FULL-LENGTH PRACTICE TESTS 13

English Test

35 Minutes — 50 Questions

Directions: Each passage has certain words and phrases that are underlined and numbered. The questions in the right column will provide alternatives for the underlined segments. Most questions require you to choose the answer that makes the sentence grammatically correct, concise, and relevant. If the word or phrase in the passage is already the correct, concise, and relevant choice, select Choice A, NO CHANGE. Some questions will ask a question about the underlined segment. When a question is presented, choose the best answer.

Some questions will ask about part or all of the passage. These questions do not refer to a specific underlined segment. Instead, these questions will accompany a number in a box.

For each question, choose your answer and fill in the corresponding bubble on your answer sheet. Read the passage once before you answer the questions. You will o en need to read several sentences beyond the underlined portion to be able to choose the correct answer. Be sure to read enough to answer each question.

Passage I

Origins of Urban Legends

[1]

Since primitive times, societies have created, and told[1] legends. Even before the development of written language, cultures would orally pass down these popular stories. The legends were told and retold, passing from generation to generation.

[2]

[2] The stories served the dual purpose of entertaining audiences and of transmitting values and beliefs. Indeed[3] today we have many more permanent ways of handing down our beliefs to future generations, we continue to create and tell legends. In our technological society, a new form of folktale has emerged: the[4] urban legend.

[3]

Urban legends are stories we all have heard; they are supposed to have really happened, but are never verifiable. It seems that the people involved can never be found. Researchers of the urban legend call the elusive participant in such supposed "real-life" events a FOAF; a Friend of a Friend.[5] [A]

[4]

Urban legends have some characteristic features. They are often humorous in nature with a surprise ending and a conclusion. [B] One such legend is the tale of the hunter who was returning home from an unsuccessful hunting trip. On his way home, he accidentally hit and killed a deer on a deserted highway. Even though he knew it was illegal, he decided to keep the deer, and he loads it in the back of his station wagon. As the hunter continued driving, the deer, he was only temporarily knocked unconscious by the car, woke up and began thrashing around. The hunter panicked, stopped the car, ran to hide in the roadside ditch, and watched the enraged deer destroy his car.

[5]

[C] One legend involves alligators in the sewer systems of major metropolitan areas. According to the story, before alligators were a protected species, people vacationing in tropical locations purchased baby alligators to take home as souvenirs.

After the pet alligators proved to be nuisances, many people heartlessly discarded their alligators.

Legend has it that the baby alligators found a perfect growing and breeding environment in city sewer systems, where they thrive to this day on the ample supply of rats.

[6]

In addition to urban legends that are told from friend to friend, a growing number of urban legends are passed along through the Internet and email. One of the most popular stories are about[11] a woman who was unwittingly charged $100 for a cookie recipe she requested at an upscale restaurant. To get her money's worth, this woman supposed[12] copied the recipe for the delicious cookies and forwarded it via email to everyone she knew. [D]

[7]

Although today's technology enhances our ability to tell and retell urban legends, the Internet can also serve as a monitor of urban legends. Dedicated to commonly told urban legends, research is done by many websites.[13]

According to those websites, most legends, including the ones told here, have no basis in reality.

1. A. NO CHANGE
   B. created then subsequently told
   C. created and told
   D. created, and told original

2. The writer wants to add a sentence that describes the different kinds of oral stories told by these societies. Which of the following true statements would most clearly and effectively accomplish the writer's goal?

   F. These myths and tales varied in substance, from the humorous to the heroic.
   G. These myths and tales were often recited by paid storytellers.
   H. Unfortunately, no audio recording of the original myths and tales exists.
   J. Sometimes it took several evenings for the full story to be recited.

3. A. NO CHANGE
   B. However,
   C. Because
   D. Although

4. F. NO CHANGE
   G. it is called the
   H. it being the
   J. known as the

5. A. NO CHANGE
   B. FOAF . . . a Friend of a Friend.
   C. FOAF a Friend of a Friend.
   D. FOAF: a Friend of a Friend.

6. F. NO CHANGE
   G. ending.
   H. ending, which is a conclusion.
   J. ending or conclusion.

7. A. NO CHANGE
   B. loaded it in
   C. is loading it in
   D. had loaded it in

8. F. NO CHANGE
   G. which being
   H. that is
   J. which was

9. A. NO CHANGE
   B. species; people
   C. species. People
   D. species people

10. Which choice maintain's the essays humorous tone and most clearly conveys the legend being described at this point in the essay?

F. NO CHANGE
G. When pet alligators turned out to be less fun than many people assume, their owners got rid of them.
H. Once people deduced that alligators were unsafe companions, they resorted to using industrial plumbing to dispose of the reptiles, disseminating the creatures among miles of municipal distribution pipes.
J. After the novelty of having a pet alligator wore off, many people flushed their baby souvenirs down city toilets.

11. A. NO CHANGE
B. would be about
C. is about
D. is dealing with

12. F. NO CHANGE
G. woman supposedly
H. women supposedly
J. women supposed to

13. A. NO CHANGE
    B. Many websites are dedicated to researching the validity of commonly told urban legends.
    C. Researching the validity of commonly told urban legends, many websites are dedicated.
    D. Dedicated to commonly told urban legends, the validity of them is researched by many websites.

Questions 14–15 ask about the preceding passage as a whole.

14. The writer wants to add the following sentence to the essay:

    Other urban legends seem to be designed to instill fear.

    The sentence would most logically be placed at Point:

    F. A.
    G. B.
    H. C.
    J. D.

15. Suppose the writer's primary purpose had been to compare the purposes and topics of myths and legends in primitive societies and in our modern society. Would this essay accomplish that purpose?

A. Yes, because the essay describes myths and legends from primitive societies and modern society.
B. Yes, because the essay provides explanations of possible purposes and topics of myths and legends from primitive societies and modern society.
C. No, because the essay does not provide enough information about the topics of the myths and legends of primitive societies to make a valid comparison.
D. No, because the essay does not provide any information on the myths and legends of primitive societies.

Passage II

Henry David Thoreau: A Successful Life

What does it mean to be successful? Do one[16] measure success by how much money someone earns? When[17] I told you about a man who worked as a teacher, a land surveyor, and a factory worker (never holding any of these jobs for more than a few years), would that man sound like a success to you? If I told you that he spent two solitary[18] years living alone in a small cabin that he built for himself and that he spent those years looking at plants and writing in a diary, would you think of him as a celebrity or an important figure? What if I told you that he rarely ventured far from the town where he was born—that he was thrown in[19] jail for refusing to pay his taxes, and that he died

at the age of 45? Do any of these facts seem to point to a man whose life should be studied and emulated?

You may already know about this man. You may even have read some of his writings. His name was, Henry David Thoreau and he (20) was, in addition to the jobs listed above, a poet, an essayist, a naturalist, and a social critic. Although the facts listed about him may not seem to add up to much, he was, in fact a (21) tremendously influential person. Along with writers such as Ralph Waldo Emerson, Mark Twain, and Walt Whitman, Thoreau helped to create the first literature and philosophy that most people identify as uniformly (22) American.

In 1845 Thoreau, built a cabin (23) near Walden Pond and remained there for more than two years. He lived alone, fending for himself, and observing the nature around him. He kept scrupulous notes in his diary, which he wrote in daily; he later (24) distilled those notes into his most famous work titled *Walden*.

[1] To protest slavery, Thoreau refused to pay his taxes in 1846. [2] Thoreau was a firm believer in the abolition of slavery, and he objected to

slavery's extension into the new territories of the West. [3] For this act of rebellion, he was thrown in the Concord jail. [25]

Thoreau used his writing to spread his message of resistance and activism; he published [26] an essay entitled *Civil Disobedience* (also known as *Resistance to Civil Government*). In it, he emphasized the importance of prioritizing one's consciousness over legal traditions. Thoreau was wholeheartedly unapologetic in arguing for the right to refuse to obey unjust laws.

Given that [27] Thoreau's life was very brief, his works and his ideas continue to touch and influence people. Students all over the country—all over the world—continue to read his essays and hear his unique voice, urging them to lead lives of principle, individuality, and freedom. To be able to live out ideas that have so much meaning—surely you [28] would agree that is the meaning of success. [29]

16. F. NO CHANGE
    G. Does we
    H. Do you
    J. Did one

17. A. NO CHANGE
    B. If
    C. Despite the fact that
    D. Before

18. F. NO CHANGE
    G. two solitary years all by himself
    H. he spent two years living alone
    J. he spent a couple of years alone living in solitude

19. A. NO CHANGE
    B. born that he was thrown in jail for refusing to pay his taxes and
    C. born—that he was thrown in jail for refusing to pay his taxes and
    D. born, that he was thrown in jail for refusing to pay his taxes, and

20. F. NO CHANGE
    G. was Henry David Thoreau he
    H. was, Henry David Thoreau; and he
    J. was Henry David Thoreau, and he

21. A. NO CHANGE
    B. was, in fact, a
    C. was in fact a
    D. was in fact, a

22. F. NO CHANGE
G. uniquely
H. obliquely
J. deplorably

23. A. NO CHANGE
B. In 1845, Thoreau built a cabin,
C. Thoreau in 1845 built a cabin
D. In 1845, Thoreau built a cabin

24. Which of the following alternatives to the underlined portion would NOT be acceptable?

F. daily—he
G. daily, and he
H. daily. He
J. daily, he

25. What is the most logical order of sentences in this paragraph?

A. NO CHANGE
B. 3, 2, 1
C. 2, 1, 3
D. 3, 1, 2

26. F. NO CHANGE
    G. activism, he published:
    H. activism, he published
    J. activism, he published,

27. A. NO CHANGE
    B. Even though
    C. Because
    D. Despite the true fact that

28. F. NO CHANGE
    G. they
    H. they all
    J. everyone

29. This paragraph primarily serves to:

    A. explain why Thoreau was put in jail.
    B. prove a point about people's conception of success.
    C. suggest that Thoreau may be misunderstood.
    D. discuss Thoreau's importance in today's world.

Question 30 asks about the preceding passage as a whole.

30. By including questions throughout the entire first paragraph, the writer encourages the reader to:

F. answer each question as the passage proceeds.
G. think about the meaning of success.
H. assess the quality of Thoreau's work.
J. form an opinion about greed in modern society.

Passage III

The Sloth: Slow but Not Slothful

[1]

More than half of the world's currently living plant (31) and animal species live in tropical rain forests. Four square miles of a Central American rain forest can be home to up to 1,500 different species of flowering plants, 700 species of trees, 400 species of birds, and 125 species of mammals. Of these mammals, the sloth is one of the most unusual. [A]

[2]

Unlike most mammals, the sloth is usually upside down. A sloth does just about everything upside down, including sleeping, eating, mating, and giving birth. Its' unique (32) anatomy allows the sloth to spend most of the time hanging from one tree branch or another, high in the canopy of a rain forest tree. [B]

About the size of a large domestic cat, the (33) sloth hangs from its unusually long limbs and long, hooklike claws.

Specially designed for limbs, the sloth has muscles that seem to cling (34) to things.

[3]

In fact, a sloth's limbs are so defiantly (35) adapted to upside-down life that a sloth is essentially incapable of walking on the ground.

Instead, it must crawl, or drag (36) itself with its massive claws. This makes it easy to see why the sloth rarely leaves its home in the trees. Because (37) it cannot move swiftly on the ground, the sloth is an excellent swimmer.

[4]

(38) A sloth can hang upside down and, without moving the rest of its body, has the ability to be able to turn (39) its face 180 degrees so that it was looking (40) at the ground. A sloth can rotate its forelimbs in all directions, so it can easily reach the leaves that make up its diet. Also (41) roll itself up into a ball in order to protect itself from predators.

The howler monkey, another inhabitant of the rain forest, is not as flexible as (42) the sloth.

[5]

The best defense a sloth has from predators such as jaguars and large snakes, though, is its camouflage. During the rainy season, a sloth's thick brown or gray fur is usually covered with a coat of blue-green algae. Which 43 helps it blend in with its forest surroundings. [C] Another type of camouflage is the sloth's incredibly slow movement: it often moves less than 100 feet during a 24-hour period.

[6]

It is this slow movement that earned the sloth its name. *Sloth* is also a word for laziness or an aversion to work. But even though it sleeps an average of 15 hours a day, the sloth is not necessarily lazy. [D] It just moves, upside down, at its own slow pace through its world of rain forest trees. 44

31. A. NO CHANGE
    B. currently existing plant
    C. living plant
    D. plant

32. F. NO CHANGE
    G. It's unique
    H. Its unique
    J. Its uniquely

33. A. NO CHANGE
    B. cat; the
    C. cat. The
    D. cat, but the

34. F. NO CHANGE
    G. The sloth's muscles seem to cling to things for specially designed limbs.
    H. The muscles in a sloth's limbs seem to be specially designed for clinging to things.
    J. Specifically designed for limbs, clinging to things is how the sloth uses its muscles.

35. A. NO CHANGE
    B. enthusiastically
    C. painstakingly
    D. specifically

36. F. NO CHANGE
    G. Instead, it must crawl or drag itself
    H. Instead, it must crawl, or drag itself,
    J. Instead it must crawl or drag itself,

37. A. NO CHANGE
    B. Despite
    C. Similarly,
    D. Though

38. Which of the following true statements would provide the best transition from the preceding paragraph to this paragraph?

    F. Of course, many other animals are also excellent swimmers.
    G. Another unique characteristic of the sloth is its flexibility.
    H. In addition to swimming, the sloth is an incredible climber.
    J. Flexibility is a trait that helps the sloth survive.

39. A. NO CHANGE
    B. body, turns
    C. body, has the ability to turn
    D. body, turn

40. F. NO CHANGE
    G. had been looking
    H. will have the ability to be looking
    J. can look

41. A. NO CHANGE
    B. The sloth is known also
    C. The sloth is to also
    D. The sloth can also

42. If the writer were to delete the preceding sentence, the paragraph would primarily lose:

    F. an important detail that highlights the distinctiveness of the sloth.
    G. a statement that provides a logical transition from the ideas in one paragraph to the next.
    H. affirmation that the sloth lives in a habitat with different species, such as the howler monkey.
    J. an unnecessary detail that does not provide additional information about the writer's main idea.

43. A. NO CHANGE
    B. algae, which
    C. algae, being that it
    D. algae

44. The writer is considering deleting the last sentence of Paragraph 6. This change would:

F. diminish the amount of information provided about the habits of the sloth.
G. make the ending of the passage more abrupt.
H. emphasize the slothful nature of the sloth.
J. make the tone of the essay more consistent.

Question 45 asks about the preceding passage as a whole.

45. The writer wants to add the following sentence to the essay:

> An observer could easily be tricked into thinking that a sloth was just a pile of decaying leaves.

The sentence would most logically be placed at Point:

A. A.
B. B.
C. C.
D. D.

Passage IV

Fires in Yellowstone

During the summer of 1988, I watched Yellowstone National Park go up in flames. In June, fires ignited by lightning had been allowed to burn

unsuppressed because park officials expected that the usual summer rains would douse the flames. However, the rains never will have come. [47] A plentiful fuel supply of fallen logs and pine needles was available, and winds of up to 100 miles per hour whipped the spreading fires along and carried red-hot embers to other areas, creating new fires. By the time park officials succumbed to the pressure of public opinion and decide [48] to try to extinguish the flames. It's [49] too late. The situation remained out of control in spite of the efforts of 9,000 firefighters who were using state-of-the-art equipment. By September, more than 720,000 acres of Yellowstone had been affected by fire.

Nature was only able to curb the destruction [50]; the smoke did not begin to clear until the first snow arrived on September 11.

Being that I was [51] an ecologist who has studied forests for 20 years, I know that this was not nearly the tragedy it seemed to be. Large fires are, after all, necessary despite [52] the continued health of the forest ecosystem. Fires thin out overcrowded areas and allow it [53] to reach species of plants stunted by shade. Ash fertilizes the soil, and fire smoke kills forest bacteria. In the case of the lodgepole pine, fire is essential to reproduction: the pines' cone [54] open only when exposed to temperatures greater than 112 degrees.

The fires in Yellowstone did result in some loss of wildlife, but overall, the region's animals proved to be fire-tolerant and fire-adaptive. However, [55] large animals such as bison were often seen grazing and bedding down in meadows close to and near [56] burning forests. Also, the fire posed little threat to the members of any endangered animal species in the park.

My confidence in the natural resilience of the forest has been borne out in the years since the fires ravaged Yellowstone. [57]
Judged from recent pictures of the park [58], the forest was not destroyed; it was rejuvenated.

46. F. NO CHANGE
    G. fires having been ignited by lightning
    H. fires, the kind ignited by lightning,
    J. fires ignited and started by lightning

47. A. NO CHANGE
    B. came.
    C. were coming.
    D. have come.

48. F. NO CHANGE
    G. are deciding
    H. decided
    J. DELETE the underlined portion.

49. A. NO CHANGE
    B. flames, it’s
    C. flames, it was
    D. flames; it was

50. F. NO CHANGE
    G. Only curbing the destruction by able nature;
    H. Only nature was able to curb the destruction;
    J. Nature was able to curb only the destruction;

Mathematics Test

50 Minutes — 45 Questions

Directions: Choose the correct solution to each question and fill in the corresponding bubble on your answer sheet.

Do not continue to spend time on questions if you get stuck. Solve as many questions as you can before returning to any if time permits.

You may use a calculator on this test for any question you choose. However, some questions may be better solved without a calculator.

Note: Unless otherwise stated, you can assume:

1. Figures are NOT necessarily drawn to scale.
2. Geometric figures are two dimensional.
3. The term *line* indicates a straight line.
4. The term *average* indicates arithmetic mean.

1. What is the value of $7x + 3$ when $x = 5$?

A. 35
B. 38
C. 42
D. 45

2. If $6y - 8 = 28$, then $y = ?$

F. 4
G. 5
H. 6
J. 7

3. What is 25% of 160?

A. 30
B. 35
C. 40
D. 45

4. Which of the following is equivalent to $8(x - 5)$?

F. $8x - 40$
G. $8x - 5$
H. $x - 40$
J. $8x + 40$

5. A jacket originally priced at $80 is on sale for 30% off. What is the sale price?

A. $50
B. $54
C. $60
D. $56

6. What is the slope of a line passing through points (-3, 2) and (5, 18)?

F. 1
G. 2
H. 3
J. 4

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

A. 26
B. 20
C. 18
D. 32

8. What is the value of $|8 - 15|$?

F. -7
G. 23
H. -23
J. 7

9. A triangle has a base of 16 cm and a height of 11 cm. What is its area?

A. 27 cm^2
B. 88 cm^2
C. 176 cm^2
D. 54 cm^2

10. If $7x + 4 = 3x + 24$, then $x = ?$

F. 4
G. 7
H. 5
J. 6

11. What is the area of a circle with radius 10 inches? (Use $\pi \approx 3.14$)

A. 62.8 in^2
B. 157 in^2
C. 628 in^2
D. 314 in^2

12. Which of the following is a factor of $x^2 - 9x + 20$?

F. $(x - 4)$
G. $(x - 3)$
H. $(x + 5)$
J. $(x - 2)$

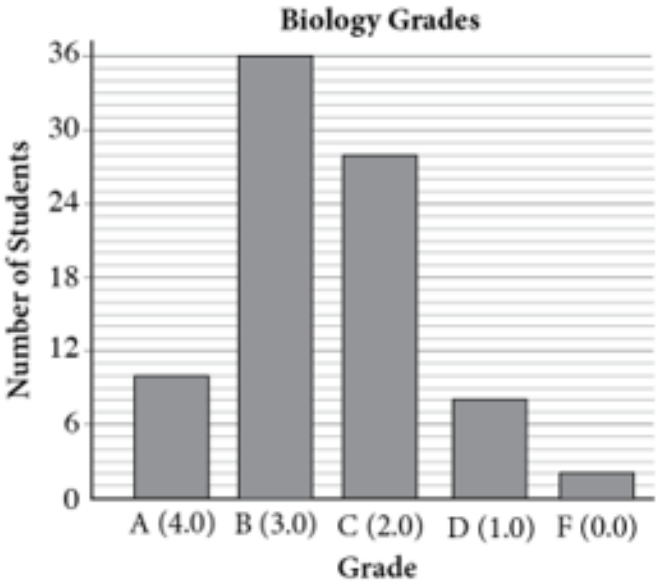
13. In a class of 80 students, 32 students received an A. What percent received an A?

A. 32%
B. 35%
C. 40%
D. 45%

14. What is the distance between points (-4, 3) and (5, 3) in the coordinate plane?

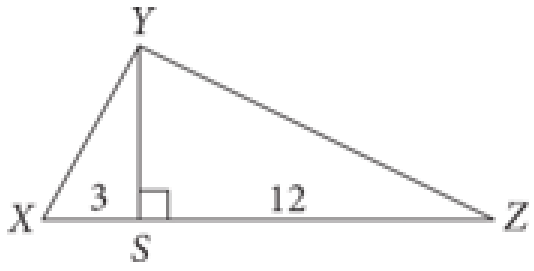
F. 1
G. 9
H. 5
J. 3

15. At most colleges, students receive letter grades, which correspond to a GPA score, rather than a numerical grade, such as 92. The following figure shows the distribution of grades and corresponding GPA scores among students in a biology class. What is the approximate mean biology GPA for this class of students?



A. 2.0
B. 2.5
C. 2.8
D. 3.0

16. In triangle XYZ shown, XS and SZ are 3 and 12 units long, respectively. If the area of triangle XYZ is 45 square units, how many units long is altitude YS?



F. 3
G. 6
H. 9
J. 12

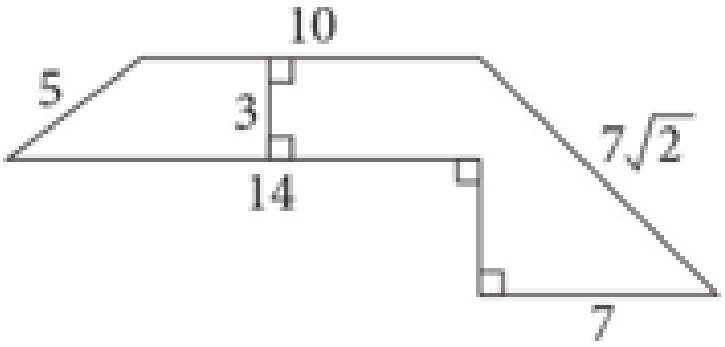
17. If 4/7 of a number is 28, what is the number?

A. 49
B. 16
C. 35
D. 56

18. What is the value of 3^6?

F. 18
G. 216
H. 729
J. 243

19. What is the area in square units of the following figure, given that the angle in the lower right corner has a measure of 45°?



A. $39 + 7\sqrt{2}$
B. 60.5
C. 91
D. 108.5

20. If the sum of five consecutive odd integers is 75, what is the smallest of these integers?

F. 11
G. 13
H. 15
J. 17

21. Which of the following is equivalent to $(x + 8)(x - 5)$?

A. $x^2 + 3x + 40$
B. $x^2 + 3x - 40$
C. $x^2 - 3x - 40$
D. $x^2 + 13x - 40$

22. If $\log_5(x) = 3$, then $x = ?$

F. 15
G. 8
H. 243
J. 125

23. What is the median of the set: 23, 17, 31, 19, 25, 21, 29?

A. 21
B. 23
C. 25
D. 23

24. A jar contains 9 red marbles, 6 blue marbles, and 10 yellow marbles. What is the probability of randomly selecting a blue marble?

F. 6/25
G. 6/25
H. 1/4
J. 2/5

25. If $\sin(\theta) = 0.5$ and θ is an acute angle, what is $\cos(\theta)$?

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

26. What is the solution set for the inequality $5x - 3 > 22$?

F. $x > 19$
G. $x < 5$
H. $x > 5$
J. $x > 25$

27. A right triangle has legs of length 9 and 12. What is the length of the hypotenuse?

A. 21
B. $3\sqrt{17}$
C. 15
D. 18

28. What is the value of $(4x - 1)^2$ when $x = 3$?

F. 121
G. 144
H. 100
J. 169

29. The sum of the interior angles of an octagon is:

A. 720°
B. 1080°
C. 1260°
D. 900°

30. If 2^(x-1) = 32, what is the value of x?

F. 5
G. 4
H. 7
J. 6

31. Which of the following is equivalent to $\sqrt{98}$?

A. $14\sqrt{2}$
B. $49\sqrt{2}$
C. $2\sqrt{49}$
D. $7\sqrt{2}$

32. In an arithmetic sequence, the first term is 9 and the common difference is 5. What is the 12th term?

F. 60
G. 64
H. 69
J. 54

33. If matrix M = [5 2; 3 4] and matrix N = [2 1; 4 3], what is M + N?

A. [7 3; 7 7]
B. [3 1; -1 1]
C. [10 2; 12 12]
D. [7 3; -1 7]

34. A sphere has a radius of 6 cm. What is its volume? (Use $\pi \approx 3.14$ and $V = (4/3)\pi r^3$)

F. 452.16 cm^3
G. 678.24 cm^3
H. 904.32 cm^3
J. 113.04 cm^3

35. What is the value of 6! (6 factorial)?

A. 36
B. 120
C. 720
D. 360

36. For which value of x is the expression $(x - 5)/(x^2 - 25)$ undefined?

F. $x = 5$ or $x = -5$
G. $x = 0$
H. $x = 25$
J. $x = -25$

37. If the angles of a triangle are in the ratio 1:2:3, what is the measure of the smallest angle?

A. 20°
B. 30°
C. 45°
D. 60°

38. What is the domain of the function $f(x) = \sqrt{(x - 7)}$?

F. All real numbers
G. $x > 7$
H. $x \geq 0$
J. $x \geq 7$

39. If 9^(x) = 729, what is the value of x?

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

40. A rectangular prism has dimensions 4 cm × 5 cm × 8 cm. What is its volume?

F. 17 cm^3
G. 160 cm^3
H. 80 cm^3
J. 320 cm^3

41. What is the least common multiple (LCM) of 12 and 18?

A. 36
B. 6
C. 72
D. 54

42. If $h(x) = x^2 - 4$ and $k(x) = 3x + 1$, what is $h(k(2))$?

F. 25
G. 45
H. 45
J. 21

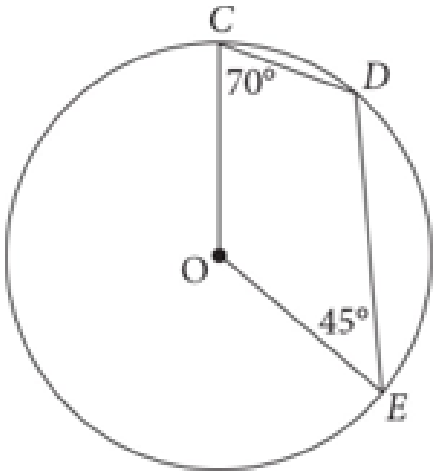
43. The arithmetic mean of six numbers is 18. If five of the numbers are 12, 15, 20, 22, and 19, what is the sixth number?

A. 18
B. 20
C. 20
D. 16

44. In an isosceles triangle, the vertex angle measures 40°. What is the measure of each base angle?

F. 70°
G. 80°
H. 50°
J. 60°

45. In the following figure, O is the center of the circle, and C, D, and E are points on the circumference of the circle. If ∠OCD measures 70° and ∠OED measures 45°, what is the measure of ∠CDE?



A. 25°
B. 115°
C. 70°
D. 90°

Reading Test

40 Minutes — 36 Questions

Directions: The Reading Test includes multiple passages. Each passage includes multiple questions. A er reading each passage, choose the best answer and fill in the corresponding bubble on your answer sheet. You may review the passages as o en as necessary.

Passage I

PROSE FICTION: This passage is adapted from the novel *Emma* by Jane Austen. It was originally published in 1815.

Emma Woodhouse, handsome, clever, and rich, with a comfortable home and happy disposition, seemed to unite some of the best blessings of existence. She had lived
(5) nearly twenty-one years in the world with very little to distress or vex her. She was the youngest of the two daughters of a most affectionate, indulgent father, and had, in consequence of her sister's marriage, been

mistress of his house from a very early period. Her mother had died too long ago for her to have more than an indistinct remembrance of her caresses, and her place had been taken by an excellent governess who had fallen little short of a mother in affection.

Sixteen years had Miss Taylor been in Mr. Woodhouse's family, less as a governess than a friend, very fond of both daughters, but particularly of Emma. Between them it was more the intimacy of sisters. Even before Miss Taylor had ceased to hold the nominal office of governess, the mildness of her temper had hardly allowed her to impose any restraint. The shadow of authority being now long passed away, they had been living together as friend and friend very mutually attached, and Emma doing just what she liked, highly esteeming Miss Taylor's judgment, but directed chiefly by her own. The real evils, indeed, of Emma's situation were the power of having rather too much her own way, and a disposition to think a little too well of herself; these were the disadvantages which threatened alloy to her many enjoyments. The danger, however, was at present so unperceived, that they did not by any means rank as misfortunes with her.

Sorrow came—a gentle sorrow—but not at all in the shape of any disagreeable consciousness. Miss Taylor married. It was Miss Taylor's loss which first brought grief. It was on the wedding-day of this beloved friend that Emma first sat in mournful thought of any continuance. The wedding over, and the bride-people gone, she and her father were left to dine together, with no prospect of a third to cheer a long evening. Her father composed himself to sleep after dinner, as usual, and she had then only to sit and think of what she had lost.

The marriage had every promise of happiness for her friend. Mr. Weston was a man of unexceptionable character, easy fortune, suitable age, and pleasant manners. There was some satisfaction in considering with what self-denying, generous friendship she had always wished and promoted the match, but it was a black morning's work for her. The want of Miss Taylor would be felt every hour of every day. She recalled her past kindness—the kindness, the affection of sixteen years—how she had taught her and how she had played with her from five years old—how she had devoted all her powers to attach and amuse her in health—and how she had nursed her through the various illnesses of childhood. A large

debt of gratitude was owing here, but the intercourse of he last seven years, the equal footing and perfect unreserve which had soon followed Isabella's marriage, on their being left to each other, was yet a dearer, tenderer recollection. She had been a friend and companion such as few possessed: intelligent, well-informed, useful, gentle, knowing all the ways of the family, interested in all its concerns, and peculiarly interested in her, in every pleasure, every scheme of hers—one to whom she could speak every thought as it arose, and who had such an affection for her as could never find fault.

How was she to bear the change? It was true that her friend was going only half a mile from them, but Emma was aware that great must be the difference between a Mrs. Weston, only half a mile from them, and a Miss Taylor in the house. With all her advantages, natural and domestic, she was now in great danger of suffering from intellectual solitude.

1. According to the passage, what are the greatest disadvantages facing Emma?

A. Her father is not a stimulating conversationalist, and she is bored.
B. She is lonely and afraid that Mrs. Weston will not have a happy marriage.
C. She is used to having her way too much, and she thinks too highly of herself.
D. She misses the companionship of her mother, her sister, and Miss Taylor.

2. In lines 51–52, the author describes Emma's solitary thoughts after dinner in order to:

F. illustrate her anger regarding Miss Taylor's marriage.
G. emphasize her feelings of sadness and loneliness.
H. suggest her disappointment in her father.
J. indicate her dislike of Mr. Weston.

3. As described in the passage, Emma's relationship with Miss Taylor can be characterized as:

A. more loving than a parent-child relationship.
B. similar to the relationship of sisters or best friends.
C. weaker than Emma's relationship with her sister.
D. stronger than Miss Taylor's relationship with her new husband.

4. As used in line 34, *disposition* can most closely be defined as:

F. tendency.
G. control.
H. placement.
J. transfer.

5. Which of the following are included in Emma's memories of her relationship with Miss Taylor?

I. Miss Taylor taking care of Emma during childhood illnesses
II. Miss Taylor entertaining Emma
III. Miss Taylor teaching her mathematics
IV. Miss Taylor scolding her for being selfish

A. I, III, and IV only
B. I and III only
C. II, III, and IV only
D. I and II only

6. According to the passage, since the death of her mother, Emma has led a:

F. desolate life.
G. restricted life.
H. happy life.
J. confused life.

7. Based on the passage, Emma could best be described as:

A. obedient.
B. unappreciative.
C. headstrong.
D. bitter.

8. The passage suggests that the quality Emma values most in a friend is:

F. intelligence.
G. devotion.
H. honesty.
J. charisma.

9. How does Emma view Mr. Weston?

A. She thinks that he is an excellent match, and it required considerable self-sacrifice not to pursue him herself.
B. She considers him to be a respectable if somewhat average match for her friend.
C. She sees him as an intruder who has carried away her best friend in “a black morning’s work” (line 60).
D. She believes he is an indulgent, easily-swayed man, reminiscent of her father.

10. The author feels that Emma is accustomed to:

F. behaving according to the wishes of her affectionate father.
G. taking the advice of Miss Taylor when faced with deciding upon a course of action.
H. doing as she pleases without permission from her father or governess.
J. abiding by strict rules governing her behavior.

Passage II

SOCIAL SCIENCE: The period of active experimentation to develop the airplane began in the 1890s. Many scientists and engineers attempted to solve the problem in the decade following, but with limited progress until Orville and Wilbur Wright made the first successful powered, heavier-than-air flight in 1903. Both of the passages below discuss aspects of the Wright brothers' invention.

Passage A

What about the method used by the Wright brothers allowed them to succeed where so many scientists, engineers, and crackpots had failed to make progress for a dozen years? In
(5) the decade leading up to their success, there had been so many unsuccessful attempts that newspaper reporters became jaded, tired of investigating each yokel who claimed to have made an airplane. In fact, the reporter present

at that historical first flight did not even bother to take his camera out of its bag, deciding that two unassuming brothers from Ohio without college educations would be two more in a long line. Instead, the Wrights, quite systematically and without much fuss or outside assistance, changed the world dramatically in 1903. What made Orville and Wilbur so different from the rest of the pack?

Most inventors of the time were working on their planes with a fairly simple and logical approach: They would design an airplane, build it, test it in the field, and then use the results of that test to tinker with their designs in an attempt to improve the next model. There was no way of knowing whether the wings were good but the engine was bad, or the shape was right but the materials were too heavy. With no way of discerning which parts worked and which parts did not, inventors' second attempts often flew worse than their initial ones, because their creators had inadvertently removed design features that were effective and exaggerated features that were not.

The Wright brothers proved to be adept scientists. With their keen analytical insight and love of engineering and all things mechanical, they were able to escape that endless loop of misguided "improvements." They worked on their machine one aspect at a time. After

familiarizing themselves with all the published literature on flight, they began working on a method of control. They theorized that twisting the wings one way or another would steer a craft. Instead of building an entire airplane to test their theory, they built a five-foot biplane kite. Sure enough, twisting the wings controlled the craft laterally. Having settled that aspect of the craft's design, they turned to wing shape.

After building two failed gliders based on their original design, they invented the first wind tunnel with instruments capable of quantifying the lift and drag of wing segments. In this wind tunnel, they could test wings alone for their efficiency and aerodynamics. In the process of testing 80 to 200 wing shapes in this way, they disproved a commonly accepted theory of lift (called "Smeaton's coefficient") and settled on a new and highly efficient wing shape for their craft.

The Wrights returned to the wind tunnel to perfect designs for their propeller and then designed an effective four-cylinder engine to power the craft. When the time came to marry all of these carefully designed components into a complete craft, there was no guesswork involved. That first historic flight was merely proof of their scientific genius.

Passage B

Few people recognize that the Wright brothers are tragic figures in American history. Today, they are hailed as great inventors, but during their lives they were scorned and discredited publicly, even though the entire world copied their successful designs. The prevailing opinion among those who made airplanes was that two rustic, uneducated fellows from Ohio could never have accomplished such a historic feat, let alone deliberately marry the disparate components of air travel that are required for successful flight. The secrecy of Orville and Wilbur during the years in which they prepared their patents only fueled doubts about their skill.

While the Wright brothers finally received a U.S. patent for their system of lateral control in May of 1906, manufacturers were unwilling to pay the modest fee the brothers asked for use of their system. The companies launched a sadly successful smear campaign against the brothers, impugning the importance of their contribution to flight. Some European airplane manufacturers were even allowed to legally copy the Wrights' technology.

In the midst of the legal battle over rights and license fees against several airplane manufacturers, Wilbur sadly succumbed to typhoid fever. He was thus deprived of seeing his claims

vindicated in court, and, though Orville was accorded a tidy sum, this small victory was hardly commensurate with the enormous contribution the two brothers had made. The court case also did nothing to compensate the brothers for the taxing and unfair period of ridicule and doubt and the obstinate refusal by much of the world to acknowledge their achievements. Perhaps most tellingly, the Smithsonian Museum did not display the brothers' historic craft until 1948, when it finally bestowed on them the title of the first men to fly in a heavier-than-air craft. Sadly, this was too little, too late, as the brothers had both passed away.

Questions 11–13 ask about Passage A.

11. The main purpose of Passage A is to:

A. describe how the Wright brothers were regarded.
B. emphasize the process of designing the airplane.
C. criticize the attitude of other inventors.
D. explore the practical application of science.

12. As it is used in line 7, the word *jaded* most nearly means:

F. excited.
G. valuable.
H. bored.
J. critical.

13. Passage A suggests that the wind tunnel played what role in the Wright brothers' research?

A. It provided more reliable data than their experiments with kites.
B. It allowed them to isolate single aspects of design from other considerations.
C. It helped them develop a method of twisting the wings to control the plane laterally.
D. It confirmed the accuracy of Smeaton's coefficient.

Questions 14–16 ask about Passage B.

14. In Passage B, the author mentions a "legal battle" (line 89) in order to:

F. emphasize the harsh way in which the Wright brothers were treated.
G. illustrate the dangers of publicizing new knowledge.
H. help explain why the Wright brothers' discovery was of little importance.
J. suggest a reason for Wilbur's fatal illness.

15. What does Passage B suggest about the Smithsonian Museum's choice to display the brothers' historic craft in 1948?

    A. It was a small victory for Orville, who lost his brother Wilbur to typhoid fever.
    B. It was a direct result of the obstinate refusal by much of the world to acknowledge their achievements.
    C. While it was a great honor, it did not fully atone for the poor treatment of the brothers.
    D. The historic craft would have been displayed sooner if European countries had issued the brothers a patent.

16. Based on the passage, it can be concluded that the author feels others characterized the Wright brothers as:

    F. meticulous in their research.
    G. prepared to design an airplane.
    H. well-compensated for their work.
    J. unlikely pioneers of flight.

Questions 17–20 ask about both passages.

17. The author of Passage B would likely agree that the "inventors of the time" (line 18) mentioned in Passage A:

A. thought that the Wright brothers did not actually make the first airplane.
B. did not believe that the Wright brothers deserved credit for the magnitude of their achievement.
C. were grateful for the breakthrough that the Wrights had engineered.
D. felt the Wright brothers had likely copied the design from a more accomplished inventor.

18. In lines 61 and 74, *marry* most nearly means:

F. prove.
G. test rigorously.
H. bring together.
J. satisfy.

19. According to Passage A, while the brothers "were scorned and discredited publicly" (line 69), as mentioned in Passage B, they were indeed skilled inventors because:

A. they designed an airplane, built it, tested it in the field, and then used the results of that test to adjust their designs.
B. they used analytical insight to work on machines one aspect at a time to perfect their design.
C. they invented the first wind tunnel, which was a greater accomplishment than inventing the first successful aircraft.
D. their claims were eventually vindicated in court, and Orville received monetary reimbursement.

20. Both passages provide support for the idea that the Wright brothers:

F. used a method of scientific inquiry that was different from everyone else's.
G. were poorly treated following their discovery.
H. were exceptional inventors.
J. should have protected the rights to their discovery more carefully.

Passage III

HUMANITIES: This passage is excerpted from *A History of Women Artists*, © 1975 by Hugo Munsterberg; Clarkson N. Potter (a division of Random House, Inc.), publisher. Reprinted by permission of the author's family.

There can be little doubt that women artists have been most prominent in photography and that they have made their greatest

contribution in this field. One reason for this is not difficult to ascertain. As several historians of photography have pointed out, photography, being a new medium outside the traditional academic framework, was wide open to women and offered them opportunities that the older fields did not.

All these observations apply to the first woman to have achieved eminence in photography, and that is Julia Margaret Cameron. Born in 1815 in Calcutta into an upper-middle-class family and married to Charles Hay Cameron, a distinguished jurist and member of the Supreme Court of India, Julia Cameron was well-known as a brilliant conversationalist and a woman of personality and intellect who was unconventional to the point of eccentricity. Although the mother of six children, she adopted several more and still found time to be active in social causes and literary activities. After the Camerons settled in England in 1848 at Freshwater Bay on the Isle of Wight, she became the center of an artistic and literary circle that included such notable figures as the poet Alfred Lord Tennyson and the painter George Frederick Watts. Pursuing numerous activities and taking care of her large family, Mrs. Cameron might have been remembered as still another rather remarkable

and colorful Victorian lady had it not been for the fact that, in 1863, her daughter presented her with photographic equipment, thinking her mother might enjoy taking pictures of her family and friends. Although forty-eight years old, Mrs. Cameron took up this new hobby with enormous enthusiasm and dedication. She was a complete beginner, but within a very few years she developed into one of the greatest photographers of her period and a giant in the history of photography. She worked ceaselessly as long as daylight lasted and mastered the technical processes of photography, at that time far more cumbersome than today, turning her coal house into a darkroom and her chicken house into a studio. To her, photography was a "divine art," and in it she found her vocation. In 1864, she wrote triumphantly under one of her photographs, "My First Success," and from then until her death in Ceylon in 1874, she devoted herself wholly to this art.

Working in a large format (her portrait studies are usually about 11 inches by 14 inches) and requiring a long exposure (on the average five minutes), she produced a large body of work that stands up as one of the notable artistic achievements of the Victorian period. The English art critic

Roger Fry believed that her portraits were likely to outlive the works of artists who were her contemporaries. Her friend Watts, then a very celebrated portrait painter, inscribed on one of her photographs, “I wish I could paint such a picture as this.” Her work was widely exhibited, and she received gold, silver, and bronze medals in England, America, Germany, and Austria. No other female artist of the nineteenth century achieved such acclaim, and no other woman photographer has ever enjoyed such success.

Her work falls into two main categories on which her contemporaries and people today differ sharply. Victorian critics were particularly impressed by her allegorical pictures, many of them based on the poems of her friend and neighbor Tennyson. Contemporary taste much prefers her portraits and finds her narrative scenes sentimental and sometimes in bad taste. Yet, not only Julia Cameron, but also the painters of that time loved to depict subjects such as *The Five Foolish Virgins* or *Pray God, Bring Father Safely Home*. Still, today her fame rests upon her portraits for, as she herself said, she was intent upon representing not only the outer likeness but also the inner greatness of the people she portrayed. Working with the utmost dedication, she

produced photographs of such eminent
(95) Victorians as Tennyson, Browning, Carlyle, Trollope, Longfellow, Watts, Darwin, Ellen Terry, Sir John Herschel, who was a close friend of hers, and Mrs. Duckworth, the mother of Virginia Woolf.

21. Which of the following conclusions can be reasonably drawn from the passage's discussion of Julia Margaret Cameron?

A. She was a traditional homemaker until she discovered photography.
B. Her work holds a significant place in the history of photography.
C. She was unable to achieve in her lifetime the artistic recognition she deserved.
D. Her eccentricity has kept her from being taken seriously by modern critics of photography.

22. According to the passage, Cameron is most respected by modern critics for her:

F. portraits.
G. allegorical pictures.
H. use of a large format.
J. service in recording the faces of so many twentieth-century figures.

23. The author uses which of the following methods to develop the second paragraph (lines 10–49)?

    A. A series of anecdotes depicting Cameron's energy and unconventionality
    B. A presentation of factual data demonstrating Cameron's importance in the history of photography
    C. A description of the author's personal acquaintance with Cameron
    D. A chronological account of Cameron's background and artistic growth

24. As it is used in the passage, *cumbersome* (line 42) most closely means:

    F. difficult to manage.
    G. expensive.
    H. intense.
    J. enjoyable.

25. When the author says that Cameron had found "her vocation" (line 46), his main point is that photography:

A. offered Cameron an escape from the confines of conventional social life.
B. became the main interest of her life.
C. became her primary source of income.
D. provided her with a way to express her religious beliefs.

26. The main point of the third paragraph (lines 50–66) is that Cameron:

F. achieved great artistic success during her lifetime.
G. is the greatest photographer who ever lived.
H. was considered a more important artist during her lifetime than she is now.
J. revolutionized photographic methods in the Victorian era.

27. In line 6, the author refers to photography as a "new medium" in order to:

A. describe why it was so popular at the time.
B. explain why the equipment was so cumbersome.
C. express Cameron's desire to be a trendsetter.
D. account for the importance of women photographers.

28. *The Five Foolish Virgins* and *Pray God, Bring Father Safely Home* (lines 76–78) are examples of:

F. portraits of celebrated Victorians.
G. allegorical subjects of the sort that were popular during the Victorian era.
H. photographs in which Cameron sought to show a subject's outer likeness and inner greatness.
J. photographs by Cameron that were scoffed at by her contemporaries.

29. According to the passage, which of the following opinions of Cameron's work was held by Victorian critics but is NOT held by modern critics?

A. Photographs should be based on poems.
B. Her portraits are too sentimental.
C. Narrative scenes are often in bad taste.
D. Her allegorical pictures are her best work.

30. The author's treatment of Cameron's development as a photographer can best be described as:

F. admiring.
G. condescending.
H. neutral.
J. defensive.

Passage IV

NATURAL SCIENCE: This passage discusses aspects of the harbor seal's sensory systems.

The harbor seal, *Phoca vitulina*, lives amphibiously along the northern Atlantic and Pacific coasts. This extraordinary mammal, which does most of its fishing at night when visibility is low and in places where noise levels are high, has developed several unique adaptations that have sharpened its acoustic and visual acuity. The need for such adaptations has been compounded by the varying behavior of sound and light in each of the two habitats of the harbor seal—land and water.

While the seal is on land, its ear operates much like the human ear, with sound waves traveling through air and entering the inner ear through the auditory canal. The directions from which sounds originate are distinguishable because the sound waves arrive at each inner ear at different times. In water, however, where sound waves travel faster than they do in air, the ability of the brain to differentiate arrival times between each ear is severely reduced. Yet it is crucial for the seal to be able to pinpoint the exact origins of sound in order to locate both its offspring and its prey. Therefore, the seal has developed an extremely sensitive

quadraphonic hearing system, composed of a specialized band of tissue that extends down from the ear to the inner ear. In water, sound is conducted to the seal's inner ear by this special band of tissue, making it possible for the seal to identify the exact origins of sounds.

The eye of the seal is also uniquely adapted to operate in both air and water. The human eye, adapted to function primarily in air, is equipped with a cornea, which aids in the refraction and focusing of light onto the retina. As a result, when a human eye is submerged in water, light rays are further refracted and the image is blurry. The seal's cornea, however, refracts light as water does. Therefore, in water, light rays are transmitted by the cornea without distortion and are clearly focused on the retina. In air, however, the cornea is astigmatic, resulting in a distortion of incoming light rays. The seal compensates for this by having a stenopaic pupil, which constricts into a vertical slit. Since the astigmatism is most pronounced in the horizontal plane of the eye, the vertical pupil serves to minimize its effect on the seal's vision.

Since the harbor seal hunts for food under conditions of low visibility, some scientists believe it has echolocation systems

akin to those of bats, porpoises, and dolphins. This kind of natural radar involves the emission of high-frequency sound pulses that reflect off obstacles such as predators, prey, or natural barriers. The reflections are received as sensory signals by the brain, which processes them into an image. The animal, blinded by unfavorable lighting conditions, is thus able to perceive its surroundings. Such echolocation by harbor seals is suggested by the fact that they emit "clicks," high-frequency sounds produced in short, fast bursts that occur mostly at night, when visibility is low.

Finally, there is speculation that the seal's whiskers, or vibrissae, which are unusually well developed and highly sensitive to vibrations, act as additional sensory receptors. Scientists speculate that the vibrissae may sense wave disturbances produced by nearby moving fish, allowing the seal to home in on and capture prey.

31. The harbor seal's eye compensates for the distortion of light rays on land by means of its:

A. vibrissae.
B. cornea.
C. stenopaic pupil.
D. echolocation.

32. The passage implies that a harbor seal's vision is:

F. inferior to a human's vision in the water, but superior to it on land.
G. superior to a human's vision in the water, but inferior to it on land.
H. inferior to a human's vision both in the water and on land.
J. equivalent to a human's vision both in the water and on land.

33. According to the passage, scientists think vibrissae help harbor seals to catch prey by:

A. improving underwater vision.
B. sensing vibrations in the air.
C. camouflaging predator seals.
D. detecting underwater movement.

34. According to the passage, the speed of sound in water is:

F. faster than the speed of sound in air.
G. slower than the speed of sound in air.
H. the same as the speed of sound in air.
J. unable to be determined exactly.

35. According to the passage, which of the following have contributed to the harbor seal's need to adapt its visual and acoustic senses?

I. Night hunting
II. The need to operate in two habitats
III. A noisy environment

A. I and II only
B. II and III only
C. I and III only
D. I, II, and III

36. Which of the following statements expresses an opinion, not a fact?

F. Seals eyes are adapted to function primarily in air.
G. When the seal is under water, its ear operates like a human ear.
H. The “clicks” emitted by the harbor seal mean it uses echolocation.
J. The need for adaptation is decreased if an animal lives in two habitats.

Science Test

40 Minutes — 40 Questions

Directions: The Science Test includes multiple passages. Each passage includes multiple questions. A er reading each passage, choose the best answer and fill in the corresponding bubble on your answer sheet. You may review the passages as o en as necessary.

You may NOT use a calculator on this test.

Passage I

Table 1 contains some physical properties of common optical materials. The refractive index of a material is a measure of the amount by which light is bent upon entering the material. The transmittance range is the range of wavelengths over which the material is transparent.

Table 1

Physical Properties of Optical Materials

Material	Refractive index for light of 0.589 μm	Transmittance range (μm)	Useful range for prisms (μm)	Chemical resistance
Flint glass is lead o				rtz.

Table 1				
Physical Properties of Optical Materials				
Material	Refractive index for light of 0.589 μm	Transmittance range (μm)	Useful range for prisms (μm)	Chemical resistance
Lithium fluoride	1.39	0.12—6	2.7—5.5	Poor
Calcium fluoride	1.43	0.12—12	5—9.4	Good
Sodium chloride	1.54	0.3—17	8—16	Poor
Quartz	1.54	0.2—3.3	0.2—2.7	Excellent
Potassium bromide	1.56	0.3—29	15—28	Poor
Flint glass	1.66	0.35—2.2	0.35—2	Excellent
Cesium iodide	1.79	0.3—70	15—55	Poor
Flint glass is lead oxide–doped quartz.				

1. According to Table 1, which material(s) will transmit light at 25 μm ?

A. Potassium bromide only
B. Potassium bromide and cesium iodide
C. Lithium fluoride and cesium iodide
D. Lithium fluoride and flint glass

2. A scientist hypothesizes that any material with poor chemical resistance would have a transmittance range wider than 10 μm. The properties of which of the following materials contradicts this hypothesis?

   F. Lithium fluoride
   G. Flint glass
   H. Cesium iodide
   J. Quartz

3. When light travels from one medium to another, total internal reflection can occur if the first medium has a higher refractive index than the second. Total internal reflection could occur if light were traveling from:

   A. lithium fluoride to flint glass.
   B. potassium bromide to cesium iodide.
   C. quartz to potassium bromide.
   D. flint glass to calcium fluoride.

4. Based on the information in the table, how is the transmittance range related to the useful prism range?

F. The transmittance range is always narrower than the useful prism range.
G. The transmittance range is narrower than or equal to the useful prism range.
H. The transmittance range increases as the useful prism range decreases.
J. The transmittance range is wider than and includes within it the useful prism range.

5. The addition of lead oxide to pure quartz has the effect of:

A. decreasing the transmittance range and the refractive index.
B. decreasing the transmittance range and increasing the refractive index.
C. increasing the transmittance range and the useful prism range.
D. increasing the transmittance range and decreasing the useful prism range.

6. Which of the following materials would provide the greatest range of transmittance as well as the greatest useful range for prisms?

F. Lithium fluoride
G. Sodium chloride
H. Quartz
J. Flint glass

Passage II

Osmosis is the diffusion of a solvent (often water) across a semipermeable membrane from the side of the membrane with a lower concentration of dissolved material to the side with a higher concentration of dissolved material. The result of osmosis is an equilibrium—an even distribution—on both sides of the membrane. In order to prevent osmosis, external pressure must be applied to the side with the higher concentration of dissolved material. *Osmotic pressure* is equivalent to the minimum external pressure required to prevent osmosis. The apparatus shown in Diagram 1 was used to measure osmotic pressure in the following experiments.

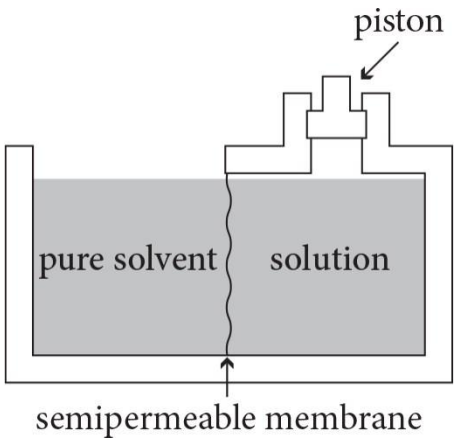


Diagram 1

Experiment 1

Aqueous (water-based) solutions containing different concentrations of sucrose were placed in the closed side of the apparatus. The open side was filled with water. The sucrose solutions also contained a blue dye that binds to sucrose. The osmotic pressure created by the piston was measured for each solution at various temperatures. The results are given in Table 1.

Table 1		
Concentration of sucrose solution (mol/L)	Temperature (K)	Osmotic pressure (atm)
1.00	298.0	24.47
0.50	298.0	12.23
0.10	298.0	2.45
0.05	298.0	1.22
1.00	348.0	28.57
0.50	348.0	14.29
0.10	348.0	2.86
0.05	348.0	1.43

Experiment 2

Sucrose solutions of four different organic solvents were investigated in the same manner as in Experiment 1 with all trials at 298 K. The results are shown in Table 2.

Table 2		
Solvent	Concentration of sucrose solution (mol/L)	Osmotic pressure (atm)
Ethanol	0.50	12.23
Ethanol	0.10	2.45
Acetone	0.50	12.23
Acetone	0.10	2.45

Table 2		
Solvent	Concentration of sucrose solution (mol/L)	Osmotic pressure (atm)
Diethyl ether	0.50	12.23
Diethyl ether	0.10	2.45
Methanol	0.50	12.23
Methanol	0.10	2.45

7. Osmotic pressure can be calculated using the formula $\Pi = MRT$, where Π represents the calculated osmotic pressure, M is the concentration in mol/L, R is a constant equal to 0.0821, and T is temperature in Kelvins. Which of the following can be inferred from this equation and the data in Table 1 ?

I. As temperatures increases, osmotic pressure decreases.
II. To maintain a constant osmotic pressure, temperature must be decreased if concentration increases.
III. Osmotic pressure increases as concentration increases.

A. I only
B. II only
C. III only
D. II and III only

8. According to the experimental results, osmotic pressure is dependent upon the:

F. solvent and temperature only.
G. solvent and concentration only.
H. temperature and concentration only.
J. solvent, temperature, and concentration.

9. According to Experiment 2, when methanol is used as a solvent, what is the minimum pressure that must be applied to a 0.5 mol/L solution of sucrose at 298 K to prevent osmosis?

A. 1.23 atm
B. 2.45 atm
C. 12.23 atm
D. 24.46 atm

10. A 0.10 mol/L aqueous sucrose solution is separated from an equal volume of pure water by a semipermeable membrane. If the solution is at an external pressure of 1 atm and a temperature of 298 K:

F. water will diffuse across the semipermeable membrane from the sucrose solution side to the pure water side.
G. water will diffuse across the semipermeable membrane from the pure water side to the sucrose solution side.
H. water will not diffuse across the semipermeable membrane.
J. water will diffuse across the semipermeable membrane, but the direction of diffusion cannot be determined.

11. In Experiment 1, the scientists investigated the effect of:

A. solvent and concentration on osmotic pressure.
B. volume and temperature on osmotic pressure.
C. concentration and temperature on osmotic pressure.
D. temperature on atmospheric pressure.

12. Which of the following conclusions can be drawn from the experimental results?

I. Osmotic pressure is independent of the solvent used.
II. Osmotic pressure is only dependent upon the temperature of the system.
III. Osmosis occurs only when the osmotic pressure is exceeded by the external pressure.

F. I only
G. III only
H. I and II only
J. I and III only

13. What was the most likely purpose of the dye placed in the sucrose solutions in Experiments 1 and 2 ?

A. The dye showed when osmosis was completed.
B. The dye showed the presence of ions in the solutions.
C. The dye was used to make the experiment more colorful.
D. The dye was used to make the onset of osmosis visible.

Passage III

A series of experiments was performed to study the environmental factors affecting the size and number of leaves on the *Cycas* plant.

Experiment 1

Five groups of 25 *Cycas* seedlings, all 2–3 cm tall, were allowed to grow for three months, each group at a different humidity level. All of the groups were kept at 75°F and received 9 hours of sunlight a day. The average leaf lengths, widths, and densities are given in Table 1.

Table 1

% Humidity	Average length (cm)	Average width (cm)	Average density(leaves/cm)
15	5.6	1.6	0.13
35	7.1	1.8	0.25
55	9.8	2.0	0.56
75	14.6	2.6	0.61
95	7.5	1.7	0.52

Number of leaves per 1 cm of plant stalk

Experiment 2

Five new groups of 25 seedlings, all 2–3 cm tall, were allowed to grow for 3 months, each group receiving different amounts of sunlight at a constant humidity of 55%. All other conditions were the same as in Experiment 1. The results are listed in Table 2.

Table 2

Sunlight (hrs/day)	Average length (cm)	Average width (cm)	Average density (leaves/cm)
0	5.3	1.5	0.32
3	12.4	2.4	0.59
6	11.2	2.0	0.56
9	8.4	1.8	0.26
12	7.7	1.7	0.19

Number of leaves per 1 cm of plant stalk

Experiment 3

Five new groups of 25 seedlings, all 2–3 cm tall, were allowed to grow at a constant humidity of 55% for three months at different daytime and nighttime temperatures. All other conditions were the same as in Experiment 1. The results are shown in Table 3.

Table 3

Table 3

Day/night temperature (°F)	Average length (cm)	Average width (cm)	Average density (leaves/cm)
85/85	8.8	1.5	0.28
85/65	12.3	2.1	0.53
65/85	8.1	1.7	0.33
75/75	7.1	1.9	0.45
65/65	8.3	1.7	0.39

Number of leaves per 1 cm of plant stalk

14. Based on the data in Experiment 3, which day/night temperatures (in degrees Fahrenheit) produced the smallest leaves?

F. 85/85
G. 85/65
H. 75/75
J. 65/85

15. Which of the following conclusions can be made based on the results of Experiment 2 alone?

A. The seedlings do not require long daily periods of sunlight to grow.
B. The average leaf density is independent of the humidity the seedlings receive.
C. The seedlings need more water at night than during the day.
D. The average length of the leaves increases as the amount of sunlight increases.

16. Seedlings grown at a 40% humidity level under the same conditions as in Experiment 1 would most likely have average leaf widths closest to:

F. 1.6 cm.
G. 1.9 cm.
H. 2.2 cm.
J. 2.5 cm.

17. According to the experimental results, under which set of conditions would a *Cycas* seedling be most likely to produce the largest leaves?

A. 95% humidity and 3 hours of sunlight
B. 75% humidity and 3 hours of sunlight
C. 95% humidity and 6 hours of sunlight
D. 75% humidity and 6 hours of sunlight

18. Which variable remained constant throughout all of the experiments?

F. The number of seedling groups
G. The humidity level
H. The daytime temperature
J. The nighttime temperature

19. It was assumed in the design of the three experiments that all of the *Cycas* seedlings were:

A. more than 5 cm tall.
B. equally capable of germinating.
C. equally capable of producing flowers.
D. equally capable of further growth.

20. As a continuation of the three experiments listed, it would be most appropriate to investigate next:

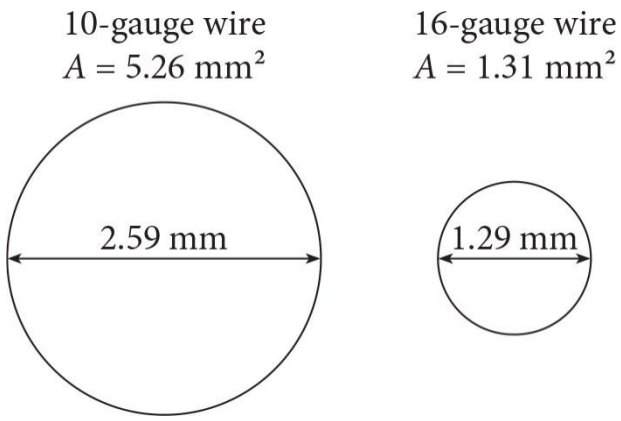
F. how many leaves over 6.0 cm long there are on each plant.
G. which animals consume *Cycas* seedlings.
H. how mineral content of the soil affects leaf size and density.
J. what time of year the seedlings have the darkest coloring.

Passage IV

The resistance (R) of a conductor is the extent to which it opposes the flow of electricity. Resistance depends not only on the conductor's resistivity (ρ) but also on the conductor's length (L) and cross-sectional area (A). The

resistivity of a conductor is a physical property of the material that varies with temperature.

A research team designing a new appliance was researching the best type of wire to use in a particular circuit. The most important consideration was the wire's resistance. The team studied the resistance of wires made from four metals—gold (Au), aluminum (Al), tungsten (W), and iron (Fe). Two lengths and two gauges (see Diagram 1) of each type of wire were tested at 20°C. The results are recorded in Table 1.



Note: area of circle = πr^2

Diagram 1

Table 1				
Material	Resistivity (mV-cm)	Length (cm)	Cross-sectional area (mm^2)	Resistance (mV)

Table 1				
Material	Resistivity (mV-cm)	Length (cm)	Cross-sectional area (mm^2)	Resistance (mV)
Au	2.44	1.0	5.26	46.4
Au	2.44	1.0	1.31	186.3
Au	2.44	2.0	5.26	92.8
Au	2.44	2.0	1.31	372.5
Al	2.83	1.0	5.26	53.8
Al	2.83	1.0	1.31	216.0
Al	2.83	2.0	5.26	107.6
Al	2.83	2.0	1.31	432.1
W	5.51	1.0	5.26	104.8
W	5.51	1.0	1.31	420.6
W	5.51	2.0	5.26	209.5
W	5.51	2.0	1.31	841.2
Fe	10.00	1.0	5.26	190.1
Fe	10.00	1.0	1.31	763.4
Fe	10.00	2.0	5.26	380.2
Fe	10.00	2.0	1.31	1,526.7

21. Of the wires tested, resistance increases for any given material as which parameter is decreased?

A. Length
B. Cross-sectional area
C. Resistivity
D. Gauge

22. Given the data in the table, which of the following best expresses resistance in terms of resistivity (ρ), cross-sectional area (*A*), and length (*L*)?

F. $\frac{\rho A}{L}$

G. $\frac{\rho L}{A}$

H. ρAL

J. $\frac{AL}{\rho}$

23. Which of the following wires would have the highest resistance?

A. A 1-cm aluminum wire with a cross-sectional area of 0.33 mm^2
B. A 2-cm aluminum wire with a cross-sectional area of 0.33 mm^2
C. A 1-cm tungsten wire with a cross-sectional area of 0.33 mm^2
D. A 2-cm tungsten wire with a cross-sectional area of 0.33 mm^2

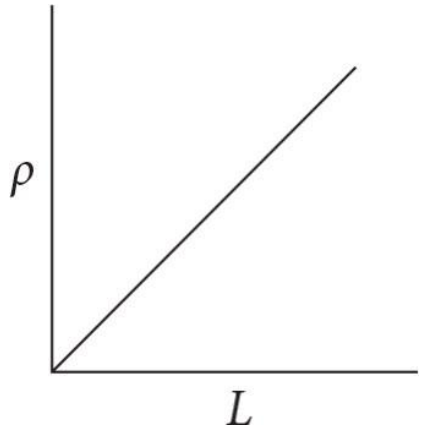
24. According to the information given, which of the following statements is (are) correct?

I. 10-gauge wire has a larger diameter than 16-gauge wire.
II. Gold has a higher resistivity than tungsten.
III. Aluminum conducts electricity better than iron.

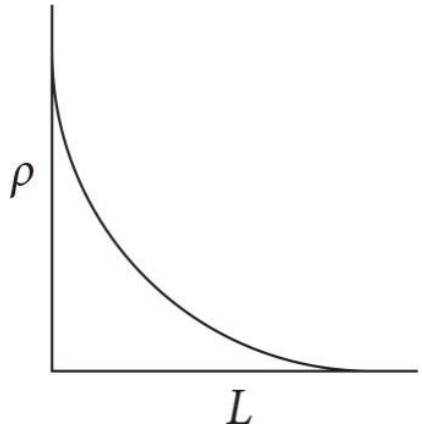
F. I only
G. II only
H. III only
J. I and III only

25. Which of the following graphs best represents the relationship between the resistivity of a tungsten wire and its length?

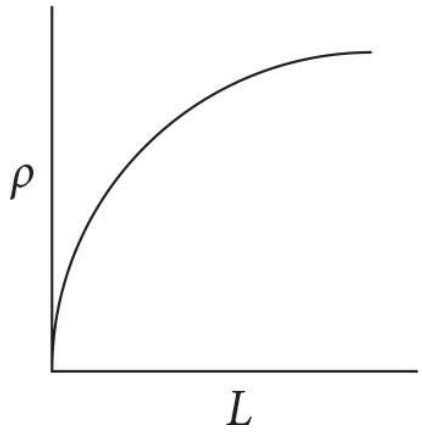
A.



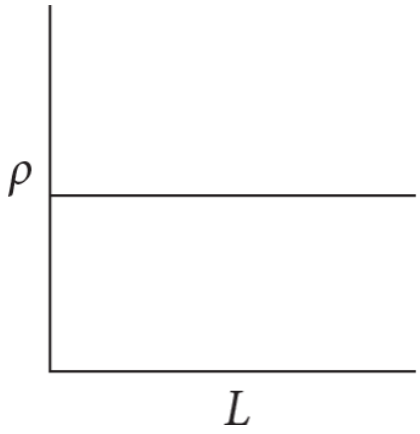
B.



C.



D.



26. If the length of the wires were increased to 4 cm, what effect would this most likely have on the wires' resistance values?

F. Resistance would increase, but only with a 10-gauge wire.
G. Resistance would decrease, but only with a 16-gauge wire.
H. Resistance would not change because 2 cm is the maximum length that affects resistance.
J. Resistance would increase on both the 10- and 16-gauge wires.

Passage V

How does evolution occur? Two scientists offered their own answers to the question.

Scientist 1

Evolution occurs by natural selection. Random mutations are continually occurring in a species as it propagates. A number of these mutations result in traits that help the species adapt to environmental changes. Because these

mutant traits are advantageous, the members of the species who possess them tend to survive and pass on their genes more often than those who do not have these traits. Therefore, the percentage of the population with an advantageous trait increases over time. For example, long necks evolved in giraffes by natural selection. The ancestors of giraffes had necks of various sizes; however, their average neck length was much shorter than the average neck length of modern-day giraffes. Since the food supply was limited, the individuals with necks on the long range of the spectrum had access to more food (the leaves of trees), and therefore were more likely to survive and pass on their traits than individuals with shorter necks. Thus, the proportion of the individuals with long necks was slightly greater in each subsequent generation.

Scientist 2

Evolution occurs by the inheritance of acquired characteristics. Characteristics that are acquired by an individual member of a species during its lifetime are passed on to its offspring. Therefore, each generation's traits are partially accounted for by all the changes that occurred in the individuals of the previous generation. This includes changes that occurred as a result of accidents, changes in the environment, overuse of muscles, and so on. The evolution of the long necks of giraffes is an example. Ancestors of giraffes had short necks and consequently had to stretch their necks to reach the leaves of trees that were their main source of food. This repeated stretching of their necks caused them to elongate slightly. This trait was passed on so that the individuals of the next generation had slightly longer necks. Each subsequent generation also stretched their necks to feed; therefore, each generation had slightly longer necks than the previous generation.

27. Both scientists agree that:

A. the environment affects evolution.
B. the individuals of a generation have identical traits.
C. acquired characteristics are inherited.
D. random mutations occur.

28. How would the two hypotheses be affected if it were found that all of the offspring of an individual with a missing leg due to an accident were born with a missing leg?

F. It would support Scientist 1's hypothesis, because it is an example of a random mutation occurring within a species.
G. It would refute Scientist 1's hypothesis, because it is an example of a random mutation occurring within a species.
H. It would support Scientist 2's hypothesis, because it is an example of an acquired characteristic being passed on to the next generation.
J. It would refute Scientist 2's hypothesis, because it is an example of an acquired characteristic being passed on to the next generation.

29. Which of the following characteristics can be inherited according to Scientist 2 ?

I. Fur color
II. Bodily scars resulting from a fight with another animal

III. Poor vision

A. I only
B. II only
C. I and III only
D. I, II, and III

30. Scientist 1 believes that the evolution of the long neck of the giraffe:

F. is an advantageous trait that resulted from overuse of neck muscles over many generations.
G. is an advantageous trait that resulted from random mutations.
H. is an advantageous trait that resulted from mutations that occurred in response to changes in the environment.
J. is a disadvantageous trait that resulted from random mutations.

31. The fundamental point of disagreement between the two scientists is whether:

A. giraffes' ancestors had short necks.
B. traits evolve from random mutations or from acquired characteristics.
C. the environment affects the evolution of a species.
D. the extinction of a species could be the result of random mutations.

32. Suppose evidence suggested that before the discovery of fire, human skin lacked the nerve endings necessary to detect extreme heat. Which of the following pieces of additional information, if true, would most seriously weaken the hypothesis of Scientist 2 ?

F. Human skin is capable of generating nerve endings with new functions during life.
G. The total number of nerve endings in the skin of a human is determined at birth and remains constant until death.
H. An excess of nerve endings that are sensitive to extreme heat is a relatively common human mutation.
J. There is no evidence that an excess of nerve endings that are sensitive to heat could be acquired through mutations.

33. The average height of a fully grown human today is significantly greater than was the average height of a fully grown human 1,000 years ago. If it were true that the increase in average height was due only to evolutionary changes, how would Scientist 1 most likely explain this increase?

A. Humans genetically prone to growing taller have been more likely to produce offspring over the last 1,000 years.
B. Over the last 1,000 years, improvements in nutrition and medicine have led to greater average growth over a lifetime, and this growth has been passed on with each new generation.
C. Over the last 1,000 years of civilization, humans have had to stretch to reach items placed on high shelves, resulting in small height increases that are inherited each generation.
D. Measurements of average height were less accurate 1,000 years ago than they are today.

Passage VI

Bovine spongiform encephalopathy (BSE) is caused by the spread of a misfolded protein that eventually kills infected cattle. BSE is diagnosed postmortem from the diseased cavities that appear in brain tissue and is associated with the use in cattle feed of ground-up meat from scrapie-infected sheep. A series of experiments was performed to determine the mode of transmission of BSE. The results of both experiments are provided in Table 1.

Experiment 1

Sixty healthy cows were divided into two equal groups. Group A's feed included meat from scrapie-free sheep; and Group B's feed included meat from scrapie-infected sheep. Eighteen months later, the two groups were slaughtered and their brains examined for BSE cavities. The results can be found in Table 1.

Experiment 2

Researchers injected ground-up sheep brains directly into the brains of two groups of 30 healthy cows each. The cows in Group C received brains from scrapie-free sheep. The cows in Group D received brains from scrapie-infected sheep. Eighteen months later, both groups were slaughtered and their brains examined for diseased cavities. The results can be found in Table 1.

Table 1

Group	Mode of transmission	Scrapie present	Number of cows infected with BSE
A	feed	no	1
B	feed	yes	12
C	injection	no	0
D	injection	yes	3

As determined visually by presence/absence of spongiform encephalopathy

34. Based on the information provided in Table 1, a cow is at greatest risk for contracting BSE if the cow:

F. consumes meat from scrapie-free sheep.
G. consumes meat from scrapie-infected sheep.
H. is injected with ground-up sheep brains from scrapie-free sheep.
J. is injected with ground-up sheep brains from scrapie-infected sheep.

35. Which of the following hypotheses was investigated in Experiment 1 ?

A. The injection of scrapie-infected sheep brains into cows' brains causes BSE.
B. The ingestion of wild grasses causes BSE.
C. The ingestion of scrapie-infected sheep meat causes scrapie.
D. The ingestion of scrapie-infected sheep meat causes BSE.

36. What is the purpose of Experiment 2 ?

F. To determine whether BSE can be transmitted by injection
G. To determine whether BSE can be transmitted by ingestion
H. To determine whether ingestion or injection is the primary mode of BSE transmission
J. To determine the healthiest diet for cows

37. Which of the following assumptions is made by the researchers in Experiments 1 and 2 ?

A. Cows do not suffer from scrapie.
B. A year and a half is a sufficient amount of time for BSE to develop.
C. Cows and sheep suffer from the same diseases.
D. Cows that eat scrapie-free sheep meat will not develop BSE.

38. A researcher wishes to determine whether BSE can be transmitted through scrapie-infected goats. Which of the following experiments would best test this?

F. Repeating Experiment 1, but using a mixture of sheep and goat meat in Group B's feed
G. Repeating Experiments 1 and 2, but replacing all the sheep with scrapie-infected goats
H. Repeating Experiments 1 and 2, but replacing healthy sheep with healthy goats and scrapie-infected sheep with scrapie-infected goats
J. Repeating Experiment 2, but replacing healthy cows with healthy goats

39. What is the control group in Experiment 1 ?

A. Group A
B. Group B
C. Group C
D. Group D

40. Which of the following conclusions can be drawn based on the results of the experiments?

I. Cows raised in proximity to scrapie-infected sheep are more likely to develop BSE than cows that are not.
II. BSE is only transmitted by eating scrapie-infected sheep meat.

III. A cow that eats scrapie-infected sheep meat is more likely to develop BSE than a cow that is injected with scrapie-infected sheep brains.

F. II only
G. III only
H. I and III only
J. II and III only

Writing Test

40 Minutes — 1 Question

Directions: The essay is used to evaluate your writing skills. You will have **40 minutes** to review the prompt and plan and write an essay in English. Before you begin, read everything in this test booklet carefully to make sure you understand the task.

Your essay will be judged based on the evidence it provides of your ability to do the following:

- Assert your own perspective on a complex issue and evaluate the relationship between your perspective and at least one other perspective
- Use reasoning and evidence to refine and justify your ideas
- Present your ideas in an organized way
- Convey your ideas effectively using standard written English

Write your essay on the lined essay pages in the answer booklet. All writing on those lined pages will be scored. Use the unlined pages in this test booklet to plan your essay. Your work on these unlined pages will not be scored.

Put your pencil down as soon as time is called.

DO NOT OPEN THIS BOOKLET UNTIL TOLD TO DO SO.

Career Readiness Programs

High school curricula are designed to ready students for future career paths, many of which include higher education. Whether or not students choose to attend college, a comprehensive high school education provides an essential foundation. Some educators argue that high schools have an obligation to provide career readiness training for students who do not intend to pursue a college degree. Should high schools invest time and money to develop programs for students who do not wish to continue their education beyond 12th grade? Given the many factors that students weigh when considering if, where, and when to attend college, it is prudent for educators to explore programs that contribute to a better-skilled workforce.

Read and carefully consider these perspectives. Each offers suggestions regarding high school–based career readiness programs.

Perspective One	Perspective Two	Perspective Three
Rather than concentrating solely on students who may not	Career-readiness training should be provided for	Students who do not want to pursue higher education should not be

pursue higher education, high schools should help all students develop valuable skills for the workforce. Requiring students to complete classes that focus on key cognitive strategies, content knowledge, and relevant skills and techniques will help them enter the workforce, either immediately after high school or	students who do not wish to pursue college, and it should be particularly targeted at students who are at risk for dropping out. When their high school experience is reframed as training for successful careers rather than government-mandated learning, students can succeed where they may	given additional accommodations in high school, because they should not be provided any incentives to not attend college. College is the best way to learn how to be productive in the workforce, and students should be encouraged to attend since it is in their best interest.

later in their lives.

previously have failed.

Essay Task

Write a clear, well-reasoned essay evaluating multiple perspectives on high school-based career readiness programs. In your essay, be sure to:

- Assert your own perspective on the issue and evaluate the relationship between your perspective and at least one other perspective
- Use reasoning and evidence to refine and justify your ideas
- Present your ideas in an organized way
- Convey your ideas effectively using standard written English

Your perspective may be fully, somewhat, or not at all in agreement with one or more of the three perspectives in the prompt.

Planning Your Essay

These pages are not scored.

Use the space below the prompt or another piece of paper to brainstorm and plan your essay. Consider the following as you think about the prompt:

- Strengths and weaknesses of the three perspectives in the prompt
  - What observations do they offer, and what do they overlook?
  - Why are they persuasive or why are they not persuasive?

- Your own background and identity
  - What is your perspective on this issue, and what are its strengths and weaknesses?
  - What evidence will you use in your essay?