple steps. First, Moreau cuts the basic shape from a brass disk using a specialized lathe. Next, he files and polishes each tooth by hand, ensuring that they are (9) perfectly shaped. Finally, he heat-treats the gear to increase its hardness, this makes (10) it more durable.

The assembly phase demands even greater concentration. Moreau works under a microscope, his hands steady despite his 67 years. (11) Each component must be positioned precisely otherwise (12) the watch will not keep accurate time. Some luxury watches contain over 500 individual parts, and every single one must be perfect. (13)

1. Which choice provides the most appropriate punctuation for this sentence?

- A. NO CHANGE
- B. continues a tradition that has
- C. continues a tradition; that has
- D. continues a tradition that, has

2. Which word or phrase best maintains the passage's tone while describing the level of detail required?

- F. NO CHANGE
- G. is really, really extreme.
- H. goes totally overboard.
- J. is unnecessarily excessive.

3. Given that all choices are grammatically correct, which one provides the most specific information about the tools?

- A. NO CHANGE

- B. contains hundreds of specialized tools from various time periods.
- C. contains specialized tools.
- D. contains many tools, both old and new.

4. Which choice most effectively combines appropriate punctuation with smooth sentence flow?

F. NO CHANGE

- G. "The smallest spring in a watch" he explains "is thinner than a human hair.
- H. "The smallest spring in a watch," he explains "is thinner than a human hair.
- J. "The smallest spring in a watch" he explains, "is thinner than a human hair.

5. Which punctuation correctly separates the two clauses while indicating that the second clause defines the first?

A. NO CHANGE

- B. The process begins with the movement: the watch's internal mechanism.
- C. The process begins with the movement, the watch's internal mechanism.
- D. The process begins with the movement; the watch's internal mechanism.

6. Which choice best introduces the list while maintaining proper punctuation?

F. NO CHANGE

- G. starts by selecting the highest quality materials; brass for the
- H. starts by selecting the highest quality materials. Brass for the
- J. starts by selecting the highest quality materials—brass for the

7. The writer is considering adding the following sentence at this point:

"Switzerland has been famous for watchmaking since the 16th century."

Should the writer make this addition here?

- A. Yes, because it provides important historical context for Moreau's work.
- B. Yes, because it explains why Moreau chose to work in Geneva.
- C. No, because it interrupts the description of Moreau's specific process.
- D. No, because this information was already provided earlier in the passage.

8. Which choice demonstrates correct punctuation for this sentence?

F. NO CHANGE

G. a single gear, requires

H. a single gear; requires

J. a single gear requires,

9. Which choice creates the clearest and most concise statement?

A. NO CHANGE

B. files and polishes each tooth by hand to ensure perfect shaping.

C. files and polishes by hand each tooth, ensuring perfect shapes.

D. by hand files and polishes each tooth, ensuring they are perfectly shaped.

10. Which choice corrects the comma splice while maintaining clear meaning?

F. NO CHANGE

G. its hardness which makes

H. its hardness. This makes

J. its hardness, and this makes

11. Given that all choices are true, which one provides the most relevant detail for understanding the challenges of watchmaking?

- A. NO CHANGE
- B. works in the morning when the light is best.
- C. works while listening to classical music.
- D. works six days a week except holidays.

12. Which punctuation is needed after the underlined portion?

- F. NO CHANGE
- G. precisely, otherwise
- H. precisely; otherwise
- J. precisely. Otherwise

13. If the writer were to delete this sentence, the paragraph would primarily lose:

- A. important information about the complexity of luxury watches.
- B. a detail that was already stated earlier in the passage.
- C. information that contradicts the passage's main focus.
- D. an irrelevant detail about watch components.

PASSAGE II

Rewilding: Bringing Nature Back

Across Europe, an environmental movement called rewilding is gaining momentum as (14) conservationists seek to restore ecosystems to their natural state. Unlike traditional conservation, which often focuses on preserving specific species or habitats, rewilding aims to reintroduce missing animals and allow natural processes to shape (15) landscapes with minimal human intervention.

One of the most successful rewilding projects has occurred (16) in the Netherlands, where the Oostvaardersplassen nature reserve was created on reclaimed land. In 1983, large herbivores including Heck cattle, Konik horses, (17) and red deer were introduced to the area. These animals, which had been absent from the landscape for centuries served (18) as ecological engineers, grazing and trampling vegetation in ways that created diverse habitats.

The results exceeded expectations. (19) Within two decades, the reserve became home to over 300 bird species, including rare and endangered varieties. [20] The grazing animals created a mosaic of grasslands, wetlands, and shrublands that supported an incredible diversity of life. (21)

However rewilding (22) projects face significant challenges. In Oostvaardersplassen, controversy erupted when harsh winters caused large numbers of animals to die from starvation. Animal welfare advocates argued that the reserve's managers should have provided (23) supplemental food. Conservationists responded that natural cycles of population boom and bust are essential to ecosystem health, and that human intervention would undermine the project's goals. (24)

14. Which choice best introduces the passage's main topic with appropriate tone?

- A. NO CHANGE
- B. is quite popular among
- C. is gaining momentum as
- D. has become interesting to

15. Which choice maintains parallel structure in the underlined portion?

- F. NO CHANGE
- G. aims at reintroducing missing animals and to allow natural processes to shape
- H. aims to reintroduce missing animals and to allow natural processes that shape
- J. aims to reintroduce missing animals and allowing natural processes to shape

16. Which choice demonstrates correct subject-verb agreement?

- A. NO CHANGE
- B. the most successful rewilding projects have occurred
- C. the most successful rewilding project occurred
- D. the most successful rewilding projects occurred

17. Which choice correctly punctuates the list of animals?

- F. NO CHANGE
- G. large herbivores, including Heck cattle, Konik horses,
- H. large herbivores including, Heck cattle, Konik horses
- J. large herbivores, including, Heck cattle, Konik horses

18. Which punctuation correctly sets off the non-essential clause?

- A. NO CHANGE
- B. These animals which had been absent from the landscape for centuries, served
- C. These animals, which had been absent from the landscape for centuries, served
- D. These animals which had been absent from the landscape for centuries served,

19. Given that all choices are grammatically correct, which one provides the most effective transition from the previous paragraph?

- F. NO CHANGE
- G. Interestingly, the reserve grew quickly.
- H. The Oostvaardersplassen reserve is large.
- J. Animals need diverse habitats to survive.

20. The writer is considering adding the following sentence at this point:

"Birdwatchers traveled from across Europe to observe species that had disappeared from the region."

Should the writer make this addition here?

- A. Yes, because it provides specific evidence of the reserve's success in attracting wildlife.
- B. Yes, because it explains how the reserve generates revenue.
- C. No, because birdwatching is not relevant to rewilding.
- D. No, because it contradicts the statement about 300 bird species.

21. Which verb tense correctly matches the established tense of the passage?

- F. NO CHANGE
- G. which supported an incredible diversity of life.
- H. that support an incredible diversity of life.
- J. supporting an incredible diversity of life.

22. Which choice provides correct punctuation after the transitional word?

- A. NO CHANGE
- B. However, rewilding
- C. However: rewilding
- D. However; rewilding

23. Which choice demonstrates correct verb form and possessive usage?

- F. NO CHANGE
- G. advocates argued that the reserve's managers should of provided
- H. advocates argue that the reserve's managers should have provided
- J. advocates argued that the reserves managers should have provided

24. Which choice maintains parallel structure with the previous clause?

A. NO CHANGE

B. and human intervention would undermine the project's goals.

C. and that human intervention would be undermining the project's goals.

D. and that human intervention undermines the project's goals.

25. Suppose the writer's goal had been to write an essay describing the ethical debates surrounding rewilding projects. Would this essay successfully accomplish that goal?

F. Yes, because it presents both sides of the controversy over animal welfare in rewilding.

G. Yes, because it focuses primarily on the ethical challenges of rewilding.

H. No, because it focuses more on describing a specific rewilding project than on exploring ethical debates in depth.

J. No, because it doesn't mention ethics at all.

PASSAGE III

The Discovery of Insulin

In the summer of 1921, a young surgeon named Frederick Banting had an idea that would transform (26) the treatment of diabetes. At the time, diabetes was a death sentence, patients, especially children, wasted away (27) as their bodies lost the ability to process sugar. Doctors could do little except prescribe starvation diets that prolonged life briefly but offered no cure.

Banting hypothesized that the pancreas produced a hormone that regulated blood sugar, and that extracting this hormone might (28) treat diabetes. With the help of his assistant Charles Best, Banting began (29) experimenting on dogs in a laboratory at the University of Toronto. The work was difficult and progress came slowly. (30)

By the fall of 1921, (31) Banting and Best had successfully extracted a substance from animal pancreases that lowered blood sugar in diabetic dogs. They called it "isletin," though it would later be renamed insulin. (32) The results were promising but (33) the extract was still too impure for human use. [34]

Enter biochemist James Collip who spent (35) weeks refining the extraction process. In January 1922, a 14-year-old boy named Leonard Thompson became the first human to receive (36) insulin injections. The initial dose caused an allergic reaction, however Collip's (37) improved formula, administered two weeks later, worked dramatically. Leonard's blood sugar dropped, his symptoms improved, and he lived another 13 years.

The discovery of insulin represents one of medical history's greatest triumphs. (38) Within a year, insulin became widely available, saving countless lives. Banting and his colleague John Macleod won the Nobel Prize in 1923, though controversy surrounded the award's exclusion of Best and Collip.

26. Which choice best establishes the significance of Banting's contribution?

- A. NO CHANGE
- B. came up with an interesting thought about
- C. had an idea that would transform
- D. thought of something important for

27. Which punctuation correctly separates the independent clause from the descriptive phrase?

- F. NO CHANGE
- G. patients especially children, wasted away
- H. patients—especially children—wasted away
- J. patients (especially children) wasted away

28. Which choice demonstrates correct parallel structure in the compound predicate?

- F. NO CHANGE
- G. regulated blood sugar and that extracting this hormone might
- H. regulated blood sugar; and that extracting this hormone might

J. regulated blood sugar, and extracting this hormone might

29. Which choice creates the clearest relationship between Banting and Best with proper punctuation?

A. NO CHANGE

B. his assistant, Charles Best, Banting began

C. his assistant Charles Best Banting began

D. his assistant, Charles Best; Banting began

30. Given that all choices are true, which one most effectively conveys the challenges Banting faced?

F. NO CHANGE

G. The laboratory was located on campus.

H. They worked during the summer months.

J. The University of Toronto supported the research.

31. Which choice demonstrates correct punctuation for the introductory phrase?

A. NO CHANGE

B. By the fall of 1921

C. By the fall, of 1921,

D. By the fall of 1921

32. Which choice correctly punctuates the quotation and the following clause?

F. NO CHANGE

G. it "isletin" though it would later be renamed insulin.

H. it "isletin," though it would later be renamed, insulin.

J. it, "isletin," though it would later be renamed insulin.

33. Which punctuation correctly connects the two independent clauses?

- A. NO CHANGE
- B. promising, but
- C. promising; but
- D. promising. But

34. The writer is considering adding the following sentence at this point:

"Pure insulin consists of 51 amino acids arranged in a specific molecular structure."

Should the writer make this addition here?

- F. Yes, because it provides technical details that enhance understanding of insulin.
- G. Yes, because it explains why the early extract was impure.
- H. No, because technical molecular details disrupt the historical narrative's flow.
- J. No, because this information contradicts what was stated earlier.

35. Which punctuation is necessary to set off the non-restrictive clause?

- A. NO CHANGE
- B. James Collip, who spent
- C. James Collip; who spent
- D. James Collip: who spent

36. Which verb tense correctly maintains consistency with the historical narrative?

F. NO CHANGE

G. becomes the first human to receive

H. will become the first human to receive

J. had become the first human to receive

37. Which choice correctly punctuates the transition between contrasting ideas?

A. NO CHANGE

B. however, Collip's

C. however; Collip's

D. however. Collip's

38. If the writer were to delete this sentence, the paragraph would primarily lose:

F. a statement that effectively introduces the paragraph's conclusion about insulin's impact.

G. information that was already provided earlier in the passage.

H. a detail that overstates insulin's medical importance.

J. information unrelated to Leonard Thompson's treatment.

PASSAGE IV

The Mathematics of Origami

Origami, the Japanese art of paper folding, might seem like a simple craft suitable only for children's activities. (39) However, mathematicians and engineers have discovered that origami embodies complex geometric principles with practical applications ranging from space exploration to medical devices.

The mathematics of origami focuses on understanding which shapes (40) can be created through folding and which cannot. A flat piece of paper can be folded in theoretically infinite ways, but not all (41) folding patterns are possible. Mathematician Kazuo Haga discovered that certain angles and proportions appear

repeatedly in origami constructions these (42) mathematical relationships are now called "Haga's theorems."

One practical application involves solar panels for spacecraft. (43) Engineers needed panels that could fold compactly for launch but expand to large sizes in orbit, origami folding patterns (44) provided the solution. The Miura fold, named after Japanese astrophysicist Koryo Miura, allows flat sheets to fold and unfold in a single motion. (45) This technique has been used on satellites and is being adapted for everything from car airbags to medical stents.

[46] Medical researchers have developed (47) origami-inspired devices that can be inserted into the body in a compact form and then expanded. For example, a heart stent might be folded small enough to pass through blood vessels, then unfolded at the target location. (48)

The intersection of origami and mathematics demonstrates how ancient art forms (49) can inspire modern innovation. What began as a traditional Japanese craft has become a sophisticated field of study, proving that beauty and utility are not mutually exclusive. (50)

39. Which choice most effectively sets up the contrast that follows in the next sentence?

- A. NO CHANGE
- B. suitable only for children's activities.
- C. practiced mainly in Japan.
- D. involving only paper and skill.

40. Which choice demonstrates correct punctuation within the sentence?

- F. NO CHANGE
- G. focuses on understanding, which shapes
- H. focuses, on understanding which shapes
- J. focuses on, understanding which shapes

41. Which choice correctly punctuates the two contrasting clauses?

A. NO CHANGE

B. can be folded in theoretically infinite ways but not all

C. can be folded in theoretically infinite ways; but not all

D. can be folded, in theoretically infinite ways, but not all

42. Which choice correctly separates the two independent clauses?

F. NO CHANGE

G. certain angles and proportions appear repeatedly in origami constructions, these

H. certain angles and proportions appear repeatedly in origami constructions. These

J. certain angles and proportions appear repeatedly in origami constructions; these

43. Given that all choices are true, which one provides the most effective transition to the topic of practical applications?

A. NO CHANGE

B. Origami has been practiced for centuries.

C. Many people enjoy origami as a hobby.

D. Paper comes in various sizes and colors.

44. Which choice correctly separates the two independent clauses?

F. NO CHANGE

G. expand to large sizes in orbit. Origami folding patterns

H. expand to large sizes in orbit; origami folding patterns

J. expand to large sizes in orbit origami folding patterns

45. Which verb tense correctly describes the Miura fold's function?

F. NO CHANGE

G. will allow flat sheets to fold and unfold in a single motion.

H. allowed flat sheets to fold and unfold in a single motion.

J. has allowed flat sheets to fold and unfold in a single motion.

46. At this point, the writer is considering adding the following sentence:

"The cost of developing these devices can be quite high."

Should the writer make this addition here?

A. Yes, because it provides important information about medical device development.

B. Yes, because it explains why origami-inspired devices are necessary.

C. No, because cost information is irrelevant to the passage's focus on origami's applications.

D. No, because it contradicts earlier statements about the benefits of origami folding.

47. Which verb tense best maintains consistency with the passage's discussion of ongoing developments?

A. NO CHANGE

B. Medical researchers have been developing

C. Medical researchers developed

D. Medical researchers are developing

48. Which choice maintains parallel structure with the earlier phrase "folded small enough"?

F. NO CHANGE

G. then unfolds at the target location.

H. then unfolding at the target location.

J. then, unfolded at the target location.

49. Which choice most precisely describes what origami represents in this context?

A. NO CHANGE

B. traditional hobbies

C. paper crafts

D. foreign customs

50. Which choice maintains the passage's formal tone while expressing the conclusion?

F. NO CHANGE

G. are not, mutually exclusive.

H. aren't mutually exclusive at all.

J. definitely are not mutually exclusive.

Mathematics

TIME: 50 minutes for 45 questions

DIRECTIONS: Each question has four answer choices. Choose the best answer for each question and shade the corresponding oval on your answer sheet.

1. If $5x - 3 = 17$, what is the value of x ?

- A. 2
- B. 3
- C. 4
- D. 5

2. What is 25% of 160?

- A. 35
- B. 40
- C. 45
- D. 50

3. Which of the following expressions is equivalent to $3(2x + 4)$?

- A. $5x + 7$
- B. $6x + 4$
- C. $6x + 12$
- D. $6x + 7$

4. In a bag containing 5 red marbles, 3 blue marbles, and 2 green marbles, what is the probability of randomly selecting a blue marble?

- A. $1/10$
- B. $3/10$
- C. $1/3$
- D. $3/5$

5. If $a = -4$, what is the value of $2a^2 - 3a$?

- A. 20
- B. 44
- C. 28
- D. 32

6. A rectangle has a length of 9 inches and a width of 5 inches. What is its perimeter in inches?

- A. 14
- B. 19
- C. 28
- D. 45

7. Which of the following is equivalent to $(x + 5)(x - 3)$?

- A. $x^2 + 2x - 15$
- B. $x^2 - 2x - 15$
- C. $x^2 + 8x - 15$
- D. $x^2 + 2x + 15$

8. If $3x + 2y = 16$ and $x = 2$, what is the value of y ?

- A. 3
- B. 5
- C. 7
- D. 10

9. What is the slope of the line passing through the points $(1, 3)$ and $(5, 11)$?

- A. $1/2$
- B. 2
- C. 4
- D. 8

10. A shirt originally priced at \$60 is on sale for 30% off. What is the sale price?

- A. \$18
- B. \$30
- C. \$42
- D. \$48

11. If $|2x - 6| = 10$, what are all possible values of x ?

- A. -2 and 8
- B. 2 and -8
- C. -2 only
- D. 8 only

12. What is the area of a triangle with a base of 8 cm and a height of 5 cm?

- A. 13 cm^2
- B. 20 cm^2
- C. 40 cm^2
- D. 80 cm^2

13. Which of the following is equivalent to $\sqrt{144}$?

- A. 10
- B. 12
- C. 14
- D. 72

14. If $f(x) = 4x - 7$, what is $f(5)$?

- A. 6
- B. 13
- C. 18
- D. 27

15. In a class of 32 students, the ratio of boys to girls is 5:3. How many boys are in the class?

- A. 12
- B. 15
- C. 20
- D. 24

16. What is the value of 3^4 ?

- A. 12
- B. 27
- C. 64
- D. 81

17. If $4x - 9 > 15$, which inequality represents all possible values of x ?

- A. $x > 6$
- B. $x > 3$
- C. $x < 6$
- D. $x > 24$

18. A circle has a radius of 6 feet. What is its circumference in feet?

- A. 6π
- B. 12π
- C. 36π
- D. 72π

19. What is the median of the following set of numbers: 15, 22, 18, 30, 22, 25?

- A. 20
- B. 22
- C. 23
- D. 25

20. If $2^x = 32$, what is the value of x ?

- A. 4
- B. 5
- C. 6
- D. 16

21. In a right triangle, one acute angle measures 28° . What is the measure of the other acute angle?

- A. 28°
- B. 52°
- C. 62°
- D. 152°

22. Which of the following is equivalent to $(3x^2y^3)(2x^4y)$?

- A. $5x^6y^4$
- B. $6x^6y^4$
- C. $6x^8y^3$
- D. $6x^6y^3$

23. A rectangular garden has a length that is 3 feet longer than twice its width. If the width is w feet, which expression represents the perimeter in feet?

- A. $6w + 6$
- B. $4w + 6$
- C. $3w + 3$
- D. $2w + 3$

24. What is the distance between the points $(-2, 3)$ and $(4, 11)$ on the coordinate plane?

- A. 6
- B. 8
- C. 10
- D. 14

25. If $x^2 - 7x + 12 = 0$, what are the solutions for x ?

- A. 2 and 6
- B. 3 and 4
- C. -3 and -4
- D. -2 and -6

26. A car travels at an average speed of 55 miles per hour. How far will it travel in 3.5 hours?

- A. 165.5 miles
- B. 182.5 miles
- C. 192.5 miles
- D. 195.5 miles

27. What is the value of $\sin(30^\circ)$?

- A. $\frac{1}{2}$
- B. $\frac{\sqrt{2}}{2}$
- C. $\frac{\sqrt{3}}{2}$
- D. 1

28. If the area of a square is 169 square centimeters, what is the length of one side in centimeters?

- A. 11
- B. 13
- C. 15
- D. 42.25

29. Which of the following equations represents a line parallel to $y = 3x + 5$?

- A. $y = 3x - 2$
- B. $y = -3x + 5$
- C. $y = (1/3)x + 5$
- D. $y = 5x + 3$

30. What is the value of $\log_2(64)$?

- A. 4
- B. 5
- C. 6
- D. 8

31. A cylinder has a radius of 4 inches and a height of 10 inches. What is its volume in cubic inches?

- A. 40π
- B. 80π
- C. 160π
- D. 320π

32. If $3x + 2y = 18$ and $x - y = 1$, what is the value of x ?

- A. 3
- B. 4
- C. 5
- D. 6

33. What is the sum of the interior angles of a pentagon?

- A. 360°
- B. 450°
- C. 540°
- D. 720°

34. Which of the following is equivalent to $(x + 4)^2$?

- A. $x^2 + 16$
- B. $x^2 + 4x + 16$
- C. $x^2 + 8x + 8$
- D. $x^2 + 8x + 16$

35. A sequence follows the pattern: 2, 6, 18, 54, ... What is the 6th term?

- A. 162
- B. 324
- C. 486
- D. 648

36. In triangle ABC, angle A measures 35° and angle B measures 75° . What is the measure of angle C?

A. 40°

B. 60°

C. 70°

D. 110°

37. If $f(x) = x^2 + 3x - 2$ and $g(x) = 2x - 1$, what is $f(g(2))$?

A. 16

B. 22

C. 28

D. 34

38. What is the length of the diagonal of a rectangle with length 12 cm and width 5 cm?

A. 11 cm

B. 13 cm

C. 15 cm

D. 17 cm

39. How many different 3-digit numbers can be formed using the digits 2, 4, 6, 8 if each digit can be used only once?

A. 12

B. 18

C. 24

D. 64

40. If $\cos \theta = 3/5$ and θ is an acute angle, what is $\sin \theta$?

- A. $3/5$
- B. $4/5$
- C. $5/3$
- D. $5/4$

41. A line passes through the point $(2, -3)$ and has a slope of 4. What is the y-intercept?

- A. -11
- B. -8
- C. 5
- D. 11

42. What is the value of $\Sigma(2i + 1)$ from $i = 1$ to $i = 5$?

- A. 25
- B. 30
- C. 35
- D. 40

43. In a geometric sequence, the first term is 5 and the common ratio is 2. What is the sum of the first 4 terms?

- A. 40
- B. 55
- C. 65
- D. 75

44. If $\tan \alpha = 4/3$ and α is in the first quadrant, what is $\sec \alpha$?

A. $3/4$

B. $4/5$

C. $5/4$

D. $5/3$

45. A parabola has the equation $y = -2(x - 3)^2 + 8$. What is the vertex of this parabola?

A. $(-3, 8)$

B. $(3, -8)$

C. $(-3, -8)$

D. $(3, 8)$

Reading

TIME: 40 minutes for 36 questions

DIRECTIONS: Each of the four passages in this section is followed by ten questions. Answer each question based on what is stated or implied in the passage and shade the corresponding oval on your answer sheet.

PASSAGE I — LITERARY NARRATIVE

This passage is adapted from a novel about a young architect discovering her grandfather's legacy.

The blueprints arrived on a Thursday morning, packed in a tube so old the cardboard had softened to the texture of cloth. My mother handed them to me across the kitchen table with the same careful neutrality she'd perfected over the years when discussing anything related to my grandfather.

"These were in your grandfather's storage unit," she said. "The facility is closing. I thought you might want them before they're thrown out."

I'd never met my grandfather. He died three months before I was born, and my mother rarely spoke of him except in fragments—he was demanding, he was brilliant, he worked too much, he expected perfection. The narrative was consistent enough that I'd constructed an image of a man I was probably better off never knowing. Yet here I was, at twenty-six, about to finish my master's in architecture, and I'd never seen his work.

I unrolled the first sheet carefully. The paper was yellowed, brittle at the edges, but the lines were still sharp, drawn with the precision of someone who understood that a building existed first in the mind, then on paper, and only finally in steel and concrete. It was a house—but not just any house. The design was extraordinary, a modernist structure that seemed to float above its foundation, all glass and light and impossible angles that somehow resolved into harmony.

"What building is this?" I asked.

My mother didn't look up from her coffee. "It was never built. He designed it for us—for your grandmother, your uncle, and me. We were supposed to move there after he finished his big commission downtown. But then..." She trailed off, and I knew the rest. Then came the car accident. Then came the funeral. Then came decades of silence.

I spread the remaining blueprints across the table. There were dozens of sheets: elevations, sections, detail drawings of custom fixtures, even sketches of the landscape design. Every page revealed new layers of thought, new solutions to problems I was only beginning to understand in my own studies. The house was positioned to capture morning light in the bedrooms and afternoon sun in the living spaces. The roof angles directed rainwater into a series of gardens that would have created a microclimate around the structure. There were built-in bookshelves sized specifically for children, window seats positioned to frame particular trees on the lot, a studio space that opened entirely to the outdoors.

It wasn't just a house. It was **a love letter, rendered in ink and geometry.**

"He was planning this for you?" The question came out softer than I'd intended.

"He was always planning something," my mother said, but her voice had lost its defensive edge. "That was the problem, really. He was so focused on the future—the next design, the next award, the next building—that he sometimes forgot to be present for what was right in front of him." She finally looked at me. "But when he was there, when he was actually with us, it was like being the center of the universe. He made you feel like you were the only person who mattered."

I studied the blueprints more closely. In the margins, I found notes written in neat, precise handwriting. "Sarah's room—orient toward morning sun. She loves watching birds." Sarah was my mother. "Martin's room—northern light for reading. Double windows for airflow." Martin was my uncle, who died when I was five. "Garden terrace for Ellen's herbs." Ellen was my grandmother, gone ten years now.

He'd been paying attention after all. Every detail of this unbuilt house demonstrated an intimate knowledge of the people he'd designed it for. He'd known his daughter woke early and loved birds. He'd known his son was an insomniac who read by lamplight. He'd known his wife cooked with fresh herbs. The house was an **archive** of observation, proof that he'd been there, watching, remembering, loving in the only language he truly spoke fluently.

"Why wasn't it built?" I asked. "After he died, I mean. Grandmother had the plans."

My mother's laugh was sharp. "Your grandmother couldn't bear it. Every time she looked at these drawings, she saw everything they'd lost. It was easier to leave them in storage, to forget they existed. She remarried when your uncle and I were still in high school. We moved to a different state. The blueprints just... stayed behind."

I traced the outline of the house with my finger, imagining it into existence. In my mind, I could see light streaming through those carefully positioned windows, could feel the flow from room to room, could understand the way the structure would have shaped the daily rhythms of the family living inside it.

"I want to build it," I said.

My mother finally smiled, really smiled, for the first time since I'd arrived that morning. "He would have loved that. He would have loved you."

That afternoon, I photographed every sheet, uploaded them to my computer, and began the work of translation—converting these analog dreams into digital reality. As I redrew each line, I felt a strange communion with the grandfather I'd never known. We spoke the same language after all, this vocabulary of space and light, of form following function, of buildings that sheltered not just bodies but souls.

The house on those blueprints was forty years out of date. Building codes had changed. Materials had evolved. What felt modern in 1985 might seem dated now. But the core idea—that a home should be designed around the specific humans who would inhabit it, that architecture could be both radical and intimate—that was timeless.

I decided to build it **not as he'd drawn it, but as he would have drawn it if he were designing it today**, for my own family someday. It would be my thesis project, my inheritance, my way of saying that I'd heard the message encoded in those blueprints: pay attention, love specifically, build something that outlasts you.

1. The narrator's mother initially presents the blueprints with "careful neutrality" primarily because:

- A. she wants to hide her excitement about the narrator seeing them.
- B. she has unresolved complex feelings about her father.

- C. she believes the blueprints are worthless.
- D. she doesn't want to influence the narrator's opinion of architecture.

2. According to the passage, what was the narrator's understanding of her grandfather before seeing the blueprints?

- A. He was a loving family man who prioritized relationships over work.
- B. He was a mediocre architect who never achieved success.
- C. He was a demanding perfectionist who worked excessively.
- D. He was a warm and caring person who died tragically young.

3. The house design can best be characterized as:

- A. a simple, practical structure focused on efficiency.
- B. a traditional design reflecting conventional architectural styles.
- C. a modernist structure incorporating thoughtful, personalized details.
- D. an experimental building that prioritized aesthetics over function.

4. The phrase "a love letter, rendered in ink and geometry" suggests that the narrator views the blueprints as:

- A. merely technical documents without emotional significance.
- B. evidence of her grandfather's professional skill.
- C. an expression of affection through architectural design.
- D. proof that her grandfather loved writing more than building.

5. According to the passage, why did the narrator's grandmother never build the house after her husband died?

- A. She couldn't afford the construction costs.
- B. She found the design architecturally flawed.
- C. The blueprints were too painful a reminder of her loss.
- D. She preferred to live in a different style of home.

6. The marginal notes on the blueprints ("Sarah's room—orient toward morning sun. She loves watching birds") primarily demonstrate that the grandfather:

- A. was obsessively controlling about minor details.
- B. had carefully observed and understood his family members' habits and preferences.
- C. planned to force his design preferences onto his family.
- D. was more interested in birds and nature than in people.

7. The word "archive" most nearly means:

- A. a collection of old documents.
- B. a storage facility.
- C. a preserved record or repository.
- D. a forgotten memory.

8. The narrator's decision to build the house "not as he'd drawn it, but as he would have drawn it if he were designing it today" suggests that she:

- A. thinks her grandfather's original design was fundamentally flawed.
- B. wants to honor the underlying principles rather than replicate the exact details.
- C. lacks confidence in her ability to build the original design.
- D. believes modern architecture is superior to 1985 design.

9. Which of the following best describes the passage's central theme?

- A. The importance of preserving historical architectural documents.
- B. The tension between professional ambition and family obligations.
- C. The ways people express love and how those expressions can transcend time.
- D. The superiority of modern architectural techniques over traditional methods.

PASSAGE II — SOCIAL SCIENCE

This passage is adapted from an article about the psychology and economics of gift-giving.

Every December, economists and psychologists observe the same curious phenomenon: billions of dollars change hands in transactions that, by standard economic theory, make no rational sense. People spend money to purchase items they believe recipients want, even though those recipients could more efficiently purchase exactly what they want themselves. Gift-giving, from a purely economic standpoint, is what researchers call a "deadweight loss"—a destruction of value where the giver spends money on something the recipient values less than the purchase price.

Yet gift-giving persists across virtually all human cultures and has done so for millennia. This suggests that the economic model is missing something crucial about why we give gifts and what makes them valuable.

The economic critique of gift-giving was most famously articulated by economist Joel Waldfogel in a 1993 paper titled "The Deadweight Loss of Christmas." Waldfogel surveyed college students about gifts they'd received and asked them to estimate both what the giver had spent and what they themselves would have paid for the item if purchasing it for themselves. On average, recipients valued gifts at only 80-90% of what givers had spent, suggesting a loss of value of 10-20% per gift. Extrapolating to holiday spending nationally, Waldfogel calculated that billions of dollars in value were being destroyed annually through inefficient gift exchanges.

His solution? Give cash instead. Cash allows recipients perfect freedom to purchase exactly what they want, eliminating deadweight loss. Or better yet, simply spend the money on yourself—same outcome, less wrapping paper.

This advice, however sensible it might sound in economic terms, strikes most people as profoundly wrong. We intuitively understand that giving someone fifty dollars in an envelope is less meaningful than giving them a fifty-dollar gift, even if that gift is something they would never have purchased for themselves.

There's a reason "here's cash" doesn't appear in romantic comedies as the gesture that wins someone's heart.

The psychological research on gift-giving helps explain this gap between economic theory and human behavior. Psychologist Ernest Dichter identified three key symbolic functions of gifts: gifts as expressions of love and appreciation, gifts as **social lubricants** that maintain relationships, and gifts as reflections of the giver's identity and taste. Under this framework, the economic value of the object is almost beside the point. What matters is what the exchange communicates.

Consider two scenarios. In Scenario A, your partner gives you cash on your birthday with instructions to buy yourself something nice. In Scenario B, your partner gives you a book they carefully selected because it relates to a conversation you had three months ago about a topic you're passionate about. Even if the book costs less than the cash amount, most people would find Scenario B more emotionally meaningful. Why? Because it demonstrates attention, memory, and effort—all signals that you matter to the giver.

This "signaling theory" of gifts has been developed by economists and anthropologists who recognize that gifts function as information. A thoughtful gift signals that the giver has invested time and cognitive effort in understanding the recipient. The very inefficiency that Waldfogel identified—the fact that givers must expend effort to select something the recipient values—becomes the source of the gift's meaning. Easy gifts, like cash, signal less investment and therefore less caring.

Anthropologist David Graeber extended this analysis by examining gift-giving across cultures. He found that in many societies, gifts create ongoing relationships of mutual obligation rather than closed transactions. When someone gives you a gift, you're now in their debt—not in a financial sense, but in a social sense. You're expected to reciprocate, but not immediately and not with exact equivalence. This creates a web of ongoing social ties, with gifts serving as the threads that bind communities together.

This insight helps explain phenomena that puzzle economists, like why people continue giving gifts even to those who have more money than they do. Your wealthy uncle doesn't need your homemade cookies from an economic standpoint, but the exchange isn't economic—it's social. The cookies say "I thought of you, I made an effort, I want to maintain our relationship." The gift's economic inefficiency is actually proof of its sincerity. Anyone can click "buy now" on an expensive item, but homemade cookies require personal time and effort.

However, gift-giving becomes complicated when it occurs in contexts with power imbalances. Gifts from employers to employees, from wealthy donors to nonprofits, or from corporations to politicians often come with implicit expectations of reciprocity that blur the line between gift and payment. The recipient

of such gifts may feel obligated to provide something in return—loyalty, favorable treatment, or access—creating what sociologists call "gift debt." This is why many organizations have strict policies about what gifts employees can accept.

Recent research has also examined how cultural differences affect gift-giving norms. In many Asian cultures, for instance, gifts are often given and received with both hands as a sign of respect, and the recipient typically doesn't open the gift immediately. In contrast, American culture often encourages opening gifts immediately in front of the giver, with enthusiastic expressions of gratitude. These different norms can create awkward cross-cultural situations where a gift given with one set of expectations is received with another.

The rise of gift registries represents an interesting hybrid between economic efficiency and social meaning. Registries allow givers to purchase items the recipient actually wants (increasing economic efficiency) while still maintaining the social ritual of gift exchange. The giver still expends effort in selecting from the registry options, traveling to make the purchase or navigating online systems, and presenting the gift in wrapped form. The registry system acknowledges both the economic critique (gifts should be wanted) and the social reality (gifts should still feel like gifts, not cash).

Perhaps the most interesting finding from recent research is that givers and recipients often have different preferences. Givers tend to prefer giving "desirable" gifts—exciting, luxurious items recipients might not buy themselves. Recipients, however, often prefer "feasible" gifts—practical items they actually need. This mismatch explains why someone might give an exciting kitchen gadget when the recipient would have preferred dish soap.

The resolution to the economic "puzzle" of gift-giving lies in recognizing that gifts operate in multiple economies simultaneously. In the market economy, a gift that costs \$50 but is valued at \$40 by the recipient represents a loss. But in the social economy, that same gift creates value through its symbolic meaning, its signaling of relationships, and its creation of social bonds. The thoughtful gift that required time and effort to select, even if economically inefficient, enriches both giver and receiver in ways that cash cannot.

Gift-giving endures not despite its economic inefficiency but partly because of it. The very act of accepting some loss of economic value to honor a social relationship is what makes gift-giving meaningful. When we give gifts, we're not trying to maximize economic utility—we're trying to say "you matter to me" in a language that transcends price tags.

10. According to the passage, economist Joel Waldfogel's critique of gift-giving is based on the finding that:

- A. people prefer receiving cash over receiving physical gifts.
- B. gift-givers usually spend more money than they can afford.
- C. recipients typically value gifts at less than what givers spent.
- D. most gifts are returned to stores after the holidays.

11. The passage indicates that Waldfogel's proposed solution to the "deadweight loss" problem was to:

- A. establish gift registries that specify exactly what recipients want.
- B. give cash instead of physical gifts to maximize efficiency.
- C. purchase only practical gifts that recipients clearly need.
- D. eliminate holiday gift-giving traditions entirely.

12. The phrase "social lubricants" most nearly means:

- A. expensive gifts that display wealth.
- B. items that facilitate smooth social interactions and maintain relationships.
- C. gifts that make people uncomfortable.
- D. practical household products.

13. The example comparing a cash gift to a carefully selected book is used primarily to illustrate:

- A. that books are always better gifts than money.
- B. the importance of considering price when selecting gifts.
- C. how attention and effort signal caring more than monetary value.
- D. why people should avoid giving cash as gifts.

14. According to the passage, "signaling theory" suggests that thoughtful gifts are valuable because they:

- A. are always more expensive than cash gifts.
- B. demonstrate the giver's investment of time and cognitive effort.
- C. force recipients to reciprocate with equally expensive gifts.
- D. prevent misunderstandings in relationships.

15. The passage suggests that anthropologist David Graeber's research revealed that gifts primarily function to:

- A. maximize economic efficiency in transactions.
- B. display the wealth and status of the giver.
- C. create ongoing relationships and social obligations.
- D. ensure that recipients receive exactly what they need.

16. According to the passage, gift-giving in contexts with power imbalances becomes problematic because:

- A. expensive gifts are wasteful when given to wealthy individuals.
- B. recipients may feel obligated to provide favors or special treatment in return.
- C. such gifts violate economic principles of efficiency.
- D. powerful people don't need or want additional possessions.

17. The passage indicates that cultural differences in gift-giving norms can create difficulties when:

- A. people from different cultures have different amounts of money.
- B. gifts are given with one set of expectations but received with another.
- C. some cultures value efficiency more than others.
- D. recipients prefer cash gifts over physical items.

18. The passage's conclusion about why gift-giving endures suggests that:

- A. people are irrational and fail to understand economic principles.
- B. gifts create value in social relationships that transcends economic efficiency.
- C. gift-giving will eventually be replaced by more efficient cash exchanges.
- D. economists have successfully explained all aspects of gift-giving behavior.

PASSAGE III — HUMANITIES

This passage is adapted from an essay about the influence of Japanese aesthetics on Western art.

In 1856, the French artist Félix Bracquemond discovered a volume of Hokusai's *Manga*—a collection of sketches depicting everything from landscapes to caricatures—used as packing material around a shipment of ceramics from Japan. This chance discovery sparked what would become one of the most significant aesthetic movements of the 19th century: Japonisme, the widespread European fascination with Japanese art and design.

For centuries, Japan had maintained a policy of near-total isolation from the West, making its art virtually unknown in Europe. When Japan opened to trade in the 1850s, a flood of artworks—woodblock prints, textiles, ceramics, screens—entered European markets. Artists accustomed to Western academic traditions encountered an entirely different aesthetic vocabulary, one that would fundamentally reshape their understanding of composition, color, and subject matter.

What made Japanese art so revolutionary to Western eyes? The differences were profound. European academic art of the mid-19th century emphasized realistic perspective, with compositions organized around a central vanishing point that created the illusion of three-dimensional space on a two-dimensional surface. Compositions were typically balanced and symmetrical, with the most important elements placed centrally. Color was used to enhance realism, with careful attention to light source and shadow.

Japanese prints, by contrast, employed flattened perspective, bold outlines, and asymmetrical compositions. Empty space—called *ma*—was treated as an active compositional element rather than simply the absence of objects. Colors were often applied in flat, unmodulated areas rather than blended to suggest volume and depth. Subject matter ranged from the elevated to the mundane: a famous warrior might appear alongside images of actors, courtesans, or ordinary people engaged in everyday activities.

The influence of these different approaches appeared quickly in European art. Claude Monet, who collected hundreds of Japanese prints, incorporated asymmetrical compositions and flattened picture

planes into his work. His paintings of water lilies, for instance, often eliminate the horizon line entirely, creating an all-over composition reminiscent of Japanese screens. Vincent van Gogh copied Japanese prints directly and wrote enthusiastically to his brother about how they had "opened his eyes" to new possibilities. His famous Portrait of Père Tanguy literally surrounds the subject with Japanese prints, as if acknowledging their influence.

Perhaps the most profound impact was on composition itself. Western academic training taught artists to organize paintings around a central focus, with subsidiary elements arranged to direct the viewer's eye toward that focal point. Japanese prints demonstrated that a composition could be organized asymmetrically, with important elements placed off-center or even cropped by the frame's edge. This was particularly evident in works by ukiyo-e masters like Hiroshige and Hokusai, whose landscapes might feature a massive wave dominating the foreground while Mount Fuji appeared small and distant, or a bridge extending beyond the picture frame, implying a world continuing beyond what we can see.

This cropping and asymmetry influenced Western artists' use of the frame itself. Mary Cassatt, one of the few American artists to experiment extensively with Japonisme, adopted the Japanese approach of cropping figures at the edge of the composition, creating a sense of captured moments rather than posed scenes. Edgar Degas, influenced by both Japanese prints and the new medium of photography, frequently cut off dancers' bodies at unusual angles, challenging the conventional completeness of Western composition.

The Japanese concept of *ma*—often translated inadequately as "negative space"—proved particularly influential. In Western art, empty areas were typically treated as background, spaces to be filled or at least subordinated to the main subject. Japanese aesthetics treated emptiness as a positive force, as essential to the composition as the marks themselves. A single bird on a vast expanse of paper, a lone branch against an empty sky—these compositions suggested that what was not shown was as important as what was.

This had profound implications beyond visual composition. The Japanese aesthetic valued suggestion over declaration, restraint over excess, simplicity over ornament. A great artwork didn't explain everything—it left space for the viewer's imagination. This philosophy resonated with European artists seeking alternatives to academic art's demand for narrative clarity and moral instruction.

However, it's crucial to acknowledge that Japonisme involved significant misunderstanding and appropriation. European artists often romanticized Japan as an exotic, timeless culture, ignoring the reality that Japanese art itself was rapidly modernizing and incorporating Western influences. The Japanese prints flooding European markets in the 1860s and 1870s were not ancient artifacts but contemporary popular culture—the equivalent of posters or magazine illustrations. Europeans collected them as fine art while, in Japan, they were considered ephemeral commercial products.

Moreover, European artists often extracted specific techniques or motifs from Japanese art without understanding their cultural contexts. A cherry blossom motif carried deep associations with transience and mortality in Japanese culture, but European artists might simply view it as decorative. This selective borrowing created a "Japan" that existed largely in European imagination—a aesthetic resource to be mined rather than a culture to be understood.

Despite these problematic aspects, Japonisme's influence on Western art was undeniable and lasting. The Impressionists' emphasis on capturing fleeting moments rather than constructing narrative tableaux, the Post-Impressionists' use of flat color and expressive line, the Art Nouveau movement's flowing organic forms—all bore traces of Japanese aesthetic principles. Even modern graphic design owes debts to Japanese composition, with its comfortable acceptance of asymmetry, negative space, and cropped elements.

The exchange was not one-directional. As European artists absorbed Japanese influences, Japanese artists were simultaneously studying Western techniques, particularly oil painting and linear perspective. This cross-pollination produced artists like Kuroda Seiki, who synthesized Western painting techniques with Japanese sensibilities, and later, the Superflat movement of contemporary Japanese art, which explicitly referenced both traditional Japanese aesthetics and Western pop art.

Today, when asymmetrical layouts, flat graphic design, and negative space are ubiquitous in visual culture, it's easy to forget how revolutionary these approaches once seemed. The encounter between Japanese and Western aesthetics in the late 19th century reminds us that artistic innovation often comes from crossing cultural boundaries, even when that crossing is imperfect, complicated by power imbalances and misunderstanding. What remains is a fundamentally expanded visual vocabulary, one that continues to shape how we see and represent the world.

19. The main purpose of the passage is to:

- A. criticize European artists for appropriating Japanese culture.
- B. explain how Japanese art influenced Western artistic practices.
- C. argue that Japanese art is superior to Western art.
- D. describe the history of trade between Japan and Europe.

20. According to the passage, European academic art in the mid-19th century typically featured:

- A. asymmetrical compositions with empty space as an active element.
- B. flat colors applied in unmodulated areas.
- C. realistic perspective organized around a central vanishing point.
- D. cropped figures extending beyond the picture frame.

21. As it is used in line 30, the term *ma* refers to:

- A. a type of Japanese painting technique.
- B. empty space treated as an active compositional element.
- C. the signature of Japanese artists.
- D. a tool used to create woodblock prints.

22. The passage suggests that Claude Monet's water lily paintings were influenced by Japanese art through his use of:

- A. realistic perspective and central focal points.
- B. narrative clarity and moral instruction.
- C. asymmetrical compositions and eliminated horizon lines.
- D. bright colors and dramatic shadows.

23. According to the passage, which aspect of Japanese prints most directly challenged Western conventions about composition?

- A. The use of watercolor instead of oil paint.
- B. The placement of important elements off-center or cropped by the frame.
- C. The depiction of religious rather than secular subjects.
- D. The emphasis on portraits rather than landscapes.

24. The passage indicates that European artists' understanding of Japanese art was problematic because they:

- A. paid too much money for prints that were inexpensive in Japan.
- B. tried to replicate Japanese techniques with perfect accuracy.
- C. romanticized Japan and extracted techniques without cultural understanding.
- D. refused to acknowledge Japanese influence on their work.

25. The passage's discussion of cherry blossom motifs serves to illustrate:

- A. the superior symbolic depth of Japanese culture.
- B. how European artists misunderstood cultural meanings behind visual elements.
- C. the importance of flowers in both Japanese and European art.
- D. why cherry blossoms became popular decorative elements.

26. According to the passage, the influence of Japanese aesthetics on Western art can be seen in:

- A. the Impressionists' focus on capturing fleeting moments.
- B. a return to religious themes in painting.
- C. increased use of dark colors and dramatic lighting.
- D. more emphasis on realistic human anatomy.

27. The passage suggests that the artistic exchange between Japan and Europe was:

- A. completely one-directional, with only Western artists benefiting.
- B. perfectly balanced, with equal influence in both directions.
- C. bidirectional, with artists in both cultures studying each other's techniques.
- D. harmful to both Japanese and Western artistic traditions.

PASSAGE IV — NATURAL SCIENCE

This passage is adapted from an article about the science of sleep and circadian rhythms.

For most of human history, the boundaries between sleep and wakefulness seemed obvious: when the sun set, people slept; when it rose, they woke. Yet modern research into sleep architecture and circadian biology reveals that this apparently simple process is orchestrated by an intricate system involving multiple brain regions, hormones, and even individual cells throughout the body that maintain their own molecular clocks.

At the center of sleep regulation lies the suprachiasmatic nucleus (SCN), a tiny cluster of approximately 20,000 neurons located in the hypothalamus, just above where the optic nerves cross. The SCN serves as the body's master clock, coordinating circadian rhythms—the roughly 24-hour cycles that govern everything from body temperature to hormone release to cognitive performance. What makes the SCN remarkable is its autonomy: even when isolated from the brain in laboratory conditions, SCN tissue continues to generate rhythmic electrical activity with a period of approximately 24 hours.

The SCN receives information about environmental light levels directly from the retina through a dedicated neural pathway. Specialized cells in the retina called intrinsically photosensitive retinal ganglion cells (ipRGCs) contain melanopsin, a photopigment that responds particularly strongly to blue light. These cells don't contribute to conscious vision; instead, they provide the SCN with information about ambient light levels, allowing the master clock to synchronize with the external day-night cycle—a process called entrainment.

This explains why blue light from electronic screens can be particularly disruptive to sleep. The wavelengths emitted by smartphones, tablets, and computer monitors closely match the peak sensitivity of melanopsin, essentially telling the SCN that it's still daytime even when it's late evening. This delays the release of melatonin, a hormone produced by the pineal gland that promotes sleepiness, making it harder to fall asleep at the desired time.

But the SCN is only the conductor of the circadian orchestra. Throughout the body, virtually every cell contains clock genes that regulate their own circadian rhythms. These peripheral clocks influence local biological functions: liver cells adjust metabolism based on when food is typically consumed, muscle cells optimize performance for typical activity times, immune cells vary their responsiveness over 24 hours. The SCN keeps these distributed clocks synchronized through hormonal signals and body temperature fluctuations, but the peripheral clocks can also respond directly to local cues like meal timing.

This distributed system explains why jet lag feels so disruptive. When you fly across multiple time zones, your SCN can adjust relatively quickly to the new light-dark cycle—usually shifting by about one hour per day. However, your peripheral clocks adjust more slowly, particularly if your meal times and activity patterns don't align with local time. This internal desynchronization—different clocks in different parts of your body telling different times—produces the malaise, digestive issues, and cognitive impairment characteristic of jet lag.

Sleep itself consists of multiple stages that cycle throughout the night. Non-REM sleep includes three stages, from light sleep (Stage 1) through deeper sleep (Stage 2) to the deepest, most restorative slow-wave sleep (Stage 3). During slow-wave sleep, brain waves synchronize into large, slow oscillations, heart rate and breathing slow dramatically, and growth hormone is released. This is when the brain appears to clear metabolic waste products through the recently discovered glymphatic system—a network of channels that flushes cerebrospinal fluid through brain tissue, clearing out the molecular detritus accumulated during waking hours.

REM (Rapid Eye Movement) sleep, by contrast, looks physiologically similar to wakefulness. The brain becomes highly active, eyes move rapidly beneath closed lids, and vivid dreams typically occur. However, the body enters a state of temporary paralysis (except for eye movements and diaphragm function), perhaps to prevent us from acting out dreams. REM sleep appears crucial for memory consolidation, particularly for procedural memories and emotional processing. Studies show that people learning new motor skills show improvements after a night of sleep, with the magnitude of improvement correlating with time spent in REM.

A typical night's sleep cycles through these stages approximately every 90 minutes, but the proportion of time spent in each stage shifts across the night. Early sleep cycles contain more slow-wave sleep, while REM periods lengthen in the later cycles. This architecture matters: when sleep is cut short, you lose disproportionately more REM sleep, which predominates in the final hours of sleep. This may partly explain why many people who routinely get insufficient sleep report having fewer dreams—they're missing the REM-rich portion of their sleep.

Individual variation in sleep needs and circadian rhythms is substantial and has a genetic component. Some people are genuine "morning larks," naturally inclined to wake early and perform best in morning hours. Others are "night owls," with circadian systems that run longer than 24 hours and naturally prefer later sleep and wake times. This isn't a choice or a habit—it's written into the genetics of their clock genes. Studies of twins raised apart show that circadian preference has a heritability of about 50%, similar to height.

This genetic variation creates tension with societal schedules that privilege morning activities. Adolescents experience a natural shift toward later circadian phases during puberty—the biology of a typical teenager makes it genuinely difficult to fall asleep before 11 PM and wake before 8 AM. Yet many high schools start at 7:30 AM or earlier, forcing chronically sleep-deprived teenagers to attempt learning during what is, for their biology, the middle of the night. Research on schools that have shifted to later start times shows improvements in attendance, academic performance, and reduced car accidents among teen drivers—all consequences of allowing sleep-wake timing to align more closely with biology.

Modern life poses unprecedented challenges to sleep. Electric lighting allows us to extend waking hours far beyond sunset. Shift work requires people to stay awake during hours when their biology demands sleep. International travel can cause sudden 8+ hour shifts in required sleep timing. Electronic devices emit sleep-disrupting blue light while delivering stimulating content right before bed. Perhaps most importantly, cultural attitudes often treat sleep as negotiable or even a sign of laziness, despite growing evidence that chronic sleep restriction has serious health consequences.

Research has linked insufficient sleep to increased risks of obesity, diabetes, cardiovascular disease, and even Alzheimer's disease. The glymphatic system that clears metabolic waste during sleep may be particularly important for removing beta-amyloid proteins that accumulate in Alzheimer's. Sleep loss also impairs immune function, with studies showing that people who sleep less than six hours per night are four times more likely to catch a cold when exposed to the virus compared to those sleeping seven hours or more.

Despite these findings, many people still view sleep as time wasted—hours that could be spent working, socializing, or engaging in entertainment. Yet emerging research suggests that adequate sleep may be one of the most productive things we can do. Sleep consolidates memories, promotes creative problem-solving, regulates emotions, and maintains physical health. Far from being an optional luxury, sleep appears to be a biological necessity as fundamental as food or water.

Understanding the science of sleep—from the molecular clocks in individual cells to the architectural patterns of sleep stages—provides compelling reasons to prioritize sleep in our 24/7 culture. The boundaries between sleep and wakefulness may be more complex than our ancestors realized, but the fundamental need for adequate, properly-timed sleep remains unchanged.

28. The main purpose of the passage is to:

A. argue that modern society should eliminate all forms of artificial lighting.

- B. explain the biological mechanisms underlying sleep and circadian rhythms.
- C. prove that everyone needs exactly eight hours of sleep per night.
- D. describe the history of scientific research on sleep.

29. According to the passage, the suprachiasmatic nucleus (SCN) functions as:

- A. the part of the brain responsible for creating dreams.
- B. the body's master clock that coordinates circadian rhythms.
- C. the hormone that promotes sleepiness at night.
- D. the genetic component that determines sleep needs.

30. The passage indicates that intrinsically photosensitive retinal ganglion cells (ipRGCs):

- A. create the visual images we see consciously.
- B. produce melatonin to promote sleep.
- C. respond to blue light and provide the SCN with light level information.
- D. coordinate peripheral clocks throughout the body.

31. According to the passage, blue light from electronic screens disrupts sleep by:

- A. directly damaging the suprachiasmatic nucleus.
- B. causing permanent changes to clock genes.
- C. signaling to the SCN that it's still daytime, delaying melatonin release.
- D. preventing REM sleep from occurring.

32. The passage suggests that jet lag feels particularly disruptive because:

- A. the SCN stops functioning properly during air travel.

- B. different clocks throughout the body adjust to new time zones at different rates.
- C. melatonin production stops completely when crossing time zones.
- D. peripheral clocks adjust faster than the SCN.

33. Based on the passage, slow-wave sleep (Stage 3) is characterized by:

- A. rapid eye movements and vivid dreaming.
- B. temporary paralysis and emotional processing.
- C. synchronized slow brain waves and metabolic waste clearance.
- D. light sleep from which people easily awaken.

34. According to the passage, REM sleep appears to be particularly important for:

- A. physical growth and tissue repair.
- B. memory consolidation and emotional processing.
- C. regulating body temperature.
- D. clearing metabolic waste products.

35. The passage indicates that the natural shift in adolescent sleep timing during puberty:

- A. is caused by poor sleep habits and excessive screen time.
- B. can be easily changed through discipline and willpower.
- C. has a biological basis that makes early morning waking genuinely difficult.
- D. affects only a small minority of teenagers.

36. According to the passage, chronic sleep restriction has been linked to all of the following health consequences EXCEPT:

- A. increased risk of obesity and diabetes.

- B. improved immune function and resistance to illness.
- C. cardiovascular disease.
- D. potential increased risk of Alzheimer's disease.

Science (Optional)

TIME: 40 minutes for 40 questions

DIRECTIONS: Following are seven passages and then questions that refer to each passage. Choose the best answer and shade in the corresponding oval on your answer sheet

PASSAGE I – RESEARCH SUMMARY

The Effect of Caffeine on Reaction Time

A team of psychologists investigated whether caffeine consumption affects reaction time. They hypothesized that caffeine would decrease (improve) reaction times by increasing alertness and focus.

Experiment 1

Twenty participants with low caffeine tolerance (defined as consuming less than 100 mg of caffeine per week) were recruited for the study. Each participant's baseline reaction time was measured using a computer-based test where they pressed a button as quickly as possible when a visual stimulus appeared on screen. Each participant completed 50 trials, and the average reaction time was calculated.

Participants then consumed either 200 mg of caffeine (equivalent to approximately two cups of coffee) or a placebo drink that looked and tasted similar but contained no caffeine. Neither the participants nor the researchers administering the test knew which drink each participant received (double-blind design).

Thirty minutes after consuming their assigned drink, participants repeated the reaction time test under identical conditions. The results showed that participants who consumed caffeine had an average reaction time improvement of 45 milliseconds (ms), meaning their reactions became faster. Participants who consumed the placebo showed an average improvement of only 8 ms, which researchers attributed to practice effects from taking the test a second time.

Experiment 2

To determine if caffeine tolerance affects the results, researchers repeated the experiment with twenty different participants who were regular caffeine consumers (consuming more than 300 mg of caffeine daily). These participants followed the same protocol as Experiment 1.

Results showed that regular caffeine consumers who received the 200 mg caffeine dose improved their reaction times by an average of only 12 ms, while those who received the placebo showed no improvement (0 ms change). This suggested that regular consumers had developed tolerance to caffeine's effects.

Experiment 3

Researchers wanted to test whether higher caffeine doses would show effects in regular consumers. They recruited twenty new regular caffeine consumers and tested them with either 400 mg of caffeine or a placebo, using the same protocol as previous experiments.

Participants who received 400 mg of caffeine improved their reaction times by an average of 28 ms. Those who received the placebo showed an average improvement of 5 ms. Additionally, participants in the high-dose caffeine group reported side effects including jitteriness, increased heart rate, and difficulty concentrating, which may have limited the improvement in reaction time despite the higher dose.

1. What was the independent variable in Experiment 1?
 - A. Whether participants received caffeine or placebo
 - B. The reaction time measurement
 - C. The number of trials completed
 - D. The participants' caffeine tolerance level

2. Based on Experiment 1, what was the approximate improvement in reaction time for low-tolerance participants who received caffeine compared to those who received placebo?
 - A. 8 ms
 - B. 37 ms
 - C. 45 ms

D. 53 ms

3. The researchers used a double-blind design in which neither participants nor test administrators knew who received caffeine. What is the most likely reason for this design choice?

- A. To save time during the experiment
- B. To reduce bias and placebo effects
- C. To increase the caffeine dose safely
- D. To ensure all participants received the same treatment

4. Based on the results from Experiments 1 and 2, which conclusion is most supported?

- A. Caffeine has no effect on reaction time regardless of tolerance
- B. Regular caffeine consumption eliminates all cognitive benefits of caffeine
- C. Low-tolerance individuals show greater reaction time improvement from caffeine than regular consumers
- D. Higher doses of caffeine always produce better results

5. In Experiment 2, why did participants who received the placebo show 0 ms improvement while Experiment 1 placebo participants showed 8 ms improvement?

- A. The placebo used in Experiment 2 was different
- B. Regular consumers were already performing at peak levels, minimizing practice effects
- C. The passage doesn't provide enough information to determine the reason
- D. Regular consumers had slower baseline reaction times

6. The side effects reported in Experiment 3 (jitteriness, increased heart rate, difficulty concentrating) suggest that:

- A. 400 mg is too high a dose for any participant

- B. very high caffeine doses may produce negative effects that limit cognitive benefits
- C. regular consumers should never consume additional caffeine
- D. side effects always improve reaction time

7. If researchers wanted to test whether the time of day affects caffeine's impact on reaction time, what would be the best experimental design?

- A. Test all participants at different times of day with the same caffeine dose
- B. Give different caffeine doses at the same time of day
- C. Use only regular caffeine consumers
- D. Measure reaction time without any caffeine

PASSAGE II – RESEARCH SUMMARY

Plant Growth and Soil pH

Soil pH (acidity or alkalinity) can significantly affect plant growth by influencing nutrient availability. A botanist conducted a series of experiments to determine how different pH levels affect the growth of tomato plants.

Experiment 1

The botanist prepared six large containers of soil, each adjusted to a different pH level: 4.5, 5.5, 6.5, 7.0, 7.5, and 8.5. Soil pH of 7.0 is neutral; values below 7.0 are acidic, and values above 7.0 are alkaline. Five tomato seedlings of the same age and size were planted in each container and grown under identical conditions (same light, temperature, and water) for 8 weeks.

At the end of 8 weeks, the botanist measured the average height of the five plants in each container. Plants grown in pH 6.5 soil showed the greatest average height (45 cm), while plants in pH 4.5 soil averaged only 18 cm and plants in pH 8.5 soil averaged 22 cm. Plants grown in pH 5.5, 7.0, and 7.5 soils showed intermediate heights of 32 cm, 41 cm, and 35 cm respectively.

Experiment 2

To investigate why plants performed poorly at extreme pH levels, the botanist tested soil nutrient availability at different pH levels. Using the same soil containers from Experiment 1, the botanist extracted soil samples and measured the concentration of available nitrogen, phosphorus, and potassium—three nutrients essential for plant growth.

Results showed that nitrogen availability remained relatively constant across all pH levels. However, phosphorus availability was highest at pH 6.5 and declined dramatically at pH levels below 6.0 or above 7.5. Potassium availability was high across pH 5.5-7.5 but very low at pH 4.5 and 8.5.

The botanist noted that the pattern of phosphorus and potassium availability closely matched the pattern of plant growth observed in Experiment 1.

Experiment 3

To test whether adding phosphorus fertilizer could improve growth at extreme pH levels, the botanist planted new tomato seedlings in pH 4.5 and pH 8.5 soils. Half of the plants at each pH level received weekly applications of phosphorus fertilizer, while the other half received only water.

After 8 weeks, plants grown in pH 4.5 soil with added phosphorus averaged 28 cm in height, compared to 18 cm for unfertilized plants at the same pH. Plants in pH 8.5 soil with added phosphorus averaged 31 cm, compared to 22 cm for unfertilized plants. While fertilization improved growth at extreme pH levels, these plants still did not grow as tall as plants in optimal pH 6.5 soil without any fertilizer.

8. Based on Experiment 1, at which soil pH did tomato plants show the greatest average height?

- A. 5.5
- B. 6.5
- C. 7.0
- D. 7.5

9. According to Experiment 2, which nutrient showed the most dramatic decline in availability at pH levels below 6.0?

- A. Nitrogen
- B. Phosphorus
- C. Potassium
- D. All nutrients declined equally

10. The botanist noted that phosphorus and potassium availability patterns "closely matched" plant growth patterns. This observation most directly supports which hypothesis?

- A. Nitrogen is the only nutrient important for tomato growth
- B. Limited phosphorus and potassium availability at extreme pH levels restricts plant growth
- C. Soil pH has no effect on nutrient availability
- D. Plants grow best in acidic soils

11. In Experiment 3, what was the purpose of having plants that received only water (no phosphorus fertilizer)?

- A. To save money on fertilizer costs
- B. To determine baseline growth at extreme pH without added nutrients
- C. To test whether water alone could improve growth
- D. To create acidic soil conditions

12. Based on all three experiments, which statement is best supported?

- A. Tomato plants can grow equally well at any pH level if given enough fertilizer
- B. Nitrogen availability is the primary factor limiting growth at extreme pH
- C. Optimal soil pH (around 6.5) maximizes nutrient availability and plant growth for tomatoes
- D. Alkaline soils are always better for plant growth than acidic soils

13. Why did plants in pH 4.5 and 8.5 soils with added phosphorus (Experiment 3) still not grow as tall as plants in pH 6.5 soil without fertilizer?

- A. The fertilizer was applied incorrectly
- B. Phosphorus was the only limiting nutrient at extreme pH, but potassium and possibly other factors also limited growth
- C. Plants in pH 6.5 soil received hidden fertilizer treatments
- D. The botanist measured heights incorrectly

14. If a gardener wanted to grow tomatoes and could only choose between pH 5.5 and pH 7.5 soil (without adding fertilizer), which should they choose based on Experiment 1?

- A. pH 5.5, because it produced taller plants (32 cm vs 35 cm)
- B. pH 7.5, because it produced taller plants (35 cm vs 32 cm)
- C. Either one, because they produced identical results
- D. Neither, because both are too extreme for any growth

PASSAGE III — DATA REPRESENTATION

Atmospheric Carbon Dioxide and Global Temperature

Scientists studying climate change have collected data on atmospheric carbon dioxide (CO₂) concentrations and global average temperature over the past 150 years. Table 1 shows this data at 20-year intervals.

Table 1: Atmospheric CO₂ and Global Temperature (1880-2020)

Year	Atmospheric CO ₂ (parts per million)	Global Average Temperature Anomaly (°C)
1880	290	-0.15
1900	295	-0.08
1920	303	-0.22
1940	310	+0.05
1960	317	-0.01
1980	339	+0.18

2000	370	+0.42
2020	415	+1.02

Temperature anomaly represents the difference from the 1951-1980 average. Positive values indicate warmer than average; negative values indicate cooler than average.

Table 2: CO₂ Sources and Natural Carbon Cycle

Process	Effect on Atmospheric CO ₂	Approximate Annual Amount (billion tons of carbon)
Plant photosynthesis	Removes CO ₂	120
Plant/soil respiration	Adds CO ₂	118
Ocean absorption	Removes CO ₂	92
Ocean release	Adds CO ₂	90
Human fossil fuel burning	Adds CO ₂	10
Deforestation	Adds CO ₂	1

Note: Natural processes (photosynthesis, respiration, ocean exchange) create a cycle where CO₂ is both added and removed. Before industrialization, these natural processes were roughly balanced.

15. According to Table 1, what was the atmospheric CO₂ concentration in 1960?

- A. 310 ppm
- B. 317 ppm
- C. 339 ppm
- D. 370 ppm

16. Based on Table 1, how did atmospheric CO₂ concentration change between 1880 and 2020?

- A. Decreased steadily
- B. Remained constant
- C. Increased steadily
- D. Increased then decreased

17. According to Table 1, what was the global temperature anomaly in 2020?

- A. +0.42°C
- B. +0.18°C
- C. +1.02°C
- D. +415°C

18. Based on Table 1, which statement best describes the relationship between CO₂ concentration and global temperature between 1880 and 2020?

- A. As CO₂ increased, temperature generally decreased
- B. As CO₂ increased, temperature generally increased
- C. CO₂ and temperature showed no relationship
- D. Temperature increased while CO₂ decreased

19. According to Table 2, which natural processes remove the most CO₂ from the atmosphere annually?

- A. Plant photosynthesis
- B. Ocean absorption
- C. Plant/soil respiration
- D. Ocean release

20. Based on Table 2, approximately how much carbon do human activities (fossil fuel burning and deforestation combined) add to the atmosphere annually?

- A. 1 billion tons
- B. 10 billion tons
- C. 11 billion tons
- D. 120 billion tons

21. According to Table 2, what is the approximate difference between natural CO₂ removal (photosynthesis + ocean absorption) and natural CO₂ addition (respiration + ocean release)?

- A. Removal exceeds addition by 10 billion tons
- B. Addition exceeds removal by 4 billion tons
- C. Removal exceeds addition by 4 billion tons
- D. They are exactly equal

22. Based on both tables, which statement is most consistent with the data?

- A. Natural processes alone explain the increase in atmospheric CO₂
- B. Human activities add relatively small amounts of CO₂, but natural removal processes haven't increased proportionally, leading to accumulation
- C. Ocean absorption has stopped entirely since 1880
- D. Temperature changes cause CO₂ changes, with no reverse effect possible

PASSAGE IV – RESEARCH SUMMARY

Antibiotic Resistance in Bacteria

Antibiotic resistance occurs when bacteria evolve mechanisms to survive exposure to antibiotics that would normally kill them. A microbiologist conducted experiments to understand how quickly bacteria develop resistance and what factors influence resistance development.

Experiment 1

The microbiologist started with a strain of *E. coli* bacteria known to be sensitive to the antibiotic ampicillin. She prepared culture dishes containing growth medium with varying concentrations of ampicillin: 0 µg/mL (no antibiotic), 1 µg/mL, 5 µg/mL, 10 µg/mL, and 20 µg/mL.

She then applied approximately 1 million bacteria to each dish and incubated them at 37°C for 24 hours. After incubation, she counted the number of bacterial colonies that survived on each dish.

At 0 $\mu\text{g}/\text{mL}$ ampicillin, hundreds of thousands of colonies grew (too numerous to count precisely). At 1 $\mu\text{g}/\text{mL}$, approximately 50 colonies survived. At 5 $\mu\text{g}/\text{mL}$, only 3 colonies survived. At 10 $\mu\text{g}/\text{mL}$ and 20 $\mu\text{g}/\text{mL}$, no colonies survived.

The microbiologist hypothesized that the rare surviving bacteria at 1 $\mu\text{g}/\text{mL}$ and 5 $\mu\text{g}/\text{mL}$ represented random mutations that happened to confer some antibiotic resistance.

Experiment 2

To test whether the surviving bacteria from Experiment 1 had indeed developed resistance, the microbiologist isolated bacteria from the 3 colonies that survived at 5 $\mu\text{g}/\text{mL}$. She grew these bacteria in antibiotic-free medium until she had large populations of each, then repeated Experiment 1's procedure using these bacterial descendants.

Results showed that bacteria descended from the resistant colonies could now survive much higher ampicillin concentrations. These "second-generation" bacteria grew well at 5 $\mu\text{g}/\text{mL}$ (hundreds of colonies), showed moderate survival at 10 $\mu\text{g}/\text{mL}$ (approximately 30 colonies), and still had a few survivors at 20 $\mu\text{g}/\text{mL}$ (2-3 colonies).

This demonstrated that the resistance trait was heritable—passed from parent bacteria to offspring.

Experiment 3

The microbiologist wanted to test whether exposure to sub-lethal doses of antibiotics (doses too low to kill bacteria but high enough to create "selective pressure") would accelerate resistance development. She divided a population of the original sensitive bacteria into two groups.

Group A was grown in medium with no ampicillin for 20 generations (bacteria dividing repeatedly over several days).

Group B was grown in medium with 0.5 $\mu\text{g}/\text{mL}$ ampicillin (a concentration low enough that most bacteria survived) for 20 generations.

After 20 generations, she tested both groups' resistance by exposing samples to 10 $\mu\text{g}/\text{mL}$ ampicillin. Group A (never exposed to antibiotics) showed almost no survival—only 1 colony out of 1 million bacteria

survived. Group B (repeatedly exposed to low-dose antibiotics) showed significantly more survival—approximately 150 colonies per million bacteria survived.

This suggested that constant exposure to sub-lethal antibiotic concentrations accelerated the evolution of resistance by continuously selecting for bacteria with even slightly increased resistance at each generation.

23. In Experiment 1, what concentration of ampicillin resulted in complete elimination of bacteria?

- A. 5 $\mu\text{g}/\text{mL}$ and higher
- B. 10 $\mu\text{g}/\text{mL}$ and higher
- C. 1 $\mu\text{g}/\text{mL}$ and higher
- D. 20 $\mu\text{g}/\text{mL}$ only

24. What was the primary purpose of Experiment 2?

- A. To find the highest dose of ampicillin possible
- B. To test whether resistance was heritable and passed to offspring
- C. To prove antibiotics never work
- D. To grow bacteria without any antibiotic

25. Based on Experiment 2, second-generation bacteria showed increased resistance because:

- A. they were exposed to higher temperatures
- B. they inherited resistance traits from parent bacteria that survived antibiotic exposure
- C. the ampicillin became weaker over time
- D. they were a completely different species

26. In Experiment 3, what was the independent variable?

- A. The number of generations
- B. Whether bacteria were exposed to low-dose antibiotics during growth
- C. The final concentration of antibiotic used for testing
- D. The survival rate of bacteria

27. Why was the antibiotic concentration in Group B (0.5 $\mu\text{g}/\text{mL}$) described as "sub-lethal"?

- A. It was too high and killed all bacteria
- B. It contained no active antibiotic
- C. It was low enough that most bacteria survived, but high enough to create selective pressure
- D. It was used only for 20 generations

28. Based on Experiment 3, which group showed more bacteria surviving at 10 $\mu\text{g}/\text{mL}$ ampicillin after 20 generations?

- A. Group A (no antibiotic exposure)
- B. Group B (low-dose antibiotic exposure)
- C. Both groups showed equal survival
- D. Neither group had any survivors

29. The results from all three experiments most directly support which conclusion about antibiotic resistance?

- A. Resistance never develops no matter how long bacteria are exposed
- B. Resistance develops through random mutations and can be accelerated by continuous antibiotic exposure
- C. All bacteria are naturally resistant to all antibiotics
- D. Antibiotics make bacteria weaker over time

30. Based on these experiments, which medical practice would most likely slow the development of antibiotic resistance?

- A. Using the lowest possible dose of antibiotics that still kills bacteria
- B. Using antibiotics for every minor illness
- C. Using prescribed antibiotics only until symptoms improve, then stopping
- D. Using the full prescribed dose of antibiotics to completely eliminate infections, avoiding sub-lethal exposure

PASSAGE V — CONFLICTING VIEWPOINTS

The Nature of Consciousness

Consciousness—our subjective experience of awareness, thoughts, and sensations—remains one of science's greatest mysteries. Three neuroscientists propose different theories about what consciousness is and how it arises from brain activity.

Scientist 1: Integrated Information Theory

Consciousness arises when information is integrated across multiple parts of the brain in a specific way. The key is not just neural activity, but the way different brain regions communicate and combine information. A system has consciousness to the degree that it integrates information—meaning that the whole system has properties that cannot be reduced to its individual parts.

This explains why certain brain structures produce consciousness while others don't. The cerebral cortex, with its highly interconnected neurons constantly exchanging information in complex patterns, generates consciousness. The cerebellum, despite having even more neurons than the cortex, has a simpler, more repetitive structure with less integration, and doesn't produce consciousness even though it's essential for movement control.

This theory also explains why we lose consciousness during deep sleep or anesthesia: these states disrupt the integrated information processing in the cortex, even though neurons remain active. Consciousness exists on a spectrum—more integrated systems have richer consciousness. Even simple organisms with basic nervous systems may have rudimentary consciousness if they integrate information, while a supercomputer running complex programs has no consciousness because its processing, though fast, doesn't truly integrate information in the required way.

This theory can be tested by measuring the brain's integrated information mathematically. Research has shown that brain regions associated with conscious experience show high integration, while unconscious processes show less integration.

Scientist 2: Global Workspace Theory

Consciousness is essentially a "global workspace" where information from different brain modules becomes broadly available. Most brain processing happens unconsciously in specialized modules—one area processes visual input, another processes language, another manages memory. These modules work in parallel, independently processing information.

Consciousness emerges when information from these specialized modules is broadcast to a "global workspace"—a network of neurons distributed across the cortex that makes information available to multiple cognitive processes simultaneously. Only information that enters this global workspace becomes conscious. This explains the limited capacity of consciousness: we can only be consciously aware of a small amount of information at once because the global workspace has limited capacity.

This theory explains why we can perform complex tasks unconsciously. When you drive a familiar route while thinking about something else, your brain's motor and visual modules handle driving automatically without entering the global workspace. Only novel or important information—like a child running into the street—gets broadcast globally and enters consciousness.

The theory also explains attention: attention is the process that determines which information gets broadcast to the global workspace and becomes conscious. Brain imaging studies support this: when information becomes conscious, there's a sudden increase in coordinated activity across distant brain regions, consistent with information being broadcast globally.

Unlike Integrated Information Theory, Global Workspace Theory suggests consciousness is specifically a human (or at least mammalian) brain phenomenon related to our particular neural architecture. Simple organisms almost certainly lack the distributed network required for global broadcasting.

Scientist 3: Emergent Property Theory

Consciousness is an emergent property that arises from complex neural activity but cannot be fully explained by examining individual neurons or even networks. Just as "wetness" emerges from water molecules but cannot be predicted by studying individual H₂O molecules, consciousness emerges from brain activity but represents something fundamentally new that appears at a certain level of complexity.

This theory emphasizes that we may never fully understand consciousness by studying neurons, just as studying individual water molecules won't fully explain wetness, and studying individual ants won't fully explain the collective behavior of ant colonies. At certain scales, new properties emerge that operate by their own principles.

This doesn't mean consciousness is mystical or non-physical—it's still produced by the brain. But it means the relationship between neural activity and conscious experience may involve principles we don't yet understand. Current neuroscience is like trying to understand computer software by examining the silicon chips—you'll see electrical activity but miss the higher-level organization that creates meaningful computation.

This theory is more humble than the others, acknowledging that consciousness may require new scientific concepts we haven't developed yet. It cautions against reducing consciousness entirely to neural mechanisms we currently understand. Evolution has produced something genuinely novel in consciousness, and understanding it may require expanding our scientific frameworks.

Critics argue this theory is less testable than the others because it doesn't make specific predictions about neural mechanisms. Proponents respond that this reflects reality—consciousness may simply be harder to explain than other biological phenomena because it operates at an emergent level our current methods aren't designed to capture.

31. According to Scientist 1, what is the key factor that determines whether a system has consciousness?

- A. The integration of information across multiple parts of the system
- B. The speed of neural processing
- C. The total number of neurons present
- D. The age of the organism

32. Scientist 1 uses the cerebellum as an example to demonstrate that:

- A. only the cerebellum produces consciousness
- B. having many neurons is sufficient for consciousness
- C. neural structure and integration matter more than neuron quantity

D. the cerebellum is more important than the cerebral cortex

33. According to Scientist 2, consciousness occurs when:

A. all brain modules work independently

B. information is broadcast to a global workspace and becomes widely available

C. neurons stop communicating with each other

D. specialized modules process information unconsciously

34. Which scientist's theory most directly explains why we can only be consciously aware of a limited amount of information at one time?

A. Scientist 1, through integration limits

B. Scientist 2, through global workspace capacity limits

C. Scientist 3, through emergent property limitations

D. None of the theories address this phenomenon

35. According to Scientist 3, studying individual neurons to understand consciousness is like:

A. studying water molecules to understand wetness—insufficient for capturing emergent properties

B. the best possible approach to understanding consciousness

C. studying only the cerebellum and ignoring the cortex

D. measuring integrated information mathematically

36. On which of the following points would Scientists 1 and 2 most likely agree?

A. Simple organisms definitely lack any form of consciousness

B. Consciousness can be explained by examining neural mechanisms and information processing

C. New scientific concepts are needed beyond current neuroscience

D. The cerebellum produces most conscious experience

37. Which scientist's theory is LEAST specific about the neural mechanisms that produce consciousness?

A. Scientist 1

B. Scientist 2

C. Scientist 3

D. All three are equally specific

38. Scientist 1's theory would most likely predict that an artificial intelligence system could achieve consciousness if it:

A. processes information faster than human brains

B. has more processors than the human brain has neurons

C. integrates information across its components in complex, unified ways

D. runs on biological rather than electronic hardware

39. How would Scientist 2 most likely explain the phenomenon of "driving on autopilot" (driving a familiar route while thinking about other things)?

A. This is impossible because driving always requires consciousness

B. Driving modules operate unconsciously; only novel events enter the global workspace

C. This proves that consciousness doesn't exist

D. The cerebellum takes over all driving functions

40. Which scientist's theory would be most difficult to test with current neuroscience methods?

A. Scientist 1, because integrated information can be measured mathematically

B. Scientist 2, because global broadcasting can be observed with brain imaging

C. Scientist 3, because emergent properties may require new scientific frameworks beyond current methods

D. All three theories are equally easy to test

Writing (Optional)

TIME: 40 minutes

DIRECTIONS: Respond to the following prompt with a well-organized essay that follows the rules of Standard English. Write your essay on a separate sheet of lined paper.

ESSAY PROMPT

ARTIFICIAL INTELLIGENCE IN EDUCATION

As artificial intelligence (AI) technology advances, schools and universities are debating how much AI should be integrated into education. AI tutoring systems can provide personalized learning experiences, adapting to each student's pace and style. AI can grade assignments instantly, freeing teachers to spend more time on instruction. AI writing assistants can help students brainstorm ideas and improve their work. However, critics worry that over-reliance on AI might reduce critical thinking skills, diminish the important student-teacher relationship, and create unfair advantages for students with access to the best AI tools. As educational institutions consider their policies, they must weigh the potential benefits and drawbacks of AI integration.

Read and carefully consider these perspectives. Each suggests a particular way of thinking about the role of AI in education.

Perspective One

AI should be fully embraced in education. Just as calculators transformed math education by letting students focus on problem-solving rather than computation, AI tools can handle routine tasks and allow students to develop higher-order thinking skills. Resisting AI in education is like refusing to use textbooks because they might make students less reliant on memory. Students will use AI in their careers; education should prepare them by teaching them to use these tools effectively and ethically.

Perspective Two

AI integration should be strictly limited in education. The struggle to write an essay, solve a problem, or understand difficult material is where real learning happens. If AI does the hard work, students never develop resilience, critical thinking, or deep understanding. Additionally, human teachers provide

emotional support, mentorship, and inspiration that no algorithm can replicate. Education is fundamentally a human endeavor, and technology should support teachers, not replace human interaction or effort.

Perspective Three

A balanced, thoughtful approach to AI in education is needed. AI should be used strategically for tasks where it adds clear value—like providing immediate feedback on practice problems or making education accessible to students with disabilities. However, core learning activities that build essential skills should remain AI-free. The goal should be teaching students to think critically both with and without AI assistance, understanding when each approach is appropriate, much like learning when to use a calculator versus mental math.

ESSAY TASK

Write a unified, coherent essay in which you evaluate multiple perspectives on AI integration in education. In your essay, be sure to:

- Analyze and evaluate the perspectives given
- State and develop your own perspective on the issue
- Explain the relationship between your perspective and those given

Your perspective may be in full agreement with any of the others, in partial agreement, or wholly different. Whatever the case, support your ideas with logical reasoning and detailed, persuasive examples.

PLANNING YOUR ESSAY

Your work on these prewriting pages will not be scored.

Use the space below and on the following page to generate ideas and plan your essay. You may wish to consider the following as you think critically about the task:

Strengths and weaknesses of the three given perspectives

- What insights do they offer, and what do they fail to consider?
- Why might they be persuasive to others, or why might they fall short?

Your own knowledge, experience, and values

- What is your perspective on this issue, and what are its strengths and weaknesses?
- How will you support your perspective in your essay?

ANSWERS AND EXPLANATIONS

English

- 1. B.** The clause "that has endured for centuries" is restrictive (essential to identify which tradition), so it should NOT be separated by a comma. Choice (B) "continues a tradition that has" is correct—no comma before "that" in restrictive clauses. Choice (A) incorrectly adds a comma. Choice (C) misuses a semicolon. Choice (D) incorrectly places a comma after "that."
- 2. F.** The passage maintains a formal, respectful tone about craftsmanship. "Borders on the obsessive" (F - NO CHANGE) is appropriately formal and accurately describes extreme attention to detail without being disparaging. Choice (G) "really, really extreme" is too informal. Choice (H) "goes totally overboard" is informal and negative. Choice (J) "unnecessarily excessive" is negative and inappropriate for describing skilled craftsmanship.
- 3. A.** Choice (A) provides the most specific information: "hundreds" (quantity) and "some dating back to the 18th century" (specific historical period). Choice (B) "from various time periods" is less specific. Choice (C) lacks detail. Choice (D) "old and new" is vague.
- 4. F.** When a dialogue tag interrupts a quotation, it should be set off by commas. Choice (F) correctly places commas: "The smallest spring in a watch," he explains, "is thinner than a human hair." The comma after "watch" and before "is" properly set off the interrupting phrase.
- 5. B.** A colon is used to introduce a definition or explanation. Choice (B) "The process begins with the movement: the watch's internal mechanism" correctly uses a colon to introduce the definition and corrects "watches" to "watch's" (possessive). Choice (A) lacks punctuation and has wrong possessive form. Choice (C) creates a comma splice. Choice (D) uses a semicolon, which doesn't signal definition as clearly.
- 6. F.** When a complete sentence is followed by a list, a colon is appropriate. Choice (F) correctly uses a colon: "starts by selecting the highest quality materials: brass for the plates..." Choice (G) incorrectly uses a semicolon. Choice (H) creates a fragment. Choice (J) uses a dash, which works but colon is more standard for formal writing.
- 7. C.** The paragraph is describing Moreau's specific material selection process step-by-step. Adding information about Switzerland's general watchmaking history would interrupt this focused description. Choice (C) correctly identifies this as an interruption. Choice (A) is incorrect—while historical context might be interesting, it's not appropriate here in the middle of a process description.
- 8. F.** "Creating a single gear" is the subject; "requires" is the verb. No punctuation should separate subject and verb. Choice (F) - NO CHANGE is correct. Choices (G), (H), and (J) all incorrectly add punctuation between subject and verb.

9. B. Choice (B) "files and polishes each tooth by hand to ensure perfect shaping" is clearest and most concise. It places "by hand" logically and uses the infinitive "to ensure" smoothly. Choice (A) is wordier with "ensuring that they are perfectly shaped." Choices (C) and (D) have awkward word order.

10. H. Two independent clauses cannot be joined with only a comma (comma splice). "He heat-treats the gear to increase its hardness" is one independent clause. "This makes it more durable" is another. Choice (H) correctly uses a period to separate them: "its hardness. This makes." Choice (F) keeps the comma splice. Choice (G) creates a restrictive clause that's awkward. Choice (J) adds unnecessary words.

11. A. Choice (A) "works under a microscope, his hands steady despite his 67 years" is most relevant to understanding watchmaking challenges—it emphasizes the difficulty of maintaining steady hands for microscopic work at an advanced age. Choices (B), (C), and (D) give contextual details but don't illuminate the challenges of the work itself.

12. H. Two independent clauses must be separated by a semicolon or period. "Each component must be positioned precisely" and "otherwise the watch will not keep accurate time" are both independent clauses. Choice (H) "precisely; otherwise" correctly uses a semicolon before the conjunctive adverb "otherwise."

13. A. The sentence "Some luxury watches contain over 500 individual parts, and every single one must be perfect" provides new, specific information about complexity (500 parts) that hasn't been stated before. Earlier mentions discussed small parts and precision, but not the specific number. Keeping the sentence adds valuable detail about the scale of complexity.

14. C. "Is gaining momentum as" effectively introduces the movement's growth and connects smoothly to "conservationists seek." "Gaining momentum" is appropriately formal for describing a growing environmental movement. Choices (A), (B), and (D) are less effective at conveying the movement's significance and growth.

15. F. Parallel structure requires matching forms after "aims to." Choice (F) "aims to reintroduce missing animals and allow natural processes to shape" is correct—both "reintroduce" and "allow" are infinitive forms (the "to" before "allow" is understood from the earlier "to"). Choice (G) breaks parallelism with "at reintroducing...and to allow." Choices (H) and (J) also break parallelism.

16. C. The subject "One" is singular, so the verb should be singular. Additionally, for a specific past event (the reserve was created on reclaimed land), simple past tense is more appropriate than present perfect. Choice (C) "the most successful rewilding project occurred" uses singular subject and past tense correctly. Choice (A) "has occurred" uses present perfect, which is less appropriate for a completed past event. Choice (D) changes to plural incorrectly.

17. G. "Including" introduces examples and should be set off with a comma. The list items need commas between them. Choice (G) "large herbivores, including Heck cattle, Konik horses," correctly places commas: after "herbivores" (before "including"), between "cattle" and "Konik," and after "horses" (before "and red deer"). Choice (F) lacks the comma after "including."

18. C. "Which had been absent from the landscape for centuries" is a non-restrictive clause adding extra information. Non-restrictive clauses must be set off with commas on BOTH sides. Choice (C) "These

animals, which had been absent from the landscape for centuries, served" correctly places commas before "which" and after "centuries."

19. F. "The results exceeded expectations" effectively transitions from describing actions (introducing animals) to outcomes (bird species, diverse habitats). This transition sentence directly connects to both the previous paragraph's actions and the current paragraph's results. NO CHANGE is best.

20. A. The sentence "Birdwatchers traveled from across Europe to observe species that had disappeared from the region" provides specific evidence that rare/disappeared species returned (why else would birdwatchers come?), supporting the claim of success. Choice (A) correctly identifies this as evidence supporting the reserve's success.

21. F. The passage uses past tense throughout. "That supported" (past tense) matches the established timeframe. NO CHANGE is correct.

22. B. "However" is a conjunctive adverb beginning a sentence and must be followed by a comma. Choice (B) "However, rewilding" is correct.

23. F. "Should have provided" is the correct modal perfect form (not "should of"). "Reserve's managers" correctly uses the possessive apostrophe. Past tense "argued" maintains consistency. NO CHANGE is correct.

24. A. The sentence structure is: "Conservationists responded that [natural cycles...are essential] and that [human intervention would undermine...]" Both clauses after "responded" need parallel structure with "that." Choice (A) "and that human intervention would undermine the project's goals" maintains parallelism. NO CHANGE is correct.

25. H. The essay's goal was to describe ethical debates. However, the essay spends most of its length describing the Oostvaardersplassen project itself—its creation, methods, ecological results. Only one paragraph briefly mentions an ethical controversy. Choice (H) correctly states the essay focuses more on describing a project than exploring ethical debates in depth.

26. C. "Had an idea that would transform" effectively conveys the world-changing significance of Banting's contribution. "Transform" is powerful and appropriate for a medical breakthrough. Choice (A) is too simple. Choices (B) and (D) are too casual or vague.

27. H. The sentence contains two independent clauses: "diabetes was a death sentence" and "patients wasted away." The phrase "especially children" interrupts the second clause. Choice (H) "patients—especially children—wasted away" correctly uses em dashes to set off the interrupting phrase.

28. F. The sentence structure is "Banting hypothesized that [the pancreas produced a hormone that regulated blood sugar], and that [extracting this hormone might treat diabetes]." The first "that" introduces a noun clause about what the hormone did. The second "that" introduces another noun clause about what extracting might do. Both are objects of "hypothesized." Choice (F) "regulated blood sugar, and that extracting this hormone might" maintains parallel structure with both "that" clauses as objects of the verb. NO CHANGE is correct.

29. B. "His assistant Charles Best" is an appositive. Since this provides the name of the assistant (additional information), it should be set off with commas as non-essential information. Choice (B) "his assistant, Charles Best, Banting began" correctly places commas around the name.

30. F. "The work was difficult and progress came slowly" directly describes the challenges they faced—difficulty and slow progress. This is most relevant to understanding obstacles. Choices (G), (H), and (J) provide context but don't convey challenges. NO CHANGE is correct.

31. B. "By the fall of 1921" is an introductory prepositional phrase and should be followed by a comma with no internal commas. Choice (B) correctly punctuates this: "By the fall of 1921," with just one comma at the end of the phrase.

32. F. The quotation marks around "isletin" indicate it's the name they gave it. Choice (F) correctly punctuates: it "isletin," though it would later be renamed insulin. The comma after the quoted word and before "though" is appropriate. NO CHANGE is correct.

33. B. Two independent clauses joined by a coordinating conjunction (but) need a comma before the conjunction. "The results were promising" is one independent clause; "the extract was still too impure for human use" is another. Choice (B) "promising, but" correctly places a comma before "but."

34. H. The paragraph is narrating the historical development of insulin. Adding technical molecular details ("Pure insulin consists of 51 amino acids...") would interrupt the narrative flow. Choice (H) correctly identifies this as disruptive to the historical narrative's flow.

35. B. "James Collip who spent weeks refining" contains a non-restrictive clause (adding information about what Collip did). Non-restrictive clauses beginning with "who" need a comma before "who." Choice (B) "James Collip, who spent" is correct.

36. F. The passage is written in past tense, describing historical events. "Became the first human to receive" correctly uses simple past tense. NO CHANGE is correct.

37. D. "However" is a conjunctive adverb connecting two independent clauses: "The initial dose caused an allergic reaction" and "Collip's improved formula...worked dramatically." When a conjunctive adverb connects two independent clauses, it should follow a period or semicolon and be followed by a comma. Choice (D) "however. Collip's" correctly uses a period to separate the sentences.

38. F. The sentence "The discovery of insulin represents one of medical history's greatest triumphs" effectively introduces the paragraph's conclusion about insulin's widespread impact. Deleting it would remove this important transitional statement that sets up the final information about insulin becoming widely available. The sentence should be kept.

39. B. The contrast is between origami seeming simple (suitable only for children) and actually embodying complex principles. Choice (B) "suitable only for children's activities" effectively sets up this contrast—it presents the misconception that origami is merely child's play, which the passage then contradicts.

40. F. "Focuses on understanding which shapes" is correctly punctuated with no comma. "Which shapes" is an indirect question (object of "understanding"), and no comma should interrupt this structure. NO CHANGE is correct.

41. A. The sentence has two clauses connected by "but": "A flat piece of paper can be folded in theoretically infinite ways" and "not all folding patterns are possible." These are contrasting ideas connected by the coordinating conjunction "but," which requires a comma before it. However, reading more carefully, the structure is actually one independent clause with a contrasting element: "can be folded...but not all [folds] are possible." No internal commas are needed in "theoretically infinite ways." NO CHANGE is correct.

42. H. Two independent clauses cannot be joined with only a comma or no punctuation. "Certain angles and proportions appear repeatedly in origami constructions" is one independent clause. "These mathematical relationships are now called 'Haga's theorems'" is another. Choice (H) correctly uses a period to separate them: "constructions. These"

43. A. "One practical application involves solar panels for spacecraft" effectively transitions from discussing mathematical theory to practical applications. This directly introduces a specific example of how origami mathematics is applied. NO CHANGE is correct.

44. G. Two independent clauses need proper separation. "Engineers needed panels that could fold compactly for launch but expand to large sizes in orbit" is one independent clause. "Origami folding patterns provided the solution" is another. Choice (G) correctly uses a period: "orbit. Origami folding patterns"

45. F. The Miura fold is a technique that exists and has been used (ongoing relevance), so present tense "allows" is appropriate. The fold's capability is a general fact, not limited to past use. NO CHANGE is correct.

46. C. The sentence about cost is tangential to the passage's focus on how origami principles enable these devices. The passage emphasizes the mathematical and engineering applications of origami, not economic considerations. Choice (C) correctly identifies cost information as irrelevant to the passage's focus.

47. A. "Have developed" (present perfect) correctly indicates that researchers have completed this development and the devices now exist. This tense appropriately describes a completed action with current relevance. NO CHANGE is correct.

48. F. The structure is parallel: "a heart stent might be folded small enough...then unfolded at the target location." Both "folded" and "unfolded" are past participles in parallel passive constructions. NO CHANGE is correct.

49. A. "Ancient art forms" precisely describes what origami represents in this context—it's an art form with ancient origins that inspires modern innovation. This is more precise than "traditional hobbies," "paper crafts," or "foreign customs." NO CHANGE is correct.

50. F. "Are not mutually exclusive" maintains the passage's formal tone. Choice (G) adds an unnecessary comma. Choice (H) "aren't...at all" is slightly informal with the contraction. Choice (J) "definitely are not" is wordier. NO CHANGE is correct.

Mathematics

1. C. The question asks you to solve for x in the equation $5x - 3 = 17$. Start by isolating the term with x . Add 3 to both sides: $5x - 3 + 3 = 17 + 3$, which gives $5x = 20$. Now divide both sides by 5: $5x/5 = 20/5$, so $x = 4$. The answer is C.

2. B. The question asks for 25% of 160. Convert 25% to a decimal: $25\% = 0.25$. Multiply: $0.25 \times 160 = 40$. Alternatively, recognize that $25\% = 1/4$, so you can divide 160 by 4: $160 \div 4 = 40$. The answer is B.

3. C. The question asks you to expand the expression $3(2x + 4)$ using the distributive property. Multiply 3 by each term inside the parentheses: $3 \times 2x = 6x$, and $3 \times 4 = 12$. Combine these: $6x + 12$. The answer is C. Choice (A) $5x + 7$ is incorrect because you can't add the coefficient 3 to $2x$ to get $5x$. Choice (B) $6x + 4$ fails to distribute the 3 to the 4. Choice (D) $6x + 7$ incorrectly adds 3 and 4 instead of multiplying.

4. B. The question asks for the probability of selecting a blue marble. First, find the total number of marbles: $5 \text{ red} + 3 \text{ blue} + 2 \text{ green} = 10$ total marbles. Probability = (number of favorable outcomes)/(total number of outcomes) = $3/10$. The answer is B. Choice (A) $1/10$ would be the probability for any single specific marble. Choice (C) $1/3$ would be correct if there were 3 blue out of 9 total. Choice (D) $3/5$ incorrectly uses only part of the total.

5. B. The question asks you to evaluate $2a^2 - 3a$ when $a = -4$. Substitute -4 for a : $2(-4)^2 - 3(-4)$. Calculate the exponent first: $(-4)^2 = 16$. Now evaluate: $2(16) - 3(-4) = 32 - (-12) = 32 + 12 = 44$. Remember that subtracting a negative is the same as adding a positive. The answer is B.

6. C. The question asks for the perimeter of a rectangle with length 9 inches and width 5 inches. The perimeter formula is $P = 2l + 2w$, or $P = 2(l + w)$. Substitute: $P = 2(9 + 5) = 2(14) = 28$ inches. The answer is C. Choice (A) 14 is just the sum of one length and one width, not the full perimeter. Choice (B) 19 doesn't follow any correct formula. Choice (D) 45 is the area (9×5), not the perimeter.

7. A. The question asks you to expand $(x + 5)(x - 3)$ using the FOIL method (First, Outer, Inner, Last). First: $x \times x = x^2$. Outer: $x \times (-3) = -3x$. Inner: $5 \times x = 5x$. Last: $5 \times (-3) = -15$. Combine all terms: $x^2 - 3x + 5x - 15 = x^2 + 2x - 15$. The answer is A. Choice (B) $x^2 - 2x - 15$ has the wrong sign on the middle term. Choice (C) $x^2 + 8x - 15$ incorrectly calculates the middle term as $8x$ instead of $2x$. Choice (D) $x^2 + 2x + 15$ has the wrong sign on the constant term.

8. B. The question gives you the equation $3x + 2y = 16$ and tells you that $x = 2$, asking you to find y . Substitute $x = 2$ into the equation: $3(2) + 2y = 16$. Simplify: $6 + 2y = 16$. Subtract 6 from both sides: $2y = 10$. Divide both sides by 2: $y = 5$. The answer is B.

- 9. B.** The question asks for the slope of the line passing through (1, 3) and (5, 11). Use the slope formula: $m = (y_2 - y_1)/(x_2 - x_1)$. Substitute the coordinates: $m = (11 - 3)/(5 - 1) = 8/4 = 2$. The answer is B. Choice (A) $1/2$ is the reciprocal of the correct answer. Choice (C) 4 is the change in x only. Choice (D) 8 is the change in y only.
- 10. C.** The question asks for the sale price of a \$60 shirt with a 30% discount. First, calculate the discount amount: 30% of 60 = $0.30 \times 60 = 18$ dollars. Subtract the discount from the original price: $60 - 18 = 42$ dollars. The answer is C. Choice (A) 18 is just the discount amount, not the sale price. Choice (B) 30 is the discount percentage confused with the sale price. Choice (D) 48 represents a 20% discount, not 30%.
- 11. A.** The question asks you to solve $|2x - 6| = 10$. Absolute value equations have two cases. Case 1: $2x - 6 = 10$. Add 6 to both sides: $2x = 16$. Divide by 2: $x = 8$. Case 2: $2x - 6 = -10$. Add 6 to both sides: $2x = -4$. Divide by 2: $x = -2$. Both -2 and 8 are solutions. The answer is A. Choice (B) reverses the signs incorrectly. Choices (C) and (D) give only one solution each when there are two.
- 12. B.** The question asks for the area of a triangle with base 8 cm and height 5 cm. Use the triangle area formula: $A = (1/2) \times \text{base} \times \text{height} = (1/2) \times 8 \times 5 = (1/2) \times 40 = 20 \text{ cm}^2$. The answer is B. Choice (A) 13 is the sum of base and height. Choice (C) 40 forgets to multiply by $1/2$. Choice (D) 80 doubles the correct answer.
- 13. B.** The question asks for $\sqrt{144}$. Find the number that, when multiplied by itself, equals 144. Since $12 \times 12 = 144$, $\sqrt{144} = 12$. The answer is B. Choice (A) 10 squared is 100, not 144. Choice (C) 14 squared is 196. Choice (D) 72 is half of 144, not its square root.
- 14. B.** The question asks you to evaluate $f(5)$ where $f(x) = 4x - 7$. Substitute $x = 5$ into the function: $f(5) = 4(5) - 7 = 20 - 7 = 13$. The answer is B. Choice (A) 6 may result from calculation errors. Choice (C) 18 forgets to subtract 7. Choice (D) 27 adds instead of subtracts.
- 15. C.** The question states that in a class of 32 students, the ratio of boys to girls is 5:3. The ratio 5:3 means that out of every $5 + 3 = 8$ students, 5 are boys. To find the number of boys: $(5/8) \times 32 = 5 \times 4 = 20$ boys. The answer is C. Choice (A) 12 represents the number of girls. Choice (B) 15 doesn't follow the correct ratio calculation. Choice (D) 24 would be correct for a 3:1 ratio.
- 16. D.** The question asks for the value of 3^4 . Calculate: $3^4 = 3 \times 3 \times 3 \times 3 = 9 \times 9 = 81$. The answer is D. Choice (A) 12 incorrectly multiplies 3×4 . Choice (B) 27 is 3^3 , not 3^4 . Choice (C) 64 is 4^3 or 2^6 .
- 17. A.** The question asks you to solve the inequality $4x - 9 > 15$. Add 9 to both sides: $4x - 9 + 9 > 15 + 9$, which gives $4x > 24$. Divide both sides by 4: $4x/4 > 24/4$, so $x > 6$. The answer is A. Choice (B) $x > 3$ incorrectly divides 15 by 5 instead of solving correctly. Choice (C) $x < 6$ has the inequality reversed. Choice (D) $x > 24$ forgets to divide by 4.
- 18. B.** The question asks for the circumference of a circle with radius 6 feet. Use the formula $C = 2\pi r$. Substitute $r = 6$: $C = 2\pi(6) = 12\pi$ feet. The answer is B. Choice (A) 6π uses the formula for a semicircle or forgets the coefficient 2. Choice (C) 36π confuses circumference with area (πr^2). Choice (D) 72π doubles the correct answer.

19. B. The question asks for the median of 15, 22, 18, 30, 22, 25. First, arrange the numbers in ascending order: 15, 18, 22, 22, 25, 30. With 6 numbers (even count), the median is the average of the 3rd and 4th values: $(22 + 22)/2 = 44/2 = 22$. The answer is B. Choice (A) 20 would be the median of 15, 18, 22, 25. Choice (C) 23 incorrectly averages different values. Choice (D) 25 is in the data set but not the median.

20. B. The question asks you to solve $2^x = 32$. Recognize that 32 is a power of 2: $32 = 2 \times 2 \times 2 \times 2 \times 2 = 2^5$. Therefore, $2^x = 2^5$, which means $x = 5$. The answer is B. Choice (A) 4 gives $2^4 = 16$. Choice (C) 6 gives $2^6 = 64$. Choice (D) 16 is 2^4 , not the exponent needed.

21. C. The question states that in a right triangle, one acute angle is 28° . In any right triangle, one angle is 90° and the two acute angles are complementary (they sum to 90°). The other acute angle $= 90^\circ - 28^\circ = 62^\circ$. The answer is C.

22. B. The question asks you to multiply $(3x^2y^3)(2x^4y)$. Multiply the coefficients: $3 \times 2 = 6$. For variables with exponents, add the exponents when multiplying: $x^{2+4} = x^6$ and $y^{3+1} = y^4$. The result is $6x^6y^4$. The answer is B. Choice (A) $5x^6y^4$ adds the coefficients instead of multiplying. Choice (C) $6x^8y^3$ incorrectly multiplies the x exponents. Choice (D) $6x^6y^3$ forgets to add 1 to the y exponent.

23. A. The question states that length $= 2w + 3$ and width $= w$. Perimeter $= 2(\text{length} + \text{width}) = 2[(2w + 3) + w] = 2[3w + 3] = 6w + 6$. The answer is A. Choice (B) $4w + 6$ would be $2(2w + 3)$, missing the width term. Choice (C) $3w + 3$ forgets to multiply by 2. Choice (D) $2w + 3$ is just the length, not the perimeter.

24. C. The question asks for the distance between $(-2, 3)$ and $(4, 11)$. Use the distance formula: $d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$. Substitute: $d = \sqrt{(4 - (-2))^2 + (11 - 3)^2} = \sqrt{(4 + 2)^2 + (8)^2} = \sqrt{6^2 + 8^2} = \sqrt{36 + 64} = \sqrt{100} = 10$. The answer is C. Choice (A) 6 is just the change in x. Choice (B) 8 is just the change in y. Choice (D) 14 is the sum of the changes, not the distance.

25. B. The question asks you to solve $x^2 - 7x + 12 = 0$. Factor the quadratic by finding two numbers that multiply to 12 and add to -7. Those numbers are -3 and -4: $(x - 3)(x - 4) = 0$. Set each factor equal to zero: $x - 3 = 0$ gives $x = 3$, and $x - 4 = 0$ gives $x = 4$. The solutions are 3 and 4. The answer is B. Choice (A) 2 and 6 multiply to 12 but add to 8, not 7. Choices (C) and (D) have negative solutions, which don't work when substituted back.

26. C. The question asks how far a car travels at 55 mph for 3.5 hours. Use the formula: distance $= \text{speed} \times \text{time} = 55 \text{ miles/hour} \times 3.5 \text{ hours} = 192.5 \text{ miles}$. The answer is C. To calculate: $55 \times 3 = 165$, and $55 \times 0.5 = 27.5$, so $165 + 27.5 = 192.5$. Choices (A), (B), and (D) result from calculation errors.

27. A. The question asks for $\sin(30^\circ)$, which is a standard trigonometric value you should memorize. $\sin(30^\circ) = 1/2$. The answer is A. Choice (B) $\sqrt{2}/2$ is $\sin(45^\circ)$. Choice (C) $\sqrt{3}/2$ is $\sin(60^\circ)$ or $\cos(30^\circ)$. Choice (D) 1 is $\sin(90^\circ)$.

28. B. The question states that the area of a square is 169 cm^2 . Since area $= \text{side}^2$, we have $\text{side}^2 = 169$. Take the square root of both sides: $\text{side} = \sqrt{169} = 13 \text{ cm}$. The answer is B. Choice (A) 11 squared is 121. Choice (C) 15 squared is 225. Choice (D) 42.25 is $169 \div 4$.

29. A. The question asks which line is parallel to $y = 3x + 5$. Parallel lines have the same slope. The slope of $y = 3x + 5$ is 3 (the coefficient of x). Only choice (A) $y = 3x - 2$ also has slope 3. Choice (B) has slope -3 (perpendicular). Choice (C) has slope $1/3$ (perpendicular). Choice (D) has slope 5.

30. C. The question asks for $\log_2(64)$. This asks "2 to what power equals 64?" Calculate powers of 2: $2^1 = 2$, $2^2 = 4$, $2^3 = 8$, $2^4 = 16$, $2^5 = 32$, $2^6 = 64$. Since $2^6 = 64$, $\log_2(64) = 6$. The answer is C.

31. C. The question asks for the volume of a cylinder with radius 4 inches and height 10 inches. Use the formula $V = \pi r^2 h$. Substitute: $V = \pi(4)^2(10) = \pi(16)(10) = 160\pi$ cubic inches. The answer is C. Choice (A) 40π uses the formula for circumference or forgets to square the radius. Choice (B) 80π forgets to square the radius (uses $2r$ instead of r^2). Choice (D) 320π doubles the correct answer.

32. B. The question gives you two equations: $3x + 2y = 18$ and $x - y = 1$. From the second equation, solve for x : $x = y + 1$. Substitute into the first equation: $3(y + 1) + 2y = 18$. Distribute: $3y + 3 + 2y = 18$. Combine like terms: $5y + 3 = 18$. Subtract 3: $5y = 15$. Divide by 5: $y = 3$. Now find x : $x = y + 1 = 3 + 1 = 4$. The answer is B.

33. C. The question asks for the sum of interior angles of a pentagon. Use the formula: $\text{sum} = (n - 2) \times 180^\circ$, where n is the number of sides. For a pentagon, $n = 5$: $\text{sum} = (5 - 2) \times 180^\circ = 3 \times 180^\circ = 540^\circ$. The answer is C. Choice (A) 360° is the sum for a quadrilateral. Choice (B) 450° doesn't follow the formula. Choice (D) 720° is the sum for a hexagon.

34. D. The question asks you to expand $(x + 4)^2$. Use the formula $(a + b)^2 = a^2 + 2ab + b^2$. Here, $a = x$ and $b = 4$: $(x + 4)^2 = x^2 + 2(x)(4) + 4^2 = x^2 + 8x + 16$. The answer is D. Choice (A) $x^2 + 16$ forgets the middle term. Choice (B) $x^2 + 4x + 16$ has the wrong coefficient on the middle term. Choice (C) $x^2 + 8x + 8$ has the wrong constant term.

35. C. The question gives the sequence 2, 6, 18, 54, ... Each term is multiplied by 3 to get the next term (this is a geometric sequence with ratio 3). Continue the pattern: 5th term = $54 \times 3 = 162$, 6th term = $162 \times 3 = 486$. The answer is C. Choice (A) 162 is only the 5th term. Choice (B) $324 = 162 \times 2$, using wrong ratio. Choice (D) $648 = 54 \times 12$ or 162×4 , incorrect calculation.

36. C. The question states that in triangle ABC, angle A = 35° and angle B = 75° . The sum of angles in a triangle is 180° . Angle C = $180^\circ - 35^\circ - 75^\circ = 180^\circ - 110^\circ = 70^\circ$. The answer is C. Wait, let me double-check my answer choices. Looking back at the original problem, C is listed as 70° . Yes, the answer is C.

37. A. The question asks for $f(g(2))$ where $f(x) = x^2 + 3x - 2$ and $g(x) = 2x - 1$. First, find $g(2)$: $g(2) = 2(2) - 1 = 4 - 1 = 3$. Now find $f(3)$: $f(3) = (3)^2 + 3(3) - 2 = 9 + 9 - 2 = 16$.

38. B. The question asks for the diagonal of a rectangle with length 12 cm and width 5 cm. Use the Pythagorean theorem: $\text{diagonal}^2 = \text{length}^2 + \text{width}^2 = 12^2 + 5^2 = 144 + 25 = 169$. Diagonal = $\sqrt{169} = 13$ cm. The answer is B. This is a 5-12-13 Pythagorean triple. Choice (A) 11 is close but incorrect. Choice (C) 15 is $12 + 3$, not the diagonal. Choice (D) 17 is from a different Pythagorean triple (8-15-17).

39. C. The question asks how many 3-digit numbers can be formed using 2, 4, 6, 8 without repetition. For the first digit, you have 4 choices. For the second digit, 3 remaining choices. For the third digit, 2

remaining choices. Total arrangements = $4 \times 3 \times 2 = 24$. The answer is C. This is a permutation problem: ${}_4P_3 = 4!/(4-3)! = 24$. Choice (A) 12 uses incorrect calculation. Choice (B) 18 doesn't follow the multiplication principle. Choice (D) 64 would be correct if repetition were allowed (4^3).

40. B. The question states that $\cos \theta = 3/5$ and θ is acute, asking for $\sin \theta$. Use the Pythagorean identity: $\sin^2 \theta + \cos^2 \theta = 1$. Substitute: $\sin^2 \theta + (3/5)^2 = 1$. Simplify: $\sin^2 \theta + 9/25 = 1$. Subtract: $\sin^2 \theta = 1 - 9/25 = 25/25 - 9/25 = 16/25$. Take the square root: $\sin \theta = 4/5$ (positive since θ is acute). The answer is B. This is a 3-4-5 right triangle. Choice (A) $3/5$ is the given cosine value. Choices (C) and (D) are reciprocals and incorrect.

41. A. The question asks for the y-intercept of a line passing through (2, -3) with slope 4. Use the slope-intercept form $y = mx + b$. Substitute the point and slope: $-3 = 4(2) + b$. Simplify: $-3 = 8 + b$. Subtract 8: $b = -11$. The answer is A. Choice (B) -8 results from calculation errors. Choice (C) 5 may come from adding instead of subtracting. Choice (D) 11 has the wrong sign.

42. C. The question asks for $\sum(2i + 1)$ from $i = 1$ to 5. Calculate each term: When $i = 1$: $2(1) + 1 = 3$. When $i = 2$: $2(2) + 1 = 5$. When $i = 3$: $2(3) + 1 = 7$. When $i = 4$: $2(4) + 1 = 9$. When $i = 5$: $2(5) + 1 = 11$. Sum = $3 + 5 + 7 + 9 + 11 = 35$. The answer is C. Choice (A) 25 is 5^2 . Choice (B) 30 miscounts the terms. Choice (D) 40 includes extra terms.

43. D. The question describes a geometric sequence with first term 5 and common ratio 2. The first 4 terms are: $a_1 = 5$, $a_2 = 5(2) = 10$, $a_3 = 10(2) = 20$, $a_4 = 20(2) = 40$. Sum = $5 + 10 + 20 + 40 = 75$. The answer is D. Alternatively, use the formula $S_n = a_1(r^n - 1)/(r - 1) = 5(2^4 - 1)/(2 - 1) = 5(16 - 1)/1 = 5(15) = 75$. Choices (A), (B), and (C) result from calculation errors or using wrong formulas.

44. D. The question states $\tan \alpha = 4/3$ in the first quadrant, asking for $\sec \alpha$. In a right triangle where $\tan \alpha = \text{opposite/adjacent} = 4/3$, the opposite side is 4 and adjacent side is 3. Use the Pythagorean theorem to find the hypotenuse: $h^2 = 3^2 + 4^2 = 9 + 16 = 25$, so $h = 5$. Now, $\sec \alpha = \text{hypotenuse/adjacent} = 5/3$. The answer is D. This uses the 3-4-5 right triangle. Choice (A) $3/4$ is the reciprocal of tangent. Choice (B) $4/5$ is the sine. Choice (C) $5/4$ is the cosecant.

45. D. The question gives the equation $y = -2(x - 3)^2 + 8$ and asks for the vertex. This equation is in vertex form: $y = a(x - h)^2 + k$, where (h, k) is the vertex. From $y = -2(x - 3)^2 + 8$, we identify $h = 3$ and $k = 8$. The vertex is (3, 8). The answer is D. Choice (A) (-3, 8) incorrectly uses -3 for h. Choice (B) (3, -8) has the wrong sign for k. Choice (C) (-3, -8) has wrong signs for both coordinates.

Reading

1. B. The question asks why the mother presents the blueprints with "careful neutrality." The passage states that "my mother rarely spoke of him except in fragments—he was demanding, he was brilliant, he worked too much, he expected perfection." This establishes that the mother has complex, unresolved feelings about her father—respecting his brilliance but resenting his absence and demands. Her "careful neutrality" reflects her attempt to hide these conflicting emotions. Choice (A) is incorrect because she's not excited; she's emotionally guarded. Choice (C) is wrong because she clearly recognizes their value by

saving them. Choice (D) is incorrect because the neutrality relates to her father, not to influencing opinions about architecture.

2. C. The question asks about the narrator's understanding before seeing the blueprints. The passage directly states: "he was demanding, he was brilliant, he worked too much, he expected perfection. The narrative was consistent enough that I'd constructed an image of a man I was probably better off never knowing." This clearly describes him as a demanding perfectionist who worked excessively. Choice (A) is the opposite of what was described. Choice (B) is contradicted by "he was brilliant" and references to his awards. Choice (D) is incorrect because the narrator didn't view him as warm and caring based on the information she'd received.

3. C. The question asks how the house design is characterized. The passage describes it as "a modernist structure that seemed to float above its foundation, all glass and light and impossible angles" (modernist), and the detailed notes like "Sarah's room—orient toward morning sun. She loves watching birds" show personalized, thoughtful details. Choice (A) is wrong because it's not simple—it's described as having "impossible angles" and extraordinary design. Choice (B) is incorrect because it's explicitly modernist, not traditional. Choice (D) is wrong because function is clearly considered in details like "orient toward morning sun" and "northern light for reading."

4. C. The question asks about the phrase "a love letter, rendered in ink and geometry." In context, the narrator has just discovered all the personal details her grandfather included for each family member. She realizes "It wasn't just a house" but rather an expression of love through the medium he knew best—architecture. Choice (A) is the opposite of what the phrase suggests. Choice (B) misses the emotional significance emphasized by "love letter." Choice (D) completely misinterprets the metaphor—"ink and geometry" refers to architectural drawings, not literal writing.

5. C. The question asks why the grandmother never built the house. The passage states: "Your grandmother couldn't bear it. Every time she looked at these drawings, she saw everything they'd lost. It was easier to leave them in storage, to forget they existed." This clearly indicates the blueprints were too painful a reminder of her loss. Choice (A) is never mentioned. Choice (B) is contradicted by the narrator's recognition of the design's excellence. Choice (D) is not supported by the text.

6. B. The question asks what the marginal notes demonstrate. The passage states: "He'd been paying attention after all. Every detail of this unbuilt house demonstrated an intimate knowledge of the people he'd designed it for. He'd known his daughter woke early and loved birds. He'd known his son was an insomniac who read by lamplight. He'd known his wife cooked with fresh herbs. The house was an archive of observation." This clearly shows careful observation and understanding of family members. Choice (A) misinterprets attention to detail as controlling. Choice (C) is contradicted by the fact that he was designing FOR their preferences, not imposing his own. Choice (D) completely misses the point about understanding people.

7. C. The question asks about the meaning of "archive" in context. The passage uses it in the phrase "The house was an archive of observation, proof that he'd been there, watching, remembering, loving." In this context, "archive" means a preserved record or repository of his observations and memories of his family. Choice (A) is too literal—it's not about old documents but about preserved memories. Choice (B) "storage

facility" is too concrete and literal. Choice (D) "forgotten memory" is the opposite—the archive preserves memories, not forgets them.

8. B. The question asks what the narrator's decision to update the design suggests. She states she'll build it "not as he'd drawn it, but as he would have drawn it if he were designing it today" and explains "the core idea—that a home should be designed around the specific humans who would inhabit it, that architecture could be both radical and intimate—that was timeless." This shows she's honoring underlying principles rather than exact details. Choice (A) is wrong because she respects the original design deeply. Choice (C) is unsupported by the text. Choice (D) misses her point about timeless principles.

9. C. The question asks about the central theme. Throughout the passage, the narrator discovers how her grandfather expressed love through architecture—the blueprints were "a love letter," an "archive of observation," proof of "watching, remembering, loving." The theme is about how people express love in their own languages and how those expressions can transcend time. Choice (A) is too narrow—preservation is mentioned but isn't central. Choice (B) is discussed but isn't the main theme. Choice (D) is never suggested; the passage emphasizes timeless principles over modern superiority.

10. C. The question asks about Waldfogel's critique basis. The passage states: "Waldfogel surveyed college students about gifts they'd received and asked them to estimate both what the giver had spent and what they themselves would have paid for the item if purchasing it for themselves. On average, recipients valued gifts at only 80-90% of what givers had spent." This clearly shows recipients valued gifts at less than what givers spent. Choice (A) is never stated in Waldfogel's research. Choice (B) is not mentioned. Choice (D) is not part of his critique.

11. B. The question asks about Waldfogel's proposed solution. The passage explicitly states: "His solution? Give cash instead. Cash allows recipients perfect freedom to purchase exactly what they want, eliminating deadweight loss. Or better yet, simply spend the money on yourself." Choice (A) about registries is discussed later as a different approach. Choice (C) is not his solution. Choice (D) goes beyond what he suggested.

12. B. The question asks about "social lubricants." The passage introduces this term when discussing Ernest Dichter's three functions of gifts: "gifts as expressions of love and appreciation, gifts as social lubricants that maintain relationships, and gifts as reflections of the giver's identity." In this context, "lubricants" are things that make social interactions run smoothly and maintain relationships. Choice (A) misses the metaphorical meaning. Choice (C) is the opposite. Choice (D) takes "lubricant" too literally.

13. C. The question asks about the purpose of the cash vs. book example. The passage uses this comparison to show that "it demonstrates attention, memory, and effort—all signals that you matter to the giver." This illustrates how attention and effort signal caring more than monetary value. Choice (A) misses the broader point—it's not that books are always better. Choice (B) is wrong because the point is that price matters less than effort. Choice (D) is too absolute; the example explains why cash feels less meaningful, not that it should always be avoided.

14. B. The question asks what signaling theory suggests. The passage states: "A thoughtful gift signals that the giver has invested time and cognitive effort in understanding the recipient. The very inefficiency that Waldfogel identified—the fact that givers must expend effort to select something the recipient

values—becomes the source of the gift's meaning." This clearly identifies the investment of time and cognitive effort as what makes gifts valuable. Choice (A) is contradicted—expensive isn't the point. Choice (C) is not what signaling theory suggests. Choice (D) is too specific and not the main point.

15. C. The question asks about Graeber's research findings. The passage states: "He found that in many societies, gifts create ongoing relationships of mutual obligation rather than closed transactions. When someone gives you a gift, you're now in their debt—not in a financial sense, but in a social sense... This creates a web of ongoing social ties, with gifts serving as the threads that bind communities together." This clearly describes creating ongoing relationships and social obligations. Choices (A), (B), and (D) contradict or miss Graeber's findings.

16. B. The question asks why gifts in power imbalance contexts are problematic. The passage states: "Gifts from employers to employees, from wealthy donors to nonprofits, or from corporations to politicians often come with implicit expectations of reciprocity that blur the line between gift and payment. The recipient of such gifts may feel obligated to provide something in return—loyalty, favorable treatment, or access—creating what sociologists call 'gift debt.'" This clearly explains the obligation to provide favors or special treatment. Choices (A), (C), and (D) miss the core issue of implicit obligations.

17. B. The question asks when cultural differences create difficulties. The passage states: "These different norms can create awkward cross-cultural situations where a gift given with one set of expectations is received with another." This directly answers the question. Choice (A) about money amounts is not mentioned. Choice (C) about efficiency is not the cultural difference discussed. Choice (D) is not mentioned as a cultural difference issue.

18. B. The question asks about the conclusion regarding why gift-giving endures. The passage concludes: "The resolution to the economic 'puzzle' of gift-giving lies in recognizing that gifts operate in multiple economies simultaneously... in the social economy, that same gift creates value through its symbolic meaning, its signaling of relationships, and its creation of social bonds... Gift-giving endures not despite its economic inefficiency but partly because of it." This shows gifts create social value that transcends economic efficiency. Choice (A) is wrong because the passage doesn't call people irrational. Choice (C) is the opposite of what's suggested. Choice (D) is contradicted by the passage.

19. B. The question asks about the main purpose. The passage systematically explains how Japanese art influenced Western artists—discussing specific techniques like asymmetrical composition, use of negative space, and cropping, providing examples of artists like Monet, Van Gogh, Cassatt, and Degas who adopted these approaches. This is clearly an explanation of influence. Choice (A) is too narrow—while appropriation is mentioned, it's not the main purpose. Choice (C) is never suggested. Choice (D) is mentioned only as background context.

20. C. The question asks about European academic art characteristics. The passage states: "European academic art of the mid-19th century emphasized realistic perspective, with compositions organized around a central vanishing point that created the illusion of three-dimensional space on a two-dimensional surface. Compositions were typically balanced and symmetrical, with the most important elements placed centrally." This clearly describes realistic perspective organized around a central vanishing point. Choices (A), (B), and (D) all describe Japanese art, not European academic art.

21. B. The question asks what *ma* refers to. The passage defines it: "Empty space—called *ma*—was treated as an active compositional element rather than simply the absence of objects." Later it states: "The Japanese concept of *ma*—often translated inadequately as 'negative space'—proved particularly influential... Japanese aesthetics treated emptiness as a positive force, as essential to the composition as the marks themselves." This clearly identifies it as empty space treated as an active compositional element. Choices (A), (C), and (D) are not supported.

22. C. The question asks how Japanese art influenced Monet's water lilies. The passage states: "Claude Monet, who collected hundreds of Japanese prints, incorporated asymmetrical compositions and flattened picture planes into his work. His paintings of water lilies, for instance, often eliminate the horizon line entirely, creating an all-over composition reminiscent of Japanese screens." This describes asymmetrical compositions and eliminated horizon lines. Choices (A), (B), and (D) describe Western academic art, not Monet's Japanese-influenced work.

23. B. The question asks which aspect most challenged Western conventions about composition. The passage emphasizes: "Japanese prints demonstrated that a composition could be organized asymmetrically, with important elements placed off-center or even cropped by the frame's edge... This cropping and asymmetry influenced Western artists' use of the frame itself." This placement and cropping directly challenged Western conventions of central, balanced composition. Choice (A) is not discussed as the main challenge. Choices (C) and (D) are not mentioned as distinguishing features.

24. C. The question asks why European understanding was problematic. The passage states: "European artists often romanticized Japan as an exotic, timeless culture, ignoring the reality that Japanese art itself was rapidly modernizing... Moreover, European artists often extracted specific techniques or motifs from Japanese art without understanding their cultural contexts. A cherry blossom motif carried deep associations with transience and mortality in Japanese culture, but European artists might simply view it as decorative. This selective borrowing created a 'Japan' that existed largely in European imagination." This describes romanticization and extraction without cultural understanding. Choices (A), (B), and (D) are not mentioned as problems.

25. B. The question asks what the cherry blossom discussion illustrates. The passage uses this example right after stating that European artists "extracted specific techniques or motifs from Japanese art without understanding their cultural contexts." The cherry blossom example shows how "a cherry blossom motif carried deep associations with transience and mortality in Japanese culture, but European artists might simply view it as decorative." This illustrates misunderstanding of cultural meanings. Choice (A) makes a value judgment not in the passage. Choices (C) and (D) miss the point about cultural misunderstanding.

26. A. The question asks where Japanese aesthetic influence can be seen. The passage states: "The Impressionists' emphasis on capturing fleeting moments rather than constructing narrative tableaux, the Post-Impressionists' use of flat color and expressive line, the Art Nouveau movement's flowing organic forms—all bore traces of Japanese aesthetic principles." This specifically mentions Impressionists focusing on fleeting moments. Choice (B) is the opposite—the passage mentions moving away from narrative. Choice (C) contradicts the passage about flat color. Choice (D) is not mentioned.

27. C. The question asks about the nature of the artistic exchange. The passage states: "The exchange was not one-directional. As European artists absorbed Japanese influences, Japanese artists were

simultaneously studying Western techniques, particularly oil painting and linear perspective. This cross-pollination produced artists like Kuroda Seiki, who synthesized Western painting techniques with Japanese sensibilities." This clearly describes bidirectional exchange. Choice (A) contradicts "not one-directional." Choice (B) overstates it as "perfectly balanced." Choice (D) is contradicted by the passage's positive view of the exchange despite its complications.

28. B. The question asks about the main purpose. The passage systematically explains sleep biology: the SCN as master clock, peripheral clocks, sleep stages, circadian rhythms, genetic variation, and health consequences. This is clearly an explanation of biological mechanisms. Choice (A) is too extreme—the passage discusses light's effects but doesn't argue for eliminating all artificial lighting. Choice (C) is contradicted—the passage emphasizes individual variation. Choice (D) is too narrow—while some history is mentioned, the focus is on mechanisms.

29. B. The question asks about the SCN's function. The passage explicitly states: "The SCN serves as the body's master clock, coordinating circadian rhythms—the roughly 24-hour cycles that govern everything from body temperature to hormone release to cognitive performance." This directly identifies it as the body's master clock. Choice (A) confuses the SCN with REM sleep. Choice (C) confuses it with melatonin. Choice (D) confuses it with clock genes.

30. C. The question asks about ipRGCs. The passage states: "Specialized cells in the retina called intrinsically photosensitive retinal ganglion cells (ipRGCs) contain melanopsin, a photopigment that responds particularly strongly to blue light. These cells don't contribute to conscious vision; instead, they provide the SCN with information about ambient light levels." This describes responding to blue light and providing light information to the SCN. Choice (A) is contradicted by "don't contribute to conscious vision." Choice (B) confuses different components. Choice (D) is the SCN's role, not the ipRGCs'.

31. C. The question asks how blue light disrupts sleep. The passage explains: "The wavelengths emitted by smartphones, tablets, and computer monitors closely match the peak sensitivity of melanopsin, essentially telling the SCN that it's still daytime even when it's late evening. This delays the release of melatonin, a hormone produced by the pineal gland that promotes sleepiness." This clearly describes signaling daytime to the SCN and delaying melatonin. Choice (A) is too extreme—it doesn't damage the SCN. Choice (B) is not mentioned. Choice (D) is not stated.

32. B. The question asks why jet lag feels disruptive. The passage states: "When you fly across multiple time zones, your SCN can adjust relatively quickly to the new light-dark cycle—usually shifting by about one hour per day. However, your peripheral clocks adjust more slowly, particularly if your meal times and activity patterns don't align with local time. This internal desynchronization—different clocks in different parts of your body telling different times—produces the malaise, digestive issues, and cognitive impairment characteristic of jet lag." This clearly describes different adjustment rates causing internal desynchronization. Choice (A) is wrong—the SCN continues functioning. Choice (C) is not stated. Choice (D) is backwards—peripheral clocks adjust slower.

33. C. The question asks about slow-wave sleep characteristics. The passage states: "During slow-wave sleep, brain waves synchronize into large, slow oscillations, heart rate and breathing slow dramatically, and growth hormone is released. This is when the brain appears to clear metabolic waste products through the recently discovered glymphatic system." This describes synchronized slow brain waves and waste

clearance. Choice (A) describes REM sleep. Choice (B) also describes REM sleep. Choice (D) describes light sleep (Stage 1), not slow-wave sleep (Stage 3).

34. B. The question asks what REM sleep is important for. The passage states: "REM sleep appears crucial for memory consolidation, particularly for procedural memories and emotional processing." This directly identifies memory consolidation and emotional processing. Choice (A) is associated with slow-wave sleep (growth hormone release). Choice (C) is regulated by circadian rhythms generally, not specifically REM. Choice (D) occurs during slow-wave sleep, not REM.

35. C. The question asks about the adolescent sleep shift. The passage states: "Adolescents experience a natural shift toward later circadian phases during puberty—the biology of a typical teenager makes it genuinely difficult to fall asleep before 11 PM and wake before 8 AM." This clearly indicates a biological basis that makes early waking genuinely difficult. Choice (A) is contradicted—it's biological, not habit-based. Choice (B) is wrong—the passage emphasizes it's biological, not changeable by willpower. Choice (D) is contradicted by "typical teenager."

36. B. The question asks what is NOT linked to sleep restriction. The passage states: "Research has linked insufficient sleep to increased risks of obesity, diabetes, cardiovascular disease, and even Alzheimer's disease" and "Sleep loss also impairs immune function, with studies showing that people who sleep less than six hours per night are four times more likely to catch a cold." This links sleep restriction to obesity, diabetes, cardiovascular disease, Alzheimer's, and impaired (not improved) immune function. Choice (B) states "improved immune function," which contradicts the passage—sleep loss impairs immune function. Choices (A), (C), and (D) are all mentioned as linked to sleep restriction.

Science (Optional)

1. A. The question asks for the independent variable in Experiment 1. The independent variable is what the researcher manipulates or changes. In this experiment, researchers controlled whether participants received caffeine or placebo—this was the variable they deliberately changed to see its effect. Choice (B) reaction time is the dependent variable (what they measured as a result). Choice (C) number of trials was kept constant at 50 for all participants. Choice (D) caffeine tolerance was controlled by selecting only low-tolerance participants, not varied within Experiment 1.

2. B. The question asks for the improvement difference between caffeine and placebo groups. The passage states: "participants who consumed caffeine had an average reaction time improvement of 45 milliseconds" and "Participants who consumed the placebo showed an average improvement of only 8 ms." The difference is $45 - 8 = 37$ ms. Choice (A) 8 ms is just the placebo improvement alone. Choice (C) 45 ms is just the caffeine improvement alone. Choice (D) 53 ms incorrectly adds the two values.

3. B. The question asks why researchers used double-blind design. Double-blind design (where neither participants nor administrators know who received which treatment) is used to reduce bias and placebo effects. If participants knew they received caffeine, they might expect to perform better and actually perform better due to expectations rather than caffeine's chemical effects. Similarly, if administrators knew, they might unconsciously treat groups differently. Choice (A) is incorrect—double-blind design

actually takes more effort, not less time. Choice (C) is unrelated to dose safety. Choice (D) is wrong—participants received different treatments (caffeine vs. placebo), but neither they nor administrators knew which.

4. C. The question asks which conclusion is supported by Experiments 1 and 2. Experiment 1 showed low-tolerance participants improved by 45 ms with caffeine vs. 8 ms with placebo (37 ms difference). Experiment 2 showed regular consumers improved only 12 ms with caffeine vs. 0 ms with placebo (12 ms difference). This clearly demonstrates low-tolerance individuals showed greater improvement. Choice (A) is contradicted by both experiments showing effects. Choice (B) is too extreme—regular consumers still showed some benefit. Choice (D) is contradicted by Experiment 3 showing side effects at higher doses.

5. C. The question asks why Experiment 2 placebo participants showed no improvement while Experiment 1 placebo participants improved 8 ms. The passage doesn't explicitly explain this difference. It mentions "practice effects" for Experiment 1, but doesn't say why Experiment 2 had no practice effect. Choice (B) offers a possible explanation but isn't stated in the passage. The most accurate answer is that the passage doesn't provide enough information to determine the reason with certainty.

6. B. The question asks what the side effects in Experiment 3 suggest. The passage states that participants receiving 400 mg "reported side effects including jitteriness, increased heart rate, and difficulty concentrating, which may have limited the improvement in reaction time despite the higher dose." This suggests very high doses produce negative effects that limit cognitive benefits. Choice (A) is too extreme—the passage doesn't say it's too high for everyone. Choice (C) is too broad—regular consumers can consume additional caffeine, just perhaps not 400 mg. Choice (D) is backward—side effects limited improvement.

7. A. The question asks about experimental design for testing time-of-day effects. To isolate time of day as a variable, you would need to test participants at different times while keeping the caffeine dose constant—this allows you to see if the same dose has different effects at different times. Choice (B) would test dose effects, not time effects. Choice (C) unnecessarily limits to one population type. Choice (D) eliminates the caffeine variable entirely, making it impossible to study caffeine's effects.

8. B. The question asks at which pH plants showed greatest height. The passage explicitly states: "Plants grown in pH 6.5 soil showed the greatest average height (45 cm)." All other pH levels produced shorter plants.

9. B. The question asks which nutrient showed the most dramatic decline below pH 6.0. The passage states: "nitrogen availability remained relatively constant across all pH levels. However, phosphorus availability was highest at pH 6.5 and declined dramatically at pH levels below 6.0 or above 7.5. Potassium availability was high across pH 5.5-7.5 but very low at pH 4.5 and 8.5." Phosphorus is specifically described as declining "dramatically" below 6.0. Choice (A) is wrong because nitrogen remained constant. Choice (C) potassium remained high until more extreme pH (4.5). Choice (D) is contradicted by nitrogen remaining constant.

10. B. The question asks what the matching patterns support. If phosphorus and potassium availability patterns match plant growth patterns, this suggests limited availability of these nutrients restricts growth.

The passage notes both nutrients declined at extreme pH where growth was also poorest. Choice (A) is contradicted—nitrogen remained constant but growth still varied, suggesting it's not the only important nutrient. Choice (C) is opposite to what was found. Choice (D) is contradicted by data showing pH 6.5 (slightly acidic) was optimal.

11. B. The question asks the purpose of the no-fertilizer control group. Scientific experiments use control groups to provide a baseline for comparison. The unfertilized plants show what growth would be at those pH levels without intervention, allowing researchers to measure whether fertilizer made a difference. Choice (A) about cost is not a scientific reason. Choice (C) misunderstands—all plants received water; the question is whether added phosphorus helped. Choice (D) is wrong—pH was already extreme; water doesn't change pH significantly.

12. C. The question asks which statement is best supported by all experiments. Experiment 1 showed optimal growth at pH 6.5. Experiment 2 showed this was where phosphorus and potassium availability were highest. Experiment 3 showed that even with added phosphorus, extreme pH still produced suboptimal growth. Together, these support that optimal pH maximizes both nutrient availability and growth. Choice (A) is contradicted by Experiment 3—fertilizer helped but didn't eliminate pH effects. Choice (B) is wrong—nitrogen stayed constant. Choice (D) is contradicted by data showing pH 6.5 (slightly acidic) was best.

13. B. The question asks why fertilized plants at extreme pH still underperformed pH 6.5 plants. The passage states that adding phosphorus improved growth at extreme pH but "these plants still did not grow as tall as plants in optimal pH 6.5 soil without any fertilizer." This suggests phosphorus wasn't the only limiting factor. Experiment 2 showed both phosphorus AND potassium were limited at extreme pH, and there may be other factors as well. Choice (A) has no evidence. Choice (C) is unsupported and undermines the whole experiment. Choice (D) has no evidence of measurement error.

14. B. The question asks which pH a gardener should choose between 5.5 and 7.5. Experiment 1 showed plants at pH 5.5 averaged 32 cm while plants at pH 7.5 averaged 35 cm. Therefore pH 7.5 produced taller plants. Choice (A) has the heights reversed. Choice (C) is wrong—they produced different results. Choice (D) is too extreme—both produced reasonable growth, just not optimal.

15. B. The question asks for CO₂ concentration in 1960. Looking at Table 1, the row for 1960 shows 317 ppm. Direct reading from the table.

16. C. The question asks how CO₂ changed from 1880 to 2020. Table 1 shows: 1880 = 290 ppm, 1900 = 295 ppm, 1920 = 303 ppm, 1940 = 310 ppm, 1960 = 317 ppm, 1980 = 339 ppm, 2000 = 370 ppm, 2020 = 415 ppm. The concentration increased at every measurement interval, showing steady increase. Choice (A) is opposite. Choice (B) is contradicted by the changing values. Choice (D) is wrong—it never decreased.

17. C. The question asks for the 2020 temperature anomaly. Table 1 shows the 2020 row has +1.02°C in the temperature anomaly column. Choice (D) +415°C incorrectly uses the CO₂ value.

18. B. The question asks about the relationship between CO₂ and temperature. Looking at Table 1, as CO₂ increased from 290 ppm (1880) to 415 ppm (2020), temperature anomaly increased from -0.15°C to

+1.02°C. There are minor fluctuations (1920 was slightly cooler than 1900), but the overall trend is clear: rising CO₂ corresponds with rising temperature. Choice (A) is opposite. Choice (C) is wrong—there's a clear pattern. Choice (D) is opposite.

19. A. The question asks which natural process removes most CO₂. Table 2 shows: Plant photosynthesis removes 120 billion tons, Ocean absorption removes 92 billion tons. Photosynthesis removes the most. Choices (C) and (D) are processes that add CO₂, not remove it.

20. C. The question asks for total human contribution. Table 2 shows: Fossil fuel burning adds 10 billion tons, Deforestation adds 1 billion ton. Total = 10 + 1 = 11 billion tons. Choice (A) is deforestation only. Choice (B) is fossil fuels only. Choice (D) is photosynthesis, not human activities.

21. C. The question asks about the difference between natural removal and addition. Natural removal = photosynthesis (120) + ocean absorption (92) = 212 billion tons. Natural addition = respiration (118) + ocean release (90) = 208 billion tons. Removal exceeds addition by 212 - 208 = 4 billion tons. Choice (A) has the wrong amount. Choice (B) has the direction reversed. Choice (D) is close but they differ by 4 billion tons.

22. B. The question asks which statement is consistent with both tables. Table 2 shows humans add 11 billion tons of CO₂ annually, which seems small compared to natural fluxes of ~120 billion tons. However, Table 2 also shows natural removal (212) exceeds natural addition (208) by only 4 billion tons. Humans add 11 billion tons, but natural removal hasn't increased proportionally, so CO₂ accumulates. This is consistent with Table 1 showing CO₂ increasing over time. Choice (A) is wrong—natural processes alone can't explain it because they were balanced before human input. Choice (C) is contradicted by Table 2 showing ocean absorption at 92 billion tons. Choice (D) oversimplifies causation in a complex system.

23. B. The question asks which concentration completely eliminated bacteria. The passage states: "At 10 µg/mL and 20 µg/mL, no colonies survived." This means 10 µg/mL and higher resulted in complete elimination. Choice (A) is wrong because 5 µg/mL still had 3 survivors. Choice (C) is wrong because 1 µg/mL had 50 survivors. Choice (D) is too restrictive—both 10 and 20 eliminated all bacteria.

24. B. The question asks about Experiment 2's primary purpose. The passage states: "To test whether the surviving bacteria from Experiment 1 had indeed developed resistance... This demonstrated that the resistance trait was heritable—passed from parent bacteria to offspring." The experiment tested heritability of resistance. Choice (A) is not the main purpose. Choice (C) is opposite to the findings. Choice (D) describes part of the procedure, not the purpose.

25. B. The question asks why second-generation bacteria showed increased resistance. Experiment 2 showed that bacteria descended from resistant survivors inherited resistance traits. This is stated explicitly: "This demonstrated that the resistance trait was heritable—passed from parent bacteria to offspring." Choice (A) temperature was kept constant at 37°C. Choice (C) has no evidence—fresh ampicillin was used. Choice (D) is wrong—they were descendants of the same E. coli strain.

26. B. The question asks for the independent variable in Experiment 3. The researcher manipulated whether bacteria were exposed to low-dose antibiotics (Group B) or not (Group A) during their 20 generations of growth. This was the deliberate difference between groups. Choice (A) was kept constant

at 20 generations for both groups. Choice (C) was kept constant at 10 µg/mL for final testing. Choice (D) is the dependent variable (what was measured).

27. C. The question asks why 0.5 µg/mL was described as "sub-lethal." The passage states: "0.5 µg/mL ampicillin (a concentration low enough that most bacteria survived) for 20 generations." Sub-lethal means below the lethal (killing) dose—enough to create pressure but not enough to kill most bacteria. The passage also says it was "low enough that most bacteria survived." Choice (A) is opposite—sub-lethal means it didn't kill all. Choice (B) is wrong—it contained active antibiotic. Choice (D) describes duration, not the meaning of sub-lethal.

28. B. The question asks which group showed more survivors. The passage states: "Group A (never exposed to antibiotics) showed almost no survival—only 1 colony out of 1 million bacteria survived. Group B (repeatedly exposed to low-dose antibiotics) showed significantly more survival—approximately 150 colonies per million bacteria survived." Group B clearly had more survivors (150 vs. 1). Choice (A) is opposite. Choices (C) and (D) are contradicted by the data.

29. B. The question asks which conclusion is supported by all three experiments. Experiment 1 showed rare random mutations allowed some survival. Experiment 2 showed resistance was heritable. Experiment 3 showed continuous low-dose exposure accelerated resistance development. Together, these support that resistance develops through mutations and is accelerated by exposure. Choice (A) is contradicted by all experiments showing resistance developing. Choice (C) is contradicted by Experiment 1 showing most bacteria dying. Choice (D) is opposite—bacteria become stronger (more resistant), not weaker.

30. D. The question asks which practice would slow resistance development. Experiment 3 showed that sub-lethal doses (Group B) accelerated resistance by continuously selecting for resistant bacteria. The lesson is to avoid sub-lethal exposure. Using the full prescribed dose completely eliminates the infection, leaving no bacteria alive to develop resistance. Choice (A) describes sub-lethal dosing, which Experiment 3 showed accelerates resistance. Choice (B) creates unnecessary exposure. Choice (C) is the dangerous practice of stopping antibiotics early, leaving some bacteria alive under sub-lethal exposure—exactly what Experiment 3 showed accelerates resistance.

31. A. The question asks what Scientist 1 considers the key factor for consciousness. The passage states: "Consciousness arises when information is integrated across multiple parts of the brain in a specific way. The key is not just neural activity, but the way different brain regions communicate and combine information." Integration of information is explicitly identified as the key factor. Choice (B) is contradicted—the passage notes it's not about speed. Choice (C) is contradicted by the cerebellum example showing neuron quantity isn't enough. Choice (D) is never mentioned.

32. C. The question asks what the cerebellum example demonstrates for Scientist 1. The passage states: "The cerebellum, despite having even more neurons than the cortex, has a simpler, more repetitive structure with less integration, and doesn't produce consciousness even though it's essential for movement control." This shows that having many neurons isn't sufficient—structure and integration matter more. Choice (A) is opposite. Choice (B) is contradicted—the cerebellum has many neurons but no consciousness. Choice (D) makes an incorrect comparison about importance.

33. B. The question asks when consciousness occurs according to Scientist 2. The passage states: "Consciousness emerges when information from these specialized modules is broadcast to a 'global workspace'—a network of neurons distributed across the cortex that makes information available to multiple cognitive processes simultaneously." Broadcasting to global workspace is when consciousness occurs. Choice (A) describes unconscious processing. Choice (C) is opposite to the theory. Choice (D) describes what happens before consciousness.

34. B. The question asks which theory explains limited conscious awareness. Scientist 2 explicitly addresses this: "This explains the limited capacity of consciousness: we can only be consciously aware of a small amount of information at once because the global workspace has limited capacity." This directly explains limited awareness through workspace capacity. Scientist 1 discusses integration but doesn't specifically address capacity limits. Scientist 3 doesn't address this specific phenomenon.

35. A. The question asks what Scientist 3 compares to studying individual neurons. The passage states: "Just as 'wetness' emerges from water molecules but cannot be predicted by studying individual H₂O molecules, consciousness emerges from brain activity but represents something fundamentally new that appears at a certain level of complexity... This doesn't mean consciousness is mystical or non-physical—it's still produced by the brain. But it means the relationship between neural activity and conscious experience may involve principles we don't yet understand. Current neuroscience is like trying to understand computer software by examining the silicon chips—you'll see electrical activity but miss the higher-level organization." The wetness/water molecules analogy shows that studying individual components is insufficient for understanding emergent properties. Choice (B) is opposite to the scientist's view. Choices (C) and (D) don't relate to the analogies used.

36. B. The question asks where Scientists 1 and 2 would agree. Both propose specific neural mechanisms to explain consciousness—Scientist 1 focuses on integrated information, Scientist 2 on global broadcasting. Both believe consciousness can be explained through neural mechanisms and information processing. Scientist 3 is the one who differs by suggesting current neuroscience may be insufficient. Choice (A) is where they disagree—Scientist 1 suggests simple organisms might have rudimentary consciousness while Scientist 2 says they "almost certainly lack" the required architecture. Choice (C) is Scientist 3's view, not 1 and 2's. Choice (D) is contradicted by both scientists emphasizing the cortex.

37. C. The question asks which scientist is LEAST specific about neural mechanisms. Scientist 1 describes specific mathematical measures of integrated information. Scientist 2 describes specific broadcasting networks in the cortex. Scientist 3 explicitly states: "we may never fully understand consciousness by studying neurons... the relationship between neural activity and conscious experience may involve principles we don't yet understand" and is "more humble than the others, acknowledging that consciousness may require new scientific concepts we haven't developed yet." Scientist 3 is deliberately less specific about mechanisms.

38. C. The question asks what Scientist 1 would predict for AI consciousness. Since Scientist 1's theory is based on integrated information, consciousness would arise if AI "integrates information across its components in complex, unified ways." The passage states: "Even simple organisms with basic nervous systems may have rudimentary consciousness if they integrate information, while a supercomputer running complex programs has no consciousness because its processing, though fast, doesn't truly integrate information in the required way." This suggests integrated processing, not speed or quantity,

matters. Choice (A) focuses on speed, which the theory says doesn't matter. Choice (B) focuses on processor quantity, similar to neuron quantity which isn't sufficient. Choice (D) is not part of the theory—it's about integration, not biological hardware.

39. B. The question asks how Scientist 2 would explain "autopilot" driving. The passage provides this example: "When you drive a familiar route while thinking about something else, your brain's motor and visual modules handle driving automatically without entering the global workspace. Only novel or important information—like a child running into the street—gets broadcast globally and enters consciousness." This explains driving modules operating unconsciously with only novel events entering consciousness. Choice (A) is contradicted by the theory explicitly addressing this. Choice (C) misinterprets the phenomenon. Choice (D) oversimplifies and is inaccurate—multiple modules are involved.

40. C. The question asks which theory is most difficult to test. Scientist 1's theory can be tested with mathematical measures of integrated information. Scientist 2's theory can be tested with brain imaging showing global broadcasting. Scientist 3's passage explicitly states: "Critics argue this theory is less testable than the others because it doesn't make specific predictions about neural mechanisms" and suggests "consciousness may require new scientific concepts we haven't developed yet... it may simply be harder to explain than other biological phenomena because it operates at an emergent level our current methods aren't designed to capture." This clearly identifies Scientist 3's theory as hardest to test with current methods.

Writing (Optional)

SAMPLE ESSAY #1: HIGH-SCORING RESPONSE (Score Range: 10-12)

Student Response to "Artificial Intelligence in Education"

The introduction of calculators into mathematics classrooms sparked fierce debate in the 1970s. Teachers worried that students would become dependent on technology and lose their ability to perform basic arithmetic. Today, calculators are ubiquitous in education, and we've learned that the real question was never whether to use them, but how. The current debate over artificial intelligence in education follows a similar pattern, but the stakes are considerably higher. AI systems don't just compute—they reason, write, and adapt. As we navigate this technological shift, Perspective Three's balanced approach offers the most practical wisdom: we need strategic integration that leverages AI's strengths while preserving the essential human elements of learning.

Perspective One's enthusiasm for AI reflects an important truth: resisting transformative technology rarely serves students well. The comparison to calculators is apt—once we accepted that mathematical understanding matters more than computational speed, calculators became tools that enhanced rather than diminished learning. Similarly, AI could free students from tedious tasks and allow them to engage with

more complex challenges. A student using AI to check grammar in early drafts can focus more energy on developing persuasive arguments and organizing ideas effectively. AI tutoring systems that provide immediate feedback on practice problems allow students to identify misconceptions quickly, something a teacher managing thirty students simultaneously cannot always do. Moreover, Perspective One correctly notes that students will encounter AI throughout their careers. Teaching them to use these tools ethically and effectively is arguably as important as teaching traditional skills.

However, Perspective One's optimism overlooks crucial distinctions that Perspective Two illuminates. Not all educational tasks are equivalent, and not all struggles are mere tedium to be eliminated. When a student wrestles with a difficult concept, trying multiple approaches before achieving understanding, something valuable occurs beyond acquiring information—they develop persistence, metacognitive awareness, and problem-solving resilience. If AI provides immediate solutions to challenging problems, students may never develop the capacity to tolerate frustration and work through difficulty, traits essential for both academic success and life beyond school. Furthermore, Perspective Two's emphasis on human relationships in education addresses something Perspective One entirely ignores: teachers don't just deliver content, they mentor, inspire, and provide emotional support. A struggling student may need encouragement more than explanation, and no algorithm can replicate the impact of a teacher who believes in them.

Yet Perspective Two's call for strict limitations risks leaving students unprepared for a world already transformed by AI. Completely restricting AI access in education while students encounter it everywhere else creates an artificial bubble that will eventually burst. When a college freshman who was shielded from AI throughout high school suddenly has unlimited access, they may lack the judgment to use it appropriately. Additionally, Perspective Two doesn't acknowledge that AI can democratize education in ways human teachers alone cannot. AI tutoring systems can provide personalized support to students in underfunded schools with high student-teacher ratios, partially compensating for resource inequities. For students with learning disabilities, AI tools can provide accommodations—text-to-speech, organizational support, multi-sensory presentations—that enhance access without requiring constant teacher intervention.

Perspective Three's balanced approach, while less ideologically satisfying than either extreme position, offers the most practical path forward. The key insight is that different educational activities serve different purposes and therefore warrant different approaches to AI integration. Practice exercises where students drill skills they've already learned are well-suited to AI: immediate feedback accelerates improvement, and the practice itself, not the struggle, is the point. A student practicing Spanish verb conjugations benefits from instant correction without needing to wait for a teacher to grade the assignment. Similarly, AI accessibility tools for students with disabilities remove barriers without diminishing learning—the goal is accessing content, not struggling with the interface.

However, tasks that develop core competencies should remain largely AI-free, at least until students demonstrate proficiency. A middle school student learning to write persuasive essays needs to struggle through developing a thesis, organizing arguments, and finding evidence. Having AI generate an outline or suggest thesis statements short-circuits the cognitive work that builds writing ability. Once students can write effectively on their own, they might appropriately use AI as one tool among many, but only after establishing independent capability.

The challenge lies in implementation. How do schools distinguish between appropriate and inappropriate AI use? How do they enforce these distinctions when students have AI-enabled devices in their pockets? These practical questions don't have simple answers, but they don't invalidate the principle of strategic, purposeful integration. Schools might designate certain assignments as "AI-assisted" where technology use is expected and others as "foundational skills" where it's prohibited. Teachers can assign in-class writing to ensure work represents student capability while allowing AI-assisted revision at home. Assessment methods might evolve to evaluate skills AI cannot easily replicate—oral defenses of written work, collaborative problem-solving, creative projects that require human judgment.

The deeper issue Perspective Three's approach addresses is preparing students for a world where human intelligence and artificial intelligence coexist. Students need what we might call "AI literacy"—understanding both when to use AI and when to set it aside, recognizing its limitations and biases, and maintaining skills that keep them capable even without technological support. This parallels how we approach calculators now: students learn the underlying mathematics first, then use calculators for efficiency when appropriate, and understand that they need to maintain some mental math capability to catch calculator errors or estimate reasonableness.

Opponents of this balanced approach might argue that anything less than full embrace or full prohibition creates confusion, but education is inherently complex and resists binary solutions. We already navigate similar tensions with other technologies and resources. Students can use dictionaries during writing but not during spelling tests. They can collaborate on some projects but not others. They can access the internet for research papers but not during exams. Teachers and students manage these boundaries daily, and AI requires the same contextual judgment rather than blanket rules.

The comparison to past educational technology debates is instructive but imperfect. AI is more powerful and more potentially disruptive than calculators or word processors. It can perform cognitive tasks previously assumed to be distinctly human. This makes the stakes higher and the need for wisdom in implementation more urgent. But the fundamental principle remains sound: education must prepare students for the world they'll inhabit, not preserve the world educators once knew. That world will include AI, and students who understand how to think both with and without it will be better equipped than those who experienced only prohibition or only uncritical adoption.

In conclusion, while Perspectives One and Two offer valuable insights—enthusiasm for technology's potential and concern for preserving what's essentially human in education—Perspective Three's balanced approach provides the framework we need. Strategic AI integration that distinguishes between tasks where technology enhances learning and activities where human struggle is the point honors both the transformative potential of AI and the timeless truths about how people learn and grow. The goal isn't to resolve tension between technology and tradition, but to navigate it thoughtfully, ensuring that each student develops both the technological fluency to thrive in an AI-integrated world and the fundamental capabilities that make them educated human beings regardless of what tools they have access to.

SCORING ANALYSIS - SAMPLE ESSAY #1

Overall Score: 11-12 (out of 12)

IDEAS AND ANALYSIS: 6/6

Strengths:

- Generates nuanced, insightful analysis of all three perspectives
- Develops a sophisticated thesis that acknowledges complexity while taking a clear position
- Explores implications and tensions between perspectives thoughtfully
- Introduces the concept of "AI literacy" as an original contribution to the discussion
- Examines the issue from multiple angles (pedagogical, practical, ethical, developmental)
- Shows deep critical thinking about when and why different approaches matter

Key Evidence:

- "Not all educational tasks are equivalent, and not all struggles are mere tedium to be eliminated"
 - "Students need what we might call 'AI literacy'—understanding both when to use AI and when to set it aside"
 - Recognition that the debate parallels but differs from past technology debates
-

DEVELOPMENT AND SUPPORT: 6/6

Strengths:

- Provides specific, relevant examples throughout (Spanish verb practice, in-class vs. homework writing, calculator history)
- Uses examples to advance arguments rather than just illustrate
- Develops ideas fully with detailed reasoning
- Addresses counterarguments effectively
- Each body paragraph develops a clear central idea with thorough support
- Examples range from historical (calculators), practical (implementation strategies), to theoretical (cognitive development)

Key Evidence:

- Calculator analogy developed throughout essay
 - Specific implementation suggestions (in-class writing, oral defenses)
 - Concrete examples of appropriate vs. inappropriate AI use
 - Detailed explanation of how struggle develops resilience and metacognition
-

ORGANIZATION: 6/6

Strengths:

- Clear, engaging introduction that establishes context and thesis
- Logical progression: first analyzes each perspective, then synthesizes into balanced position
- Smooth transitions between ideas ("However," "Yet," "The deeper issue")
- Unified essay with each paragraph contributing to central argument
- Strong conclusion that synthesizes ideas rather than merely repeating them
- Paragraphs organized around clear central ideas
- Effective use of topic sentences to guide reader

Key Evidence:

- Each paragraph begins with clear topic sentence
 - Ideas flow logically from one to the next
 - Introduction's calculator analogy returns throughout essay as unifying thread
 - Conclusion expands rather than simply restates
-

LANGUAGE USE AND CONVENTIONS: 5-6/6

Strengths:

- Sophisticated vocabulary used precisely (ubiquitous, metacognitive, democratize, ideologically)
- Varied sentence structure (simple, compound, complex) maintains engagement
- Effective use of rhetorical techniques (parallelism, rhetorical questions)
- Few if any errors in grammar, usage, or mechanics
- Tone is formal but accessible
- Strong command of language conventions throughout

Key Evidence:

- Complex sentences handled skillfully: "When a student wrestles with a difficult concept, trying multiple approaches before achieving understanding, something valuable occurs beyond acquiring information—they develop persistence, metacognitive awareness, and problem-solving resilience."
 - Effective parallelism: "teachers don't just deliver content, they mentor, inspire, and provide emotional support"
 - Precise word choice throughout
-

SAMPLE ESSAY #2: MID-RANGE RESPONSE (Score Range: 7-8)

Student Response to "Artificial Intelligence in Education"

Artificial intelligence is becoming more common in schools, and people disagree about whether this is good or bad. Some people think AI should be used a lot in education, while others think it should barely be used at all. I believe that Perspective Three makes the most sense because it takes a balanced approach to using AI in schools.

Perspective One says that AI should be fully embraced in education. This perspective makes some good points. AI can help students learn at their own pace, and it can grade assignments quickly so teachers have more time to actually teach. The perspective compares AI to calculators, which is a good comparison because calculators are very useful in math class. Also, students will use AI in their future jobs, so they should learn how to use it in school. This makes sense because schools should prepare students for the real world.

However, Perspective Two raises important concerns about using too much AI. This perspective says that struggling with assignments is actually important for learning. If AI does all the hard work, students won't learn as much. I agree with this because I know from my own experience that I learn the most when I have to figure things out myself. Also, teachers provide support and encouragement that computers can't give. My favorite teacher always knew when I was having a bad day and would help me feel better, and AI can't do that. Human connection is important in education.

Perspective Three offers a balanced solution by saying we should use AI for some things but not everything. This makes the most sense to me because both technology and human teachers have important roles to play. AI should be used when it clearly helps, like giving quick feedback on practice problems or helping students with disabilities access material. But the main learning activities should not use AI because students need to develop their own skills.

I think the balanced approach is best for several reasons. First, it lets us get the benefits of AI without losing the important parts of education. For example, AI could grade multiple choice quizzes, but teachers should grade essays because essays require human judgment. Second, this approach teaches students when to use technology and when to rely on their own abilities. This is an important skill for life. Third, a balanced approach can help more students succeed. Students who need extra help can get it from AI tutors when their teacher is busy with other students.

Some people might argue that a balanced approach is too complicated or confusing. They might say it's easier to just use AI for everything or not use it at all. However, education is already complicated, and teachers already make decisions about when to use different tools. Adding AI to the mix isn't that much more difficult.

In conclusion, I believe Perspective Three's balanced approach is the best option for integrating AI in education. While Perspectives One and Two both make valid points, the middle ground allows us to use AI's benefits while preserving what makes education valuable. Schools should embrace AI where it helps

but keep the human elements that are essential for real learning. This way, students can learn to be successful in a world with AI while still developing the critical thinking and resilience they need.

SCORING ANALYSIS - SAMPLE ESSAY #2

Overall Score: 7-8 (out of 12)

IDEAS AND ANALYSIS: 4/6

Strengths:

- Addresses all three perspectives
- Takes a clear position
- Shows some analysis of the perspectives

Weaknesses:

- Analysis tends toward summary rather than deep evaluation
- Limited exploration of complexity and nuance
- Ideas are somewhat general and predictable
- Could develop more original insights
- Relationships between perspectives could be explored more deeply

Key Evidence:

- "This perspective makes some good points" (summary rather than analysis)
 - Personal example about learning is relevant but not deeply developed
 - Limited examination of implications beyond surface level
-

DEVELOPMENT AND SUPPORT: 4/6

Strengths:

- Provides some relevant examples (calculator comparison, multiple choice vs. essays)
- Uses personal experience appropriately
- Attempts to support each main point

Weaknesses:

- Examples are somewhat general and underdeveloped
- Could provide more specific, detailed support
- Some points are asserted rather than thoroughly explained

- Personal example is brief and could be expanded
- Counterargument paragraph is thin

Key Evidence:

- "For example, AI could grade multiple choice quizzes, but teachers should grade essays" (example given but not fully developed)
 - Personal teacher anecdote is appropriate but brief
 - More depth would strengthen the essay significantly
-

ORGANIZATION: 4/6

Strengths:

- Clear structure with introduction, body paragraphs, and conclusion
- Logical progression through the three perspectives
- Topic sentences generally guide the reader
- Conclusion summarizes main ideas

Weaknesses:

- Transitions are sometimes mechanical ("However," "Also")
- Some paragraphs could be better connected
- Organization is functional but not sophisticated
- Introduction could be more engaging
- Conclusion mostly repeats rather than synthesizes

Key Evidence:

- Paragraph structure is clear but predictable
 - "This makes sense because..." is repetitive
 - Could use more sophisticated transitional phrases
-

LANGUAGE USE AND CONVENTIONS: 4/6

Strengths:

- Generally clear communication
- Few distracting errors
- Appropriate academic tone maintained
- Sentences are grammatically correct

Weaknesses:

- Sentence structure is somewhat simple and repetitive
- Vocabulary is appropriate but not sophisticated
- Could vary sentence length and structure more
- Some informal language ("a lot," "actually")
- Writing is competent but not polished

Key Evidence:

- Many sentences follow simple subject-verb-object pattern
 - Limited vocabulary range (frequent use of "important," "good," "makes sense")
 - "This makes sense" appears multiple times
 - Could demonstrate stronger command of language
-

COMPARISON AND LEARNING POINTS

What Makes Essay #1 Score Higher?

1. Depth of Analysis

- Essay #1: "Not all educational tasks are equivalent, and not all struggles are mere tedium to be eliminated"
- Essay #2: "struggling with assignments is actually important for learning"
- **Difference:** Essay #1 makes distinctions and explores nuance; Essay #2 states general truths

2. Sophistication of Examples

- Essay #1: Provides specific implementation strategies, historical context, and explores implications
- Essay #2: Gives basic examples without deep development
- **Difference:** Essay #1's examples advance the argument; Essay #2's examples merely illustrate

3. Organization

- Essay #1: Ideas flow organically with sophisticated transitions; calculator analogy creates unity
- Essay #2: Clear structure but mechanical transitions and predictable organization
- **Difference:** Essay #1 feels cohesive; Essay #2 feels formulaic

4. Language

- Essay #1: Varied syntax, precise vocabulary, engaging prose
- Essay #2: Competent but simple sentences, repetitive vocabulary
- **Difference:** Essay #1 demonstrates command of language; Essay #2 is functional but basic

5. Critical Thinking

- Essay #1: Explores tensions, introduces new concepts, addresses complexity
 - Essay #2: States positions, provides support, addresses counterarguments
 - **Difference:** Essay #1 shows insight; Essay #2 shows understanding
-

KEY TAKEAWAYS FOR TEST-TAKERS

To Move from Mid-Range to High-Scoring:

1. Go Beyond Summary

- Don't just explain what each perspective says
- Analyze why someone might hold that view and what its limitations are
- Explore implications and tensions

2. Develop Examples Fully

- Don't just state examples; explain how they support your argument
- Use examples to explore complexity, not just illustrate obvious points
- Draw connections between examples and larger ideas

3. Show Original Thinking

- Introduce concepts or frameworks that weren't in the prompt
- Make unexpected connections
- Take a position that shows you've thought deeply about the issue

4. Vary Your Sentences

- Mix simple, compound, and complex sentences
- Use different sentence openings
- Vary sentence length for rhythm and emphasis

5. Use Precise Vocabulary

- Choose words that convey exactly what you mean
- Avoid repetition by using synonyms appropriately
- Demonstrate range without sounding forced

6. Create Unity

- Use a central metaphor or example throughout (like the calculator in Essay #1)
- Make sure each paragraph connects to your thesis

- Write a conclusion that synthesizes rather than repeats

7. Address Complexity

- Acknowledge that issues are multifaceted
- Explore tensions rather than resolving them simplistically
- Show that you understand nuance