

FULL-LENGTH PRACTICE TESTS 18

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 often 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

My Old-Fashioned Father

My father, though he is only in his early 50s, is stuck in his old-fashioned ways. He has a general mistrust of any innovation or technology that he can't immediately grasp and he always tells us, that if something isn't broken, then you shouldn't fix it.

He has run a small grocery store in town, and if you were to look at a snapshot of his back office taken when he opened the store in 1975, you would see that not much has changed since. He is the most disorganized person I know and still uses a pencil and paper to keep track of his inventory. His small office is about to burst with all the various documents, notes, and receipts he has accumulated over the years, his filing cabinets have long since been filled up. The centerpiece of all the clutter is his ancient typewriter, which isn't even electric. In the past few years, Father's search for replacement typewriter ribbons has become an increasingly difficult task, because they are no longer being produced. He is perpetually tracking down the few remaining places that still have these antiquated ribbons in their dusty inventories. When people ask him why he doesn't upgrade his equipment, he tells them, "Electric typewriters won't work in a blackout. All I need is a candle and some paper, and I'm fine."

Little does Father know, however, is that the “upgrade” people are speaking of
7
is not to an electric typewriter but to a computer.

[1] Hoping to bring Father out of the Dark Ages, my sister, and I bought
8
him a brand-new computer for his fiftieth birthday. [2] We offered to help him
to transfer all of his records onto it and to teach him how to use it. [3] Eagerly,
9
we told him about all the new spreadsheet programs that would help simplify
his recordkeeping and organize his accounts; and emphasized the advantage of
10
not having to completely retype any document when he found a typo. [4]
Rather than offering us a look of joy for the life-changing gift we had
presented him, however, he again brought up the blackout scenario. [5] To
Father, this is a concrete argument, although our town hasn’t had a blackout in
five years, and that one only lasted an hour or two. [11] [12]

My father’s state-of-the-art computer now serves as a very expensive
bulletin board for the hundreds of adhesive notes he uses to keep himself
organized. Sooner than later, we fully expect it will completely disappear
13
under the mounting files and papers in the back office.

In the depths of that disorganized office, the computer will join the cell phone
14
my mom gave him a few years ago.

Interestingly enough, every once in a while, that completely forgotten cell phone will ring from under the heavy clutter of the past. 15

1. A. NO CHANGE
B. ways he has a
C. ways having a
D. ways, and still has a

2. F. NO CHANGE
G. tells us, that,
H. tells us that,
J. tells us that

3. A. NO CHANGE
B. was running
C. runs
D. ran

4. F. NO CHANGE
G. not be likely to see very much that has changed since.
H. be able to see right away that not very much has changed since.
J. not change very much.

5. Assuming that all are true, which of the following additions to the word “inventory” is most relevant in context?

- A. inventory of canned and dry goods.
- B. inventory, refusing to consider a more current method.
- C. inventory, which he writes down by hand.
- D. inventory of goods on the shelves and in the storeroom.

6. F. NO CHANGE

- G. years; his filing cabinets
- H. years, and besides that, his filing cabinets
- J. years and since his filing cabinets

7. A. NO CHANGE

- B. know, besides, that
- C. know, however, that
- D. know, beyond that,

8. F. NO CHANGE

- G. me and my sister
- H. my sister and I
- J. my sister and I,

9. A. NO CHANGE
B. On the other hand,
C. In addition
D. Rather,

10. F. NO CHANGE
G. accounts and
H. accounts and,
J. accounts, we

11. The purpose of including this fact about the town's blackout history is to:

- A. make the father appear delusional.
B. suggest that the father's reasons not to update his technology are ill-founded.
C. add an interesting detail to set the scene.
D. foreshadow an event that occurs later in the story.

12. The author wants to include the following statement in this paragraph:

We expected it to save him a lot of time and effort.

The most logical placement for this sentence would be:

- F. before Sentence 1
- G. after Sentence 1
- H. after Sentence 4
- J. after Sentence 5

13. A. NO CHANGE
- B. Sooner rather than later,
 - C. Sooner or later,
 - D. As soon as later,

14. F. NO CHANGE
- G. Deep in the disorganization of that office's, the computer will join the cell phone my mom gave him a few years back.
 - H. In the disorganized depths of the office, the computer will soon be joined by the cell phone my mom gave him a few years ago.
 - J. The computer will join the cell phone my mom gave him a few years back in the disorganized depths of that office.

15. Which of the following would provide the most appropriate conclusion for the passage?

- A. It's hard to say what else might be lost in there.
- B. We tell my father it's a reminder that he can't hide from the future forever.
- C. We have no idea who might be calling.
- D. Maybe one day I will try to find it and answer it.

Passage II

Breaking Baseball's Color Barrier

A quick perusal of any modern major league baseball team will reveal a roster of players of multiple ethnicities from the farthest reaches of the globe.

16

Second only to soccer, baseball has evolved into a global sport and a symbol among races for equality.

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Its diversity today presents a stark contrast to the state of the sport just sixty years ago. As late as the 1940s, there existed an unwritten rule in baseball that prevented all but white players to participate in the major leagues.

18

This rule was known as the “color barrier” or “color line.” The color line in baseball actually predated the birth of the major leagues. Prior to the official formation of any league of professional baseball teams, there existed an organization of amateur baseball clubs known as the National Association of Baseball Players, which was the precursor to today’s National League. On

19

December 11, 1868, the governing body of this association had unanimously adopted a rule that effectively barred any team that had, any “colored persons”

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on its roster. However, when baseball started to organize into leagues by

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professional teams in the early 1880s, the National Association of Baseball Players’ decree no longer had any weight, especially in the newly formed

American Association.

For a brief period in those early years, a few African Americans played side by side with white players on major league diamonds.

[1] Most baseball historians believe that the first African American to play in the major leagues was Moses “Fleet” Walker. [2] Walker was a catcher for the Toledo Blue Stockings of the American Association between 1884 and 1889. [3] During that time, a few other African Americans, including Walker’s brother Weldy, would be joining him on the Blue Stockings. [4] Unfortunately, this respite from segregation did not last for very long; as Jim Crow laws took their hold on the nation, many of the most popular white ballplayers started to refuse to take the field with their African American teammates. [5] By the 1890s, the color barrier had fully returned to baseball, where it would endure for more than half a century. [26]

Jackie Robinson would become the first African American to cross the color line at the time when he debuted for the Brooklyn Dodgers in 1947. For Robinson’s landmark achievements on and off the diamond, he will forever be recognized as a hero of the civil rights movement and a sports icon. His response to the prejudices of American society during the 1940s and 1950s

opened the door for the multi-racial and multi-national face of modern baseball, and fans of the sport worldwide will be forever in his debt.

16. F. NO CHANGE
G. from the most far
H. from the most farthest
J. from farther
17. A. NO CHANGE
B. among races for equality a symbol.
C. a symbol for equality among races.
D. for equality among races a symbol.
18. F. NO CHANGE
G. to be able to participate
H. from participating
J. to participation
19. Is the underlined portion relevant here?

- A. Yes, because it helps familiarize the reader with the range of baseball associations that once existed.
- B. Yes, because it helps clarify the development the author traces.
- C. No, because the names of the organizations are not important.
- D. No, because it is inconsistent with the style of the essay to provide specific historical data.

20. F. NO CHANGE

- G. had any, “colored persons”
- H. had any “colored persons”
- J. had any “colored persons,”

21. A. NO CHANGE

- B. of
- C. from
- D. about

22. The writer is considering deleting the underlined portion. Should the writer make this deletion?

- F. Yes, because the information is not relevant to the topic of the paragraph.
 - G. Yes, because the information contradicts the first sentence of the paragraph.
 - H. No, because the information shows that white players did not object to integration.
 - J. No, because the statement provides a smooth transition to the specific information about early African American players in the next paragraph.
23. A. NO CHANGE
- B. Walker, being a catcher
 - C. Walker, a catcher
 - D. Walker who was a catcher
24. F. NO CHANGE
- G. that included
 - H. who would include
 - J. including among them
25. A. NO CHANGE
- B. joined him
 - C. were to join him
 - D. will join him

26. Upon reviewing this paragraph, the author discovers that he has neglected to include the following information:

A handful of African Americans played for other teams as well.

This sentence would be most logically placed after:

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

27. A. NO CHANGE

- B. when
- C. while
- D. when the time came that

28. F. NO CHANGE

- G. one day be recognized
- H. forever recognize
- J. be admired by a lot of people for being

29. Which choice best maintains the essay's positive tone while emphasizing the unique role that Robinson played?

- A. NO CHANGE
- B. The path that he blazed through
- C. The stance he took against
- D. His collaboration in the face of

Question 30 asks about the essay as a whole.

30. Suppose the writer had been assigned to develop a brief essay on the history of baseball. Would this essay successfully fulfill that goal?

- F. Yes, because it covers events in baseball over a period of more than a century.
- G. Yes, because it mentions key figures in baseball history.
- H. No, because people played baseball before 1868.
- J. No, because the focus of this essay is on one particular aspect of baseball history.

Passage III

The Bear Mountain Bridge

When the gleaming Bear Mountain Bridge officially opened to traffic on Thanksgiving Day in 1924, it was known as the Harriman Bridge, after Edward H. Harriman, a wealthy philanthropist and patriarch of the family most

influential in the bridge's construction. Before ³²they were constructed, there were no bridges spanning the Hudson River south of Albany. By the early 1920s, the ferry services used to transport people back and forth across the river had become woefully inadequate. In February of 1922, in an effort to alleviate some of the burden on the ferries and create a permanent link across the Hudson, the New York State Legislature ³³had authorized a group of private investors, led by Mary Harriman, to build a bridge. The group, known as the Bear Mountain Hudson Bridge Company (BMHBC), was allotted thirty years to ³⁴build, construct, and maintain the structure, at which time the span would be handed over to New York State.

The BMHBC invested almost \$4,500,000 into the suspension bridge and hired the world-renowned design team ³⁵of Howard Baird and George Hodge as architects. [36] Baird and Hodge enlisted the help of John A. Roebling and Sons, ³⁷who were instrumental in the steel work of the Brooklyn Bridge and would later work on the Golden Gate and George Washington Bridges.

Amazingly, the bridge took only twenty months and eleven days to complete, and not one life was lost. [38] It was a technological marvel and would stand as a model for the suspension bridges of the future. At the time of the Harriman Bridge's completion, it was, at 2,257 feet, the longest single-

span steel suspension bridge in the world. Therefore, the³⁹ two main cables used in the suspension were 18 inches in diameter, and each contained 7,752 individual steel wires wrapped in 37 thick strands. If completely unraveled, the single wires in both cables would be 7,377 miles longer.⁴⁰ The bridge links Bear Mountain on the western bank of the Hudson to Anthony's Nose on the eastern side, it lies⁴¹ so precisely on an east-west plane that one can check a compass by it. It carries Routes 6 and 202 across the Hudson and is the point of river crossing for the Appalachian Trail.

In an attempt to recoup some of its investment after the bridge opened, the BMHBC charged⁴² an exorbitant toll of eighty cents per crossing. Even with the high toll, however, it operated at a loss for thirteen of its first sixteen years. Finally it was acquired, more than ten years earlier than planned, by the New York State Bridge Authority. The bridge was renamed the Bear Mountain Bridge. Moreover, the Bear Mountain Bridge sees⁴³ more than⁴⁴ six million vehicles cross its concrete decks each year.

31. A. NO CHANGE
B. 1924; it,
C. 1924. It,
D. 1924 and it,

32. F. NO CHANGE
G. the bridges were
H. it was
J. it were
33. A. NO CHANGE
B. authorized
C. was authorized
D. would authorize
34. F. NO CHANGE
G. build and construct and maintain
H. construct and maintain
J. construct, and maintain
35. A. NO CHANGE
B. of Howard Baird, and George Hodge
C. of Howard Baird and, George Hodge
D. of, Howard Baird and George Hodge
36. The purpose of including the cost of the bridge is to:

- F. provide a piece of information critical to the point of the essay.
- G. insert a necessary transition between the second and third paragraphs.
- H. add a detail contributing to the reader's understanding of the magnitude of the project.
- J. provide an explanation of how the group raised money to invest in the bridge.

37. A. NO CHANGE
- B. who was
 - C. a company
 - D. a company that had been

38. If the writer were to delete the preceding sentence, the essay would primarily lose:

- F. information about how long the project had been expected to take.
- G. a warning about the dangers of large-scale construction projects.
- H. crucial information about the duration of the project.
- J. a necessary transition between Paragraphs 3 and 4.

39. A. NO CHANGE
- B. Nonetheless, the
 - C. At the same time, the
 - D. The

40. F. NO CHANGE
G. long.
H. in total length.
J. lengthy.
41. A. NO CHANGE
B. side, lies
C. side, lying
D. side; and it lies
42. F. NO CHANGE
G. opened the BMHBC charged
H. opened: the BMHBC charged
J. opened; the BMHBC charged
43. A. NO CHANGE
B. In contrast,
C. Besides that fact,
D. Today,
44. F. NO CHANGE
G. over
H. even more than
J. a higher amount than

Question 45 asks about the essay as a whole.

45. Suppose the author had been assigned to write a brief history of bridge building in the United States. Would this essay successfully fulfill that requirement?
- A. Yes, because it provides information on the entire process from the initial funding through the opening of the bridge.
 - B. Yes, because Bear Mountain Bridge is historically significant.
 - C. No, because it focuses on only one bridge.
 - D. No, because the essay is primarily concerned with the financial aspects of building and maintaining the bridge.

Passage IV

The Dream of the American West

As the sun was slowly rising over the Atlantic Ocean and painted New York harbor a spectacular fiery orange, I started my old Toyota's engine. At this early hour, there was still some semblance of the night's tranquility left on the city sidewalks, but I knew that, as the minutes ticked by, the streets would flood with humanity. I smiled with the thought that soon all the wonderful chaos of New York City would be disappearing behind me as I embarked on my trip to the other side of the country.

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As the morning sun climbed into the sky, I shuddered with excitement
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to think that my final stop would be in California, where the sun itself ends its
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journey across America.

Like the sun, however, I still had quite a journey before me.

I had been planning this road trip across the United States for as long as I could remember. In my life, I had been fortunate enough to see some of the most beautiful countries in the world. However, it had always bothered me that although I'd stood in the shadow of the Eiffel Tower, marveled in the desert heat at the Pyramids of Giza, I'd never
52
seen any of the wonders of my own country, except those found in my hometown of New York City. All of that was about to change.

As I left the city, the tall buildings began to give way to smaller ones, then
53
to transform into the quaint rows of houses that clustered the crowded suburbs.
Trees and grass, then the yellow-green of cornfields and the golden wash of wheat were slowly replacing the familiar mazes of cement and steel. My world
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no longer stretched vertically toward the sky, it now spread horizontally
55
towards eternity. For two days, I pushed through the wind-whipped farmlands of Mid-America, hypnotized by the beauty of the undulating yet unbroken lines. At night, the breeze from my car would stir the wheat fields to dance

beneath the moon, and the silos hid in the shadows, quietly imposing their simply serenity upon everything.

56

Then, as the night's shadows gave way to light, there seemed to be a great force rising to meet the sun as it made its reappearance. Still, I had no idea what I was looking at. Then, there was no mistaking it. The unbroken lines of Mid-America had given way to the jagged and majestic heights of the Rockies and the gateway to the American West.

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46. F. NO CHANGE

G. rising slowly

H. rose slowly

J. continued to rise

47. The author wants to contrast the statement about the quiet of the night streets with a related detail about the daytime activity. Assuming that all of the choices are true, which of the following best accomplishes that goal?

A. NO CHANGE

B. some people might appear.

C. everything would be different.

D. the tranquility would be unbroken.

48. F. NO CHANGE

G. along with

H. at

J. all because of

49. A. NO CHANGE

B. embarked on this journey across

C. traveled to the other side of

D. traveled across

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

F. At sunrise,

G. Watching the morning sun climb into the sky,

H. The morning sun climbed into the sky,

J. As the sun rose,

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. If $4x - 9 = 15$, what is the value of x ?

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

2. What is 35% of 240?

- A. 72
- B. 84
- C. 96
- D. 108

3. Simplify: $3(4x - 5) - 2(3x - 7)$

- A. $6x - 1$
- B. $6x - 29$
- C. $18x - 1$
- D. $18x - 29$

4. What is the greatest common factor of 48 and 72?

- A. 8
- B. 12
- C. 16
- D. 24

5. If the median of five consecutive integers is 18, what is the smallest of these integers?

- A. 14
- B. 15
- C. 16
- D. 17

6. Solve for x : $3x^2 - 12x = 0$

- A. $x = 0$ only
- B. $x = 4$ only
- C. $x = 0$ or $x = 4$
- D. $x = 0$ or $x = -4$

7. What is $|-12| - |-7|$?

- A. -19
- B. -5
- C. 5
- D. 19

8. What is $\frac{5}{8} + \frac{3}{4}$?

- A. $\frac{8}{12}$
- B. $\frac{11}{8}$
- C. $\frac{15}{32}$
- D. $\frac{8}{32}$

9. A train travels 270 miles in 4.5 hours. What is its average speed?

- A. 50 mph
- B. 55 mph
- C. 60 mph
- D. 65 mph

10. Factor: $x^2 - 11x + 30$

- A. $(x - 5)(x - 6)$
- B. $(x - 3)(x - 10)$
- C. $(x - 2)(x - 15)$
- D. $(x - 1)(x - 30)$

11. What is $\sqrt{196}$?

- A. 12
- B. 13
- C. 14
- D. 15

12. If $f(x) = 2x^2 + 3x - 4$, what is $f(-2)$?

- A. -6
- B. -2
- C. 2
- D. 6

13. The slope of the line passing through (1, 3) and (5, 11) is:

- A. 1
- B. 2
- C. 3
- D. 4

14. In a 45-45-90 triangle, if one leg is 8, what is the hypotenuse?

- A. 8
- B. $8\sqrt{2}$
- C. $8\sqrt{3}$
- D. 16

15. Solve: $2x - 7 < 9$

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

16. The area of a circle with diameter 10 is:

- A. 10π
- B. 20π
- C. 25π
- D. 100π

17. Express 0.00072 in scientific notation:

- A. 7.2×10^{-4}
- B. 7.2×10^{-3}
- C. 72×10^{-5}
- D. 0.72×10^{-3}

18. What is the value of 2^5 ?

- A. 10
- B. 16
- C. 25
- D. 32

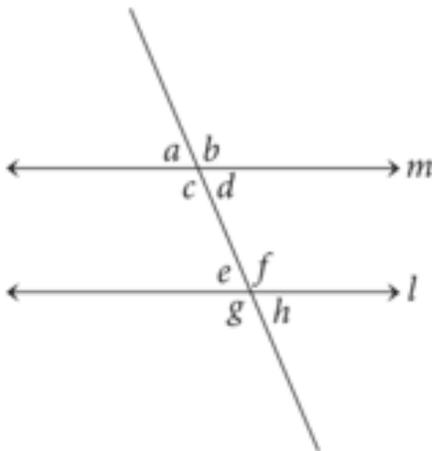
19. If $\log_3(x) = 4$, what is x ?

- A. 12
- B. 64
- C. 81
- D. 243

20. A rectangle has length 15 and width 9. What is its diagonal?

- A. 12
- B. 17.5
- C. 18.2
- D. 24

21. In the following figure, lines m and l are parallel and the measure of $\angle a$ is 68° . What is the measure of $\angle f$?



- A. 22°
- B. 68°
- C. 80°
- D. 112°

22. The mean of $\{4, 7, 9, 12, 18\}$ is:

- A. 9
- B. 10
- C. 11
- D. 12

23. Which equation represents a line parallel to $y = 3x - 5$?

- A. $y = -3x + 2$
- B. $y = 3x + 7$
- C. $y = -1/3x + 4$
- D. $y = 1/3x - 8$

24. Two angles are complementary. If one is 38° , the other is:

- A. 38°
- B. 52°
- C. 142°
- D. 152°

25. What is $\sin(30^\circ)$?

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

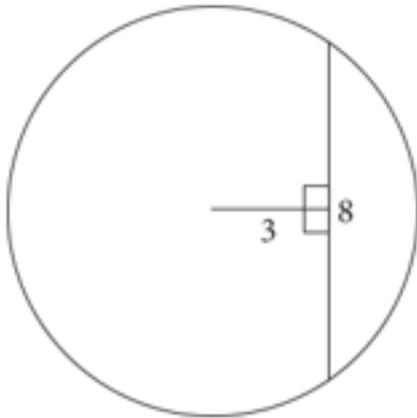
26. A bag contains 3 red, 5 blue, and 7 green marbles. What is the probability of drawing a red marble?

- A. $1/5$
- B. $3/15$
- C. $1/3$
- D. $3/7$

27. Simplify: $(3x^4)(4x^3)$

- A. $7x^7$
- B. $12x^7$
- C. $7x^{12}$
- D. $12x^{12}$

28. The chord shown in the figure is 8 units long. If the chord is 3 units from the center of the circle, what is the area of the circle?



- A. 9π
- B. 16π
- C. 18π
- D. 25π

29. The distance between points $(2, -3)$ and $(-4, 5)$ is:

- A. 8
- B. 10
- C. 12
- D. 14

30. If $3^x = 243$, what is x ?

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

31. The volume of a rectangular prism with dimensions $4 \times 6 \times 9$ is:

- A. 19
- B. 108
- C. 180
- D. 216

32. Which equation represents a line perpendicular to $y = 4x - 3$?

- A. $y = 4x + 2$
- B. $y = -4x + 1$
- C. $y = -1/4x + 5$
- D. $y = 1/4x - 7$

33. In a 30-60-90 triangle, if the hypotenuse is 10, what is the shortest side?

- A. 5
- B. $5\sqrt{2}$
- C. $5\sqrt{3}$
- D. $10\sqrt{3}$

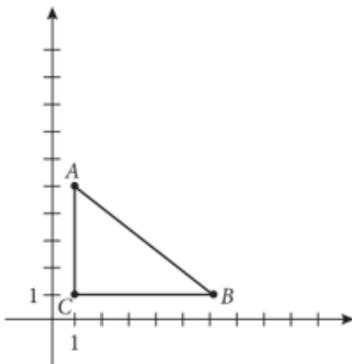
34. What is 18% of 150?

- A. 24
- B. 27
- C. 30
- D. 33

35. The mode of $\{3, 5, 7, 5, 9, 11, 5, 13\}$ is:

- A. 3
- B. 5
- C. 7
- D. 8

36. What is the length of side AC in triangle ABC graphed on the following coordinate plane?



- F. 3
- G. 4
- H. 5
- J. 6

37. If $\tan \theta = 5/12$, what is $\cos \theta$?

- A. $5/13$
- B. $12/13$
- C. $5/12$
- D. $13/12$

38. A circle has area 36π . What is its circumference?

- A. 6π
- B. 12π
- C. 18π
- D. 36π

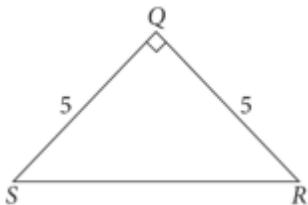
39. Solve: $|2x - 4| = 10$

- A. $x = 7$ only
- B. $x = -3$ only
- C. $x = 7$ or $x = -3$
- D. $x = 5$ or $x = -5$

40. If $(x + 3)$ is a factor of $x^2 + 7x + k$, what is k ?

- A. 10
- B. 12
- C. 14
- D. 16

41. In the following triangle, what is the value of $\cos R$?



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

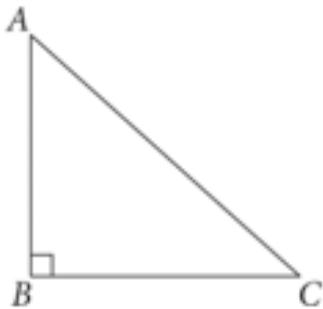
42. The equation $x^2 - 10x + k = 0$ has exactly one solution. What is k ?

- A. 20
- B. 25
- C. 30
- D. 100

43. If $i = \sqrt{-1}$, what is i^4 ?

- A. i
- B. $-i$
- C. 1
- D. -1

44. In the following triangle, if $\cos \angle BAC = 0.6$ and the hypotenuse of the triangle is 15, what is the length of side BC ?



- A. 3
- B. 5
- C. 10
- D. 12

45. The sum of three consecutive even integers is 78. What is the largest of these integers?

- A. 24
- B. 26
- C. 28
- D. 30

Reading Test

40 Minutes — 36 Questions

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

Passage I

Prose Fiction

This passage is adapted from *The Age of Innocence*, by Edith Wharton (1920).

It was generally agreed in New York that the Countess Olenska had “lost her looks.”

She had appeared there first, in Newland Archer’s boyhood, as a brilliantly pretty little girl
(5) of nine or ten, of whom people said that she “ought to be painted.” Her parents had been continental wanderers, and after a roaming babyhood she had

lost them both, and been taken in charge by her
aunt, Medora Manson, also a wanderer, who was
(10) herself returning to New York to “settle down.”

Poor Medora, repeatedly widowed, was always
coming home to settle down (each time in a less
expensive house), and bringing with her a new
husband or an adopted child, but after a few
(15) months she invariably parted from her husband or
quarrelled with her ward, and, having got rid of her
house at a loss, set out again on her wanderings.

As her mother had been a Rushworth, and her
last unhappy marriage had linked her to one of
(20) the crazy Chiverses, New York looked indulgently
on her eccentricities, but when she returned with
her little orphaned niece, whose parents had been
popular in spite of their regrettable taste for travel,
people thought it a pity that the pretty child should
(25) be in such hands.

Everyone was disposed to be kind to little
Ellen Mingott, though her dusky red cheeks and
tight curls gave her an air of gaiety that seemed
unsuitable in a child who should still have been in
(30) black for her parents. It was one of the misguided
Medora’s many peculiarities to flout the unalterable
rules that regulated American mourning, and
when she stepped from the steamer her family was
scandalized to see that the crepe veil she wore for
(35) her own brother was seven inches shorter than
those of her sisters-in-law, while little Ellen wore a
crimson dress and amber beads.

But New York had so long resigned itself to Medora that only a few old ladies shook their
(40) heads over Ellen's gaudy clothes, while her other relations fell under the charm of her high spirits. She was a fearless and familiar little thing, who asked disconcerting questions, made precocious comments, and possessed outlandish arts, such
(45) as dancing a Spanish shawl dance and singing Neapolitan love-songs to a guitar. Under the direction of her aunt, the little girl received an expensive but incoherent education, which included "drawing from the model," a thing never dreamed
(50) of before, and playing the piano in quintets with professional musicians.

Of course no good could come of this, and when, a few years later, poor Chivers finally died, his widow again pulled up stakes and departed
(55) with Ellen, who had grown into a tall bony girl with conspicuous eyes. For some time no more was heard of them; then news came of Ellen's marriage to an immensely rich Polish nobleman of legendary fame. She disappeared, and when a few years later
(60) Medora again came back to New York, subdued, impoverished, mourning a third husband, and in quest of a still smaller house, people wondered that her rich niece had not been able to do something for her. Then came the news that Ellen's own
(65) marriage had ended in disaster, and that she was herself returning home to seek rest and oblivion among her kinsfolk.

These things passed through Newland Archer's mind a week later as he watched the Countess
(70) Olenska enter the van der Luyden drawing room on the evening of the momentous dinner. In the middle of the room she paused, looking about her with a grave mouth and smiling eyes, and in that instant, Newland Archer rejected the general verdict
(75) on her looks. It was true that her early radiance was gone. The red cheeks had paled; she was thin, worn, a little older-looking than her age, which must have been nearly thirty. But there was about her the mysterious authority of beauty, a sureness
(80) in the carriage of the head, the movement of the eyes, which, without being in the least theatrical, struck him as highly trained and full of a conscious power. At the same time she was simpler in manner than most of the ladies present, and many people
(85) (as he heard afterward) were disappointed that her appearance was not more "stylish"—for stylishness was what New York most valued. It was, perhaps, Archer reflected, because her early vivacity had disappeared; because she was so quiet—quiet in
(90) her movements, her voice, and the tones of her voice. New York had expected something a good deal more resonant in a young woman with such a history.

BIG PICTURE SUMMARY:

Main idea: Ellen Mingott as a child and Countess Olenska as an adult did not fit New York society's expectations of her.

Author's purpose: To portray how a character changed from childhood to adulthood and the influences that shaped her

-
1. The author describes which of the following practices as undesirable to New York society?
 - A. Playing the piano
 - B. Performing Spanish shawl dances
 - C. Traveling
 - D. Adopting children

 2. With which of the following would the author most likely agree regarding New York society as it pertains to Medora?
 - F. It is rigid and unaccepting of different behavior.
 - G. It is usually whimsical, with few solid rules.
 - H. It is often based on unrealistic expectations.
 - J. It is snobbish but occasionally accepting of less common behavior.

 3. It is most reasonable to infer that, after the death of Medora's third husband, Ellen did not help her aunt primarily because:

- A. Ellen was no longer wealthy, since her own marriage had failed.
- B. Medora had become embittered because she hadn't heard from Ellen for so long.
- C. Ellen resented the incoherent education she received from her aunt.
- D. receiving help from her niece would interfere with Medora's desire to be eccentric.

4. Based on the characterization of Newland Archer in the last paragraph, he can best be described as:

- F. reflective and nonjudgmental.
- G. likable but withdrawn.
- H. disinterested but fair.
- J. stylish and gregarious.

5. In her descriptions of Medora, the author intends to give the impression that Medora is:

- A. eccentric and peripatetic.
- B. impoverished and resentful.
- C. kind and loyal.
- D. precocious and pretty.

6. As it is used in line 31, the word *flout* most nearly means:

- F. eliminate.
- G. exemplify.
- H. disregard.
- J. float.

7. What does the narrator suggest is a central characteristic of Medora Manson?

- A. Arrogance
- B. Immodesty
- C. Non-conformity
- D. Orthodoxy

8. Which of the following characters learns to do something otherwise unheard of by New York society?

- F. Ellen Mingott
- G. Newland Archer
- H. Medora Manson
- J. Count Olenska

9. The author includes reference to Medora's mother and Medora's marriage to "one of the crazy Chiverses" (lines 19–20) in order to indicate that:

- A. she had an unhappy childhood.
- B. her eccentricities were not surprising.
- C. she was the perfect person to raise Ellen.
- D. she was a wanderer.

10. One can reasonably infer from the passage that on the occasion of the dinner, Newland and Ellen:

- F. had not seen each other for some time.
- G. were interested in becoming romantically involved.
- H. were both disappointed with New York society.
- J. had just met, but were immediately attracted to each other.

Passage II

Social Science

This passage discusses challenges facing Florida's two largest economic sectors due to climate change.

Every state in the U.S. relies on at least one or two industries to drive its economic growth.

Boasting a top-five economy among the 50 states, Florida thrives on its tourism industry and

- (5) agricultural production. Recent climate change reports are a cause for concern for the policymakers who want to keep the state on its current upward economic trajectory. How serious are the threats

that the state faces, and can anything be done to
(10) stave off the effects of climate change before they
irreparably damage the Floridian economy?

The National Climate Assessment, a government-
mandated report released every four years,
references South Florida frequently as a locale
(15) that is likely to experience the worsening effects
of climate change sooner rather than later. In
September 2017, for example, Hurricane Irma
wreaked havoc on large swaths of the Florida
coastline when it made landfall in the Florida
(20) Keys; economists put the price tag for Irma at \$50
billion, making it the costliest hurricane in Florida's
history. It is estimated that if Irma had made a
more direct hit on Miami, Florida's second-most
popular tourist destination, the damage would have
(25) been closer to \$200 billion. Many scientists feel that
rising sea levels are making areas like Miami and
Orlando increasingly vulnerable to such catastrophic
weather events.

Another top tourist attraction in Florida, the
(30) Everglades, is already experiencing a reduction
in size due to a combination of rising sea levels
and serious weather events. Large sections of the
Everglades are less than three feet above sea level,
and soon many of the low-lying regions will be
(35) completely submerged. This does not bode well for
the over one million visitors who make the trek to
the national park each year nor for the more than
\$20 million in revenue that the Everglades National

Park generates annually. In addition, the sea level
(40) rise causes salt water to push further inland and
upstream, which endangers not only tourism but
also the drinking water of several communities.

On a peninsula like Florida, it seems ironic
that a lack of water could become an issue, but
(45) an Environmental Protection Agency report
published in 2016 pointed to a lack of irrigation due
to warmer temperatures as a potential downside
of a longer growing season. Florida relies on
groundwater pumped from permeable underground
(50) aquifers, and Florida farms consume nearly half of
the state's public water supply. Citrus fruits require
substantial amounts of irrigation to maintain crop
size; a 2003 agriculture study found that a 20%
reduction in irrigation resulted in significant losses
(55) for citrus crops. The citrus fruit industry in Florida
is a \$10 billion industry, so any negative trends
have a direct impact on Florida's overall economic
health.

Climate change has an impact on the pro-
(60) duce side of Florida's agriculture as well as the
livestock side; although it makes up a smaller
portion of Florida's \$120 billion in agricultural
revenue than the citrus industry, the livestock
industry exports cattle, calves, milk, poultry, and
(65) eggs both nationally and internationally. One
problem that arises with livestock as a result of
warmer temperatures is a reduction in productivity
because of metabolic disruption caused by heat

stress. The livestock industry also relies on the
(70) extensive perennial grasslands of the region, which
have degraded in quality because of the greater
frequency of severe weather events. Additionally, the
combination of temperature and rainfall increases
have led to greater instances of livestock diseases
(75) like the West Nile virus; the increase in humidity
leads directly to larger mosquito populations.

With so many challenges facing their state,
Floridians are taking a proactive approach to
combating some of the consequences of climate
(80) change. In Miami, lawmakers are considering
some rather unconventional recommendations. For
example, a group of Harvard students presented
Miami Beach leaders with two unique options
to help adapt to rising seas: concrete cisterns
(85) strategically placed on roofs throughout the city
to capture rainwater, and “sacrificial floors”
designed to absorb excess water before it reaches the
inhabited floors. Researchers are encouraging the
South Florida Water Management District to change
(90) their timetable for increasing freshwater flow to
the Everglades to maintain the level of freshwater
higher than sea level. Farmers are investing in
micro-surface and subsurface drip irrigation
systems to reduce the overall volume of water
(95) needed to maintain their crops and making the
move to mixed crop-livestock farms, as studies have
shown this farming style to be mutually beneficial
to both crops and livestock.

While a complete reversal of the consequences
(100) of climate change seems improbable, Floridians
can be encouraged by the fact that leaders in their
state are taking some pragmatic steps to cope with
the changes. Furthermore, as those policymakers
look to protect the sectors that have long served
(105) as the foundation of Florida’s economy, there is
also a push to continue to diversify. International
trade—Florida is already one of the largest export
states—seems an ideal sector to expand with the
increasingly globalized nature of economic systems.
(110) Despite the challenges, Florida is preparing to
weather the storm of climate change as it has
weathered so many storms before.

Suggested Passage Map notes:

- ¶1: climate change threat to FL economy: tourism + agriculture
- ¶2: S. FL storm damage (tourism)
- ¶3: Everglades
- ¶4: not enough water for citrus farms
- ¶5: livestock industry
- ¶6: plans to deal w/ problems
- ¶7: more prep, diversify economy

BIG PICTURE SUMMARY:

Main idea: Potential dangers to Florida’s tourism and agriculture industries from climate change and ways Floridians plan to address them.

Author's purpose: To describe how climate change is likely to impact Florida's economy

11. The primary purpose of the passage is to:
- A. describe how climate change has harmed Florida's land and industries.
 - B. discuss the threats climate change poses to Florida and how to address them.
 - C. argue for the implementation of unorthodox means of combating climate change.
 - D. explain the varied ways in which climate change can impact people's lives.
12. According to the passage, what makes Hurricane Irma significant?
- F. It cost Florida nearly \$200 billion in lost revenue and infrastructure repair.
 - G. It was the first hurricane to hit Florida that was significantly exacerbated by climate change.
 - H. It demonstrated to scientists how damaging rising sea levels could be.
 - J. It caused more economic damage to Florida than any other hurricane.
13. The second paragraph implies that South Florida:

- A. is a major source of tourism revenue for the state.
- B. is likely to be entirely submerged by rising sea levels.
- C. is more vulnerable to extreme weather than North Florida.
- D. is central to agricultural production in Florida.

14. The passage makes clear that the main threat climate change poses to the Everglades is:

- F. contamination; salt water pushed inland will poison fresh water sources.
- G. submersion; rising sea levels will put lands at low elevations under water.
- H. habitat destruction; extreme weather will degrade the park's lush vegetation.
- J. isolation; changes to the landscape will cut the park off from visitors.

15. The author references the 2016 Environmental Protection Agency report (lines 45–46) and the 2003 study (lines 53–55) primarily in order to:

- A. provide specific numerical evidence for the cost of climate change.
- B. counter an argument that contradicts the author's point.
- C. open a discussion about their long-term implications for Florida.
- D. add support for the paragraph's claims from authoritative sources.

16. The passage states that compared to the citrus industry, the livestock industry in Florida:

- F. consumes more water.
- G. creates less pollution.
- H. exports more products.
- J. generates less income.

17. According to the passage, how might climate change negatively impact the livestock industry in Florida?

- A. Decreased crop yields would mean less food for the animals.
- B. Higher temperatures would put a strain on the animals' bodies.
- C. Animals exposed to poor weather would be more likely to become ill.
- D. Water shortages would cause the animals to become dehydrated.

18. Which of the following best describes the purpose of the sixth paragraph?

- F. It outlines suggested infrastructure adaptations to be applied throughout Florida.
- G. It summarizes the primary challenges facing Florida's economy due to climate change.
- H. It explains some of the ways Floridians are planning to address problems caused by climate change.
- J. It examines how to best direct water supplies in order to compensate for imbalances in rainfall.

19. According to the passage, how is the agriculture industry preparing to address problems caused by climate change?

- A. Farmers are replacing microsurface and subsurface drip irrigation with more efficient systems.
- B. Industry associations are working to expand underground aquifers.
- C. Farms are integrating crops and livestock to improve production of both.
- D. Farmers are stepping up vaccinations of livestock to combat the spread of disease.

20. The detail "Florida is already one of the largest export states" (lines 107–108) most nearly serves to:

- F. identify one of the main drivers of Florida's economic expansion.
- G. compare Florida's trade balance to that of other states.
- H. explain why expanding Florida's international trade is likely to be effective.
- J. emphasize the benefits of diversifying Florida's economy.

Passage III

Humanities

One of the most enjoyable ways to analyze culture is through music. By analyzing musical styles and lyrics, one can explore quintessential characteristics of particular cultures.

Passage A explores the relationship between the central and southern areas of the Appalachian mountain range and country music. Passage B contrasts bluegrass and country music and culture.

Passage A

Country music has its roots in the southern portions of the United States, specifically in the remote and undeveloped backcountry of the central and southern areas of the Appalachian mountain (5) range. Recognized as a distinct cultural region since the late nineteenth century, the area became home to European settlements in the eighteenth century, primarily led by Ulster Scots from Ireland.

Early inhabitants have been characterized as
(10) fiercely independent, to the point of rudeness and inhospitality. It was in this area that the region's truly indigenous music, now known as country music, was born.

Rooted in spirituals as well as folk music,
(15) cowboy songs, and traditional Celtic melodies, country music originated in the 1920s. The motifs are generally ballads and dance tunes, simple in form and accompanied mostly by guitar, banjo, and violin. Though today there are many genres of
(20) country music, all have their roots in this mélange of sources.

The term "country" has replaced the original pejorative term "hillbilly." Hillbillies referred to Appalachian inhabitants who were considered poor,
(25) uneducated, isolated, and wary; the name change reflects a more accepting characterization of these mountain dwellers.

Hank Williams put country music on the map nationally, and is credited with the movement of
(30) country music from the South to more national prominence. Other early innovators include the Carter family, Ernest Tubb, Woody Guthrie, Loretta Lynn, and Bill Monroe, father of bluegrass music. More recently, Faith Hill, Reba McEntire, and
(35) Shania Twain have carried on the tradition.

What might be considered the "home base" of country music is in Nashville, Tennessee, and the legendary music hall, the Grand Ole Opry. Founded

in 1925 by George D. Hay, it had its genesis in the
(40) pioneer radio station WSM's program Barn Dance.
Country singers are considered to have reached
the pinnacle of the profession if they are asked to
become members of the Opry. While noted country
music performers and acts take the stage at the Opry
(45) numerous times, Elvis Presley performed there only
once, in 1954. His act was so poorly received that it
was suggested he return to his job as a truck driver.

The offshoots and relatives of country music
highlight the complexity of this genre. In a move
(50) away from its mountain origins, and turning a
focus to the West, honky-tonk music became
popular in the early twentieth century. Its name is
a reference to its roots in honky-tonk bars, where
the music was played. Additionally, Western swing
(55) emerged as one of the first genres to blend country
and jazz musical styles, which required a great deal
of skill and creativity. Some of the most talented
and sophisticated musicians performing in any
genre were musicians who played in bluegrass string
(60) bands, another relative of country music.

Country music has always been an expression of
American identity. Its sound, lyrics, and performers
are purely American, and though the music now
has an international audience, it remains American
(65) in its heart and soul.

Passage B

A style of music closely related to country is the

similarly indigenous music known as bluegrass, which originated in the Appalachian highland regions extending westwards to the Ozark

- (70) Mountains in southern Missouri and northern Arkansas. Derived from the music brought over by European settlers of the region, bluegrass is a mixture of Scottish, Welsh, Irish, and English melodic forms, infused, over time, with African-
- (75) American influences. Indeed, many bluegrass songs, such as “Barbara Allen” and “House Carpenter,” preserve their European roots, maintaining the traditional musical style and narratives almost intact. Story-telling ballads, often laments, are
- (80) common themes. Given the predominance of coal mining in the Appalachian region, it is not surprising that ballads relating to mining tragedies are also common.

- Unlike country music, in which musicians
- (85) commonly play the same melodies together, bluegrass highlights one player at a time, with the others providing accompaniment. This tradition of each musician taking turns with solos, and often improvising, can also be seen in jazz ensembles.
- (90) Traditional bluegrass music is typically played on instruments such as banjo, guitar, mandolin, bass, harmonica, and Dobro (resonator guitar). Even household objects, including washboards and spoons, have, from time to time, been drafted for
- (95) use as instruments. Vocals also differ from country music in that, rather than featuring a single voice,

bluegrass incorporates baritone and tenor harmonies.

Initially included under the catch-all phrase “folk music,” and later referred to as “hillbilly,” bluegrass
(100) did not come into his own category until the late
1950s, and appeared first in the comprehensive guide,
Music Index, in 1965. Presumably it was named after
Bill Monroe’s Blue Grass band, the seminal bluegrass
band. A rapid, almost frenetic pace, characterizes
(105) bluegrass tempos. Even today, decades after their
most active performing era, The Foggy Mountain
Boys members Lester Flatt, a bluegrass guitarist and
mandolinist, and Earl Scruggs, known for his threefinger
banjo picking style, are widely considered the
(110) foremost artists on their instruments.

Partially because of its pace and complexity,
bluegrass has often been recorded for movie
soundtracks. “Dueling Banjos,” played in the movie
Deliverance, exemplifies the skill required by the
(115) feverish tempo of the genre. The soundtrack for *O
Brother, Where Art Thou?* incorporates bluegrass and
its musical cousins folk, country, gospel, and blues.
Bluegrass festivals are held throughout the country
and as far away as the Czech Republic. Interactive,
(120) often inviting audience participation, they feature
performers such as Dolly Parton and Alison Krauss.

Central to bluegrass music are the themes of the
working class—miners, railroad workers, farmers.
The phrase “high, lonesome sound” was coined to
(125) represent the bluegrass undertones of intensity and
cheerlessness, symbolizing the hard-scrabble life of

the American worker. As with so much of a nation's traditional music, and for better or worse, bluegrass music reflects America.

BIG PICTURE SUMMARY:

Passage A

Main idea: Country music is an American musical genre with a rich history.

Author's purpose: To describe the origins and history of country music

Passage B

Main idea: Bluegrass music is related to but distinct from country music, with its own cultural niche.

Author's purpose: To explain what makes bluegrass music unique

21. According to the passage, country music originated from all of the following EXCEPT:

- A. Celtic melodies.
- B. spirituals.
- C. jazz.
- D. cowboy songs.

22. Which of the following would be the most logical place to hear the best of country music?

- F. Honky-tonk bars
- G. Ireland
- H. The Appalachian backcountry
- J. The Grand Ole Opry

23. As it is used in line 23, the word *pejorative* most nearly means:

- A. traditional.
- B. accurate.
- C. disparaging.
- D. mountain dwelling.

24. If a song were a lament with Welsh and African-American derivation, the author of Passage B would classify it as:

- F. bluegrass.
- G. country.
- H. jazz.
- J. hillbilly.

25. According to the passage, the instruments played in bluegrass music are:

- A. both typical and unusual.
- B. derived from African-American influences.
- C. made famous by the piece “Dueling Banjos.”
- D. restricted to those used in the Ozarks.

26. In addition to highlighting one player at a time, bluegrass music differs from country music in that it often:

- F. features harmonies sung by bass and tenor voices.
- G. features a single voice.
- H. is characterized by musicians commonly playing the same melodies together.
- J. is played on instruments such as the banjo and guitar.

27. It can be inferred that laments and high, lonesome sounds both reflect:

- A. the influence of Irish music.
- B. the challenges of American life.
- C. songs sung by Shania Twain.
- D. hillbilly music.

28. As it is used in the introductory information, “quintessential” most nearly means:

- F. old-fashioned.
- G. representative.
- H. charming.
- J. unconventional.

29. Passage A states that there were “talented and sophisticated” (line 57-58) musicians playing bluegrass music. Which sentence in Passage B suggests this claim?

- A. “Central to bluegrass music are the themes of the working class—miners, railroad workers, farmers.”
- B. “Partially because of its pace and complexity, bluegrass has often been recorded for movie soundtracks.”
- C. “Lester Flatt, a bluegrass guitarist and mandolinist, and Earl Scruggs, known for his three-finger banjo picking style, are widely considered the foremost artists on their instruments.”
- D. “A style of music closely related to country is the similarly indigenous music known as bluegrass . . .”

30. It can be inferred that both authors would agree that:

- F. country and bluegrass music are popular genres.
- G. both genres—country and bluegrass—are showcased at the Grand Ole Opry.
- H. music genres can evolve.
- J. country and bluegrass music are gaining in acceptance.

Passage IV

Natural Science

This passage is adapted from an article about the history of artificial satellites.

When the researchers at California Polytechnic university (CalPoly) and Stanford University determined the specifications of the CubeSat design back in 1999, they likely did not realize the full
(5) potential of the miniature satellites. NASA's Mars Cube One (MarCO) mission has provided strong evidence that CubeSats offer many advantages for deep space exploration. The ability to build a large portion of the CubeSat with off-the-
(10) shelf components means that future missions can be more cost-effective. The low cost of the satellites may also allow for more radical scientific experiments to be performed in space.

Experimental radio and antenna designs were
(15) an important part of the mission. The MarCO-A and MarCO-B satellites, affectionately referred to as "Eve" and "WALL-E" by the engineering team, had softball-sized UHF and X-band radios mounted to the main unit. These allowed the satellites, which
(20) were launched into space at the same time as the InSight lander, to send back photos of the landing in under eight minutes. By contrast, the lander itself took over an hour to transmit its successful

landing. The same radio and antenna technology
(25) also allowed for more efficient monitoring of the
landing process. With only a 40% success rate as of
2017, Mars landings remain notoriously difficult.
The data recorded by the MarCO satellites will help
future missions.

(30) Even beyond the completion of the Mars mission,
engineers like Joel Krajewski, project manager
for MarCO, hope to use the data sent back by the
satellites to test how long technological systems
(35) will continue to relay system data until they cease
to function. The successful survival of the two
modified satellites could lead to the possibility of
longer explorations much deeper into the outer
reaches of the universe.

(40) In order to increase the success of the mission,
the MarCO team fitted the satellites with some
specific modifications. The cameras that MarCO-B
used to take stills of the planet as the satellite
approached Mars represent a significantly more
(45) economical approach. The consumer-grade cameras
highlight the potential for greatly reducing the
costs associated with deep space missions. Soon
after receipt, images of the Red Planet, along
with its moons Phobos and Deimos, were proudly
(50) displayed on the NASA website. An elated Cody
Colley, mission manager from JPL, happily
reported, "WALL-E sent some great postcards
from Mars!" It is of note that the entire MarCO

project checked in at \$18.5 million. Compared
(55) to the price tag associated with building and
sending a more traditional satellite into space,
which can easily reach \$100 million, CubeSats
represent an unprecedented breakthrough in the
financial burden of space exploration.

(60) Cost reductions also mean that it is increasingly
possible for science experiments that stood little
chance of being greenlighted in the past to make
it into deep space via a CubeSat. Several projects
already exist in near-Earth orbit, including a 2009
(65) study on antibacterial effectiveness in zero-g,
a QuakeSat in 2003 to measure for Extremely
Low Frequency (ELF) signals that some scientists
believe occur before earthquakes, and the 2015
LightSail 1 mission to test propulsion systems.
(70) The ability to travel greater distances into space in
an economical manner will no doubt encourage
researchers to propose more novel experiments for
future missions.

The possibility of linked networks of CubeSats
(75) in deep space offers another intriguing proposition.
The QB50 project involved the cooperation of
over 30 international universities to send CubeSats
into near-earth orbit to study temporal and
spatial characteristics of the lower thermosphere.
(80) Benefits of linked networks include increased
flexibility to distribute tasks among the satellites
and reduced probability of single-point failure.
This kind of redundancy against failure, along

with the ability to adapt in real-time, is even more
(85) helpful in deep space where the satellites face an
incredibly challenging environment.

Since its inception in 1958, NASA has
encouraged its researchers, scientists, and
engineers to push the limits of existing technology.

(90) In building on the work of teams at CalPoly and
Stanford, the engineers at NASA have proven that
cost-effective CubeSat technology has the potential
to exponentially increase scientific experimentation
in deep space. As the MarCO team continues to
(95) collect data from “Eve” and “WALL-E,” the lessons
learned will no doubt set a new standard for the
vast array of deep space CubeSats to come.

31. Which of the following best describes the author’s attitude towards
the passage’s main topic?

- A. Cautious optimism
- B. Dispassionate concern
- C. Disillusioned frustration
- D. Enthusiastic anticipation

32. According to the passage, the CubeSat was first designed by:

- F. Joel Krajewski
- G. Cody Colley
- H. CalPoly and Stanford researchers
- J. NASA scientists and engineers

33. As it is used in line 13, the word *radical* most nearly means:
- A. militarized and aggressive.
 - B. ideologically extreme.
 - C. primitive and organic.
 - D. profoundly innovative.
34. According to the passage, why was the MarCO satellites' experimental communication technology notable?
- F. It transmitted landing data over seven times faster than the previous technology.
 - G. It took barely an hour to transmit landing data back to NASA.
 - H. Its off-the-shelf components made it much less expensive than other radios.
 - J. The radios were unusually space-efficient, being the size of softballs.
35. It can be inferred from the second paragraph that compared to the InSight lander, the MarCO satellites:
- A. take higher-resolution photos from greater distances.
 - B. demonstrate greater efficiency by utilizing miniaturized technology.
 - C. provided more helpful information to improve future Mars landings.
 - D. are able to land more effectively in difficult Martian conditions.

36. The fourth paragraph primarily serves to:

- F. argue for using consumer-grade components wherever possible for future NASA projects.
- G. explain how innovative choices in technology led to significant cost reductions for the MarCO satellites.
- H. describe the many reasons why the MarCO project was less expensive than comparable satellite projects.
- J. praise the superiority of the images the MarCO satellites sent back from Mars.

Science Test

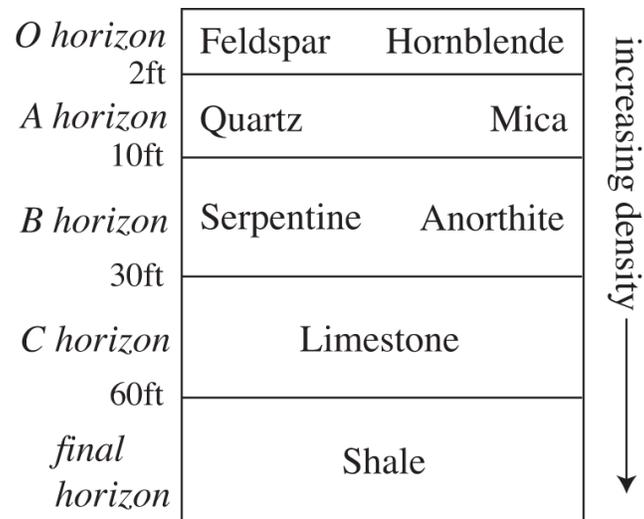
40 Minutes — 40 Questions

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

You may NOT use a calculator on this test.

Passage I

Soil, by volume, consists on average of 45% minerals, 25% water, 25% air, and 5% organic matter (including both living and nonliving organisms). Time and topography shape the composition of soil and cause it to develop into layers known as *horizons*. The soil horizons in a particular area are collectively known as the *soil profile*. The composition of soil varies in each horizon, as do the most common minerals, as can be seen in the soil profile depicted in the diagram. The diagram also shows the depth of each horizon and the overall density of the soil.



diagram

Table 1 lists the zinc and calcium contents (as percentages) in the minerals that compose soil.

Table 1		
Mineral	Zinc content (%)	Calcium content (%)
Feldspar	35-40	0-10
Hornblende	30-35	10-20
Quartz	25-30	20-30
Mica	20-25	30-40
Serpentine	15-20	40-50
Anorthite	10-15	50-60
Limestone	5-10	60-70
Shale	0-5	70-80

Table 2 shows the average percentage of minerals that compose granite and sandstone, two rock types that are commonly found in soil.

Table 2		
Mineral	Percentage of mineral in:	
	Sandstone	Granite
Feldspar	30	54
Hornblende	2	0
Quartz	50	33
Mica	10	10
Serpentine	0	0
Anorthite	0	0
Limestone	5	0
Shale	0	0
Augite	3	3

1. An analysis of an unknown mineral found in soil revealed its zinc content to be 32% and its calcium content to be 12%. Based on the data in Table 1, geologists would most likely classify this mineral as:
 - A. hornblende.
 - B. anorthite.
 - C. serpentine.
 - D. mica.

2. Geologists digging down into the A horizon would most likely find which of the following minerals?

- F. Limestone
- G. Shale
- H. Serpentine
- J. Mica

3. Based on the data presented in the diagram and Table 1, which of the following statements best describes the relationship between the zinc content of a mineral and the depth below surface level at which it is dominant? As zinc content increases:

- A. depth increases.
- B. depth decreases.
- C. depth first increases, then decreases.
- D. depth first decreases, then increases.

4. If geologists were to drill 30 feet into the Earth, which of the following minerals would they most likely encounter?

- F. Quartz, mica, and limestone
- G. Feldspar, shale, and serpentine
- H. Feldspar, quartz, and anorthite
- J. Hornblende, limestone, and serpentine

5. If augite is most commonly found in soil in close proximity to the other minerals that make up granite, then augite would most likely be found at a depth of:
- A. less than 10 feet.
 - B. between 10 feet and 30 feet.
 - C. between 30 feet and 60 feet.
 - D. greater than 60 feet.
6. Based on the passage, how is the percentage of zinc content related to the percentage of calcium content in the minerals that make up soil?
- F. The percentage of zinc content increases as the percentage of calcium content increases.
 - G. The percentage of zinc content increases as the percentage of calcium content decreases.
 - H. Both the percentage of zinc content and the percentage of calcium content remain constant.
 - J. There is no discernible relationship between the percentage of zinc content and the percentage of calcium content.

Passage II

Students conducted the following studies to determine the melting points of several materials. They attempted to melt the materials by submerging them in a variety of aqueous solutions that were heated to their boiling points.

They used the following equation to calculate the boiling points of these solutions:

$$\Delta T_b = K_b \times m \times i,$$

where

ΔT_b = increase in boiling point above pure solvent

$$K_b = 0.512 \frac{^{\circ}\text{C} \times \text{kg}}{\text{mol}}$$

$$m = \text{molality} = \frac{\text{mol solute}}{\text{kg solvent}}$$

i = number of ions present per molecule of solute

Study 1

In order to prepare various solutions of sodium chloride (NaCl), 100.00 g of H₂O were added to a beaker. A known quantity of NaCl was dissolved into the water, and the resulting boiling point of the solution was recorded. This procedure was repeated with different amounts of NaCl as shown in Table 1.

Table 1			
Solution	Mass of H ₂ O (g)	Amount of NaCl (mol)	Boiling point (°C)
1	100.00	0	100.00
2	100.00	0.085	100.88
3	100.00	0.171	101.75
4	100.00	0.257	102.63

Table 1			
Solution	Mass of H ₂ O (g)	Amount of NaCl (mol)	Boiling point (°C)
5	100.00	0.342	103.50

Study 2

In order to prepare various solutions of calcium chloride (CaCl₂), 100.00 g of H₂O were added to a beaker. A known quantity of CaCl₂ was dissolved into the water and the resulting boiling point of the solution was recorded. This procedure was repeated with different amounts of CaCl₂ as shown in Table 2.

Table 2			
Solution	Mass of H ₂ O (g)	Amount of CaCl ₂ (mol)	Boiling point (°C)
6	100.00	0.270	104.15
7	100.00	0.360	105.53
8	100.00	0.450	106.91
9	100.00	0.541	108.29
10	100.00	0.631	109.67

Study 3

Each solution from Studies 1 and 2 was brought to a boil. A small sample of a material was placed in each solution. If the material melted, a “Y” was

marked in Table 3. If the material did not melt, an “N” was marked in Table 3. This procedure was repeated for all eight materials.

Table 3										
Material	Solution									
	1	2	3	4	5	6	7	8	9	10
1	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
2	N	Y	Y	Y	Y	Y	Y	Y	Y	Y
3	N	N	Y	Y	Y	Y	Y	Y	Y	Y
4	N	N	N	N	Y	Y	Y	Y	Y	Y
5	N	N	N	N	N	Y	Y	Y	Y	Y
6	N	N	N	N	N	N	N	Y	Y	Y
7	N	N	N	N	N	N	N	N	N	Y
8	N	N	N	N	N	N	N	N	N	N

7. Which of the following modifications to Solution 5 of Study 1 would result in an increase in its boiling point?

- I. Increasing the K_b of the solution
- II. Increasing the amount of NaCl
- III. Replacing the NaCl with an equal amount of CaCl_2

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

8. In Study 1, what was the boiling point of the solution with 0.171 mols of NaCl ?

- F. 100°C
- G. 100.88°C
- H. 101.75°C
- J. 109.67°C

9. Based on the results of the studies from the passage, the boiling point of Material 5 is most likely:

- A. less than 102.63°C.
- B. between 102.63°C and 103.50°C.
- C. between 103.50°C and 104.15°C.
- D. greater than 104.15°C.

10. If a sixth solution had been prepared during Study 2 using 0.721 mol CaCl_2 , its boiling point would most likely be closest to which of the following?

- F. 108.75°C
- G. 111.07°C
- H. 113.72°C
- J. 115.02°C

11. A ninth material was submerged in Solutions 1–6 as in Experiment 3. Which of the following is LEAST likely to be a plausible set of results for this material?

	Solution					
	1	2	3	4	5	6
A.	Y	Y	Y	Y	N	N
B.	Y	Y	Y	Y	Y	Y
C.	N	N	N	N	Y	Y
D.	N	N	N	N	N	N

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

12. Which of the following best explains why the students recorded data for their solutes in mol rather than g or kg ?

- F. The H₂O was already measured in kg.
- G. The units for mass are less accurate.
- H. The change in boiling point depends on molality.
- J. The melting points of the various materials do not depend on the masses of the materials.

13. Would the results of Studies 1–3 support the claim that Material 7 has a lower melting point than Material 8 ?

- A. Yes, because in Solution 10, Material 7 melted and Material 8 did not.
- B. Yes, because in Solution 10, Material 8 melted and Material 7 did not.
- C. No, because the melting point of Material 8 cannot be determined from the data.
- D. No, because the melting point of Material 7 cannot be determined from the data.

Passage III

Engineers designing a roadway needed to test the composition of the soil that would form the roadbed. In order to determine whether their two sampling systems (System A and System B) give sufficiently accurate soil composition measurements, they first conducted a study to compare the two systems.

Soil samples were taken with varying levels of *humidity* (concentration of water). The concentrations of the compounds that form the majority of soil were measured. The results for the sampling systems were compared with data on file with the US Geological Survey (USGS), which compiles extremely accurate data. The engineers' and USGS's results are presented in Table 1 below.

Table 1					
Concentration (mg/L) of:	Level of humidity				
	10%	25%	45%	65%	80%
Nitrogen (N)					
USGS	105	236	598	781	904
System A	112	342	716	953	1,283
System B	196	408	857	1,296	1,682
Potassium oxide (K ₂ O)					
USGS	9.4	9.1	8.9	8.7	8.2
System A	9.4	9.0	8.7	8.5	8.0
System B	9.5	9.2	9.0	8.8	8.3
Calcium (Ca)					
USGS	39.8	24.7	11.4	5.0	44.8
System A	42.5	31.4	10.4	8.0	42.9
System B	37.1	23.2	11.6	11.1	45.1
Note: Each system concentration measurement is the average of 5 measurements.					

Table 1					
Concentration (mg/L) of:	Level of humidity				
	10%	25%	45%	65%	80%
Phosphorus oxide (P ₂ O ₅)					
USGS	69.0	71.2	74.8	78.9	122.3
System A	67.9	69.9	72.2	76.7	123.1
System B	74.0	75.6	78.7	82.1	126.3
Zinc (Zn)					
USGS	0.41	0.52	0.64	0.74	0.70
System A	0.67	0.80	0.88	0.97	0.93
System B	0.38	0.48	0.62	0.77	0.73
Note: Each system concentration measurement is the average of 5 measurements.					

14. The hypothesis that increasing humidity increases the concentration of a compound is supported by all of the following EXCEPT:

- F. nitrogen.
- G. potassium oxide.
- H. phosphorus oxide.
- J. zinc.

15. At a humidity level of 25%, it could be concluded that System B least accurately measures the concentration of which of the following

compounds, relative to the data on file with the USGS?

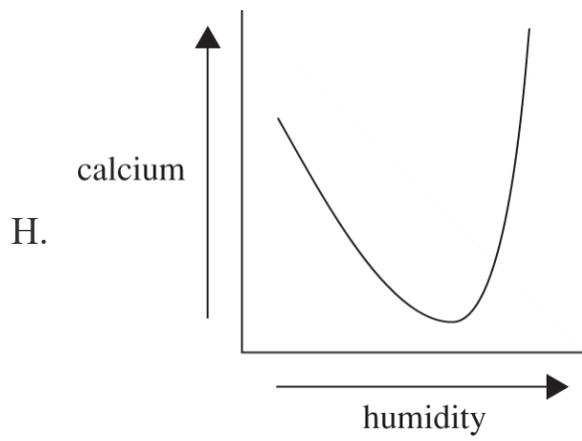
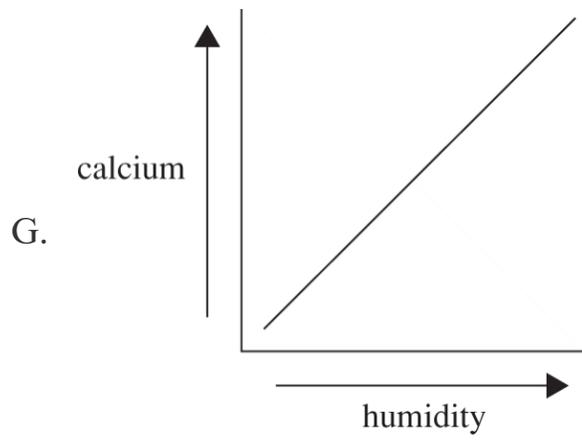
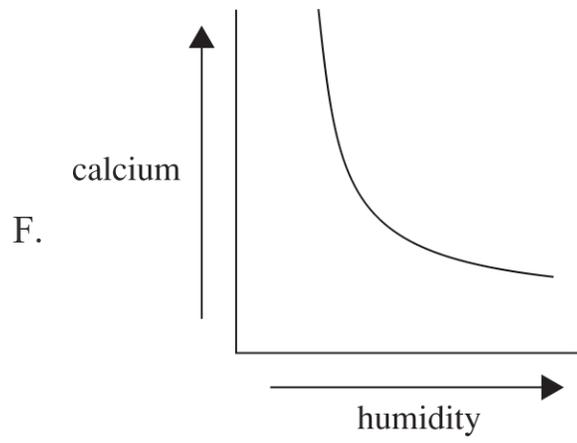
- A. N
- B. Ca
- C. K_2O
- D. P_2O_5

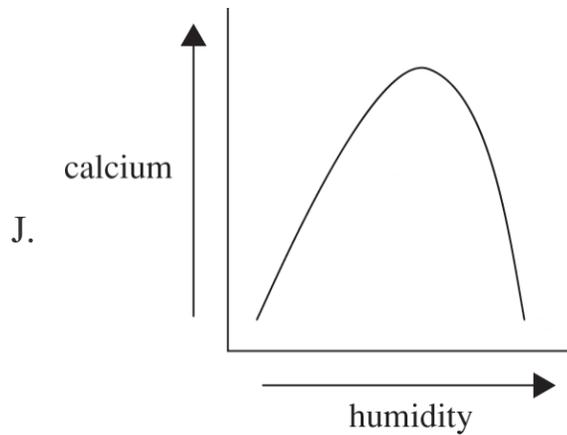
16. The engineers hypothesized that the concentration of potassium oxide (K_2O) decreases as the level of humidity increases. This hypothesis is supported by:

- F. the data from the USGS only.
- G. the System A measurements only.
- H. the data from the USGS and the System B measurements only.
- J. the data from the USGS, the System A measurements, and the System B measurements.

17. Do the results in Table 1 support the conclusion that System B is more accurate than System A for measuring the concentration of zinc?

- A. No, because the zinc measurements from System A are consistently higher than the zinc measurements from System B.
 - B. No, because the zinc measurements from System A are closer to the data provided by the USGS than the zinc measurements from System B.
 - C. Yes, because the zinc measurements from System B are consistently lower than the zinc measurements from System A.
 - D. Yes, because the zinc measurements from System B are closer to the data provided by the USGS than the zinc measurements from System A.
18. The relationship between humidity level and calcium concentration, as measured by System B, is best represented by which of the following graphs?





19. After conducting their comparisons, the engineers used System B to test a soil sample at the future road site. They measured the concentrations, in mg/L, of selected compounds in the sample and found that they were: potassium oxide = 9.1, calcium = 17.3, and zinc = 0.57. Based on the data in Table 1, the engineers should predict that the level of humidity is approximately:
- A. 16%.
 - B. 37%.
 - C. 49%.
 - D. 57%.

Passage IV

Diabetes is a metabolic disorder that causes hyperglycemia (higher-than-normal blood glucose levels). The most common form is type 2 diabetes, which occurs when the body does not produce enough insulin or has a lowered level of response to insulin (insulin resistance). Insulin is a hormone

produced in the pancreas that helps regulate blood glucose levels by stimulating cells to absorb and metabolize glucose. Typically occurring in adults, type 2 diabetes has developed in an increasing number of individuals over 45 years old. Three scientists offered hypotheses to explain the cause of type 2 diabetes.

Scientist 1

Studies have shown that the consumption of sugar-sweetened drinks in excess is associated with an increased risk of type 2 diabetes. Thus, the cause of type 2 diabetes is an overconsumption of sugar. When sugar intake is high, the insulin in the body is unable to normalize the increased blood glucose levels. In a study of individuals 18–25 years old who consumed more than the daily recommended amount of sugar, although their insulin levels were normal, their blood glucose levels were significantly elevated. When these individuals received small injections of supplemental insulin once a day, their blood sugar did not return to normal levels.

Scientist 2

Type 2 diabetes primarily occurs as a result of obesity and lack of exercise. Experimental data have shown that diets high in fat but not high in sugar are associated with an increased risk of type 2 diabetes. In a study of healthy young men, those put on a high-fat diet had twice the blood glucose levels compared to those put on a high-carbohydrate diet. Excess fat in the bloodstream breaks down into free radicals that impair insulin action, causing cells to become insulin resistant and blood glucose levels to rise. Studies have also shown that the lack of exercise causes 7% of type 2 diabetes cases. Regular exercise can boost the body's efficiency to regulate blood glucose levels.

Scientist 3

Type 2 diabetes is not caused by lifestyle or diet but inherited. Studies have shown an increased risk of type 2 diabetes in people with a parent or sibling who has type 2 diabetes. More than 36 genes that contribute to the risk of type 2 diabetes have been found. Individuals have about a 15–20% chance of developing type 2 diabetes if one of their parents has it and a roughly 50 % chance if both parents have it. The chance of siblings having type 2 diabetes is 25–50%.

20. The liver helps to regulate the amounts of glucose, protein, and fat in the blood. About eighty percent of people with diabetes have buildup of fat in the liver. This information, if true, would strengthen the viewpoint of:

- F. Scientist 1 only.
- G. Scientist 2 only.
- H. both Scientist 1 and Scientist 2.
- J. neither Scientist 1 nor Scientist 2.

21. Scientists 1 and 2 would most likely agree that the occurrence of type 2 diabetes in an individual is associated with the patient's:

- A. lifestyle.
- B. diet.
- C. genetics.
- D. age.

22. According to the passage, adults who have had their pancreas removed should exhibit:
- F. increased blood insulin levels.
 - G. decreased blood sugar levels.
 - H. increased blood sugar levels.
 - J. decreased body fat content.
23. Suppose that an individual had an 18% chance of developing type 2 diabetes. Based on the passage, Scientist 3 would most likely predict that this individual has:
- A. a high-sugar diet.
 - B. a high-fat diet.
 - C. one parent with type 2 diabetes.
 - D. two parents with type 2 diabetes.
24. Suppose a 50-year-old patient developed type 2 diabetes. Which of the following statements is most consistent with the information in the passage?
- F. Scientist 1 would conclude that the patient consumes excess fat daily.
 - G. Scientist 2 would conclude that the patient has a high-sugar diet.
 - H. Scientist 3 would conclude that the patient fails to exercise.
 - J. Scientist 3 would conclude that the patient had at least one parent with type 2 diabetes.

25. Which of the following discoveries, if accurate, would support the viewpoint of Scientist 1 ?
- A. High intake of sugar causes insulin resistance.
 - B. High intake of fat causes impaired insulin action.
 - C. Low intake of sugar causes increased insulin production.
 - D. Low intake of sugar causes increased free radical production.
26. Which of the following arguments could Scientist 3 use as an effective counter to Scientist 2's claim that lack of exercise causes 7% of type 2 diabetes cases?
- F. The 7% that lacked exercise also have family histories of type 2 diabetes.
 - G. More than 36 genes that contribute to the risk of type 2 diabetes have been found.
 - H. The 7% that lacked exercise did not receive insulin injections.
 - J. Scientist 2's hypothesis would suggest that more than 7% of type 2 diabetes cases should be due to lack of exercise.

Passage V

Human blood is composed of approximately 45% *formed elements*, including blood cells, and 50% plasma. The formed elements of blood are further broken down into red blood cells, white blood cells, and platelets. The mass of a particular blood sample is determined by the ratio of formed elements to plasma; the formed elements weigh approximately 1.10 grams

per milliliter (g/mL) and plasma approximately 1.02 g/mL. This ratio varies according to an individual's diet, health, and genetic makeup.

The following studies were performed by a phlebotomist to determine the composition and mass of blood samples from three different individuals, each of whom was required to fast overnight before the samples were taken.

Study 1

A 10 mL blood sample was taken from each of the three patients. The densities of the blood samples were measured using the *oscillator technique*, which determines fluid densities by measuring sound velocity transmission.

Study 2

Each 10 mL blood sample was spun for 20 minutes in a centrifuge to force the heavier formed elements to separate from the plasma. The plasma was then siphoned off and its mass recorded.

Study 3

The formed elements left over from Study 2 were analyzed using the same centrifuge, except this time they were spun at a slower speed for 45 minutes so that the red blood cells, white blood cells, and platelets could separate out. The mass of each element was then recorded. The results of the three studies are shown in Table 1.

Patient	Plasma (g)	Red blood cells (g)	White blood cells (g)	Platelets (g)	Total density (g/mL)
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Table 1					
Patient	Plasma (g)	Red blood cells (g)	White blood cells (g)	Platelets (g)	Total density (g/mL)
A	4.54	2.75	1.09	1.32	1.056
B	4.54	2.70	1.08	1.35	1.054
C	4.64	2.65	1.08	1.34	1.050

27. The results of the studies indicate that the blood sample with the lowest density is the sample with the most:

- A. plasma.
- B. red blood cells.
- C. white blood cells.
- D. platelets.

28. Which of the following offers the most reasonable explanation for why the phlebotomist required each patient to fast overnight before taking blood samples?

- F. It is more difficult to withdraw blood from patients who have not fasted.
- G. Fasting causes large, temporary changes in the composition of blood.
- H. Fasting ensures that blood samples are not affected by temporary changes caused by consuming different foods.
- J. Blood from patients who have not fasted will not separate when spun in a centrifuge.

29. Which of the following best explains why the amount of plasma, red blood cells, white blood cells, and platelets do not add up to 10.50 g in Patient C ?

- A. Some of the red blood cells might have remained in the plasma, yielding low red blood cell measurements.
- B. Some of the platelets might not have separated from the white blood cells, yielding high white blood cell counts.
- C. The centrifuge might have failed to fully separate the plasma from the formed elements.
- D. There are likely components other than plasma, red and white blood cells, and platelets in blood.

30. Based on the data collected from the studies, it is possible to determine that, as total blood density increases, the mass of red blood cells:

- F. increases only.
- G. increases, then decreases.
- H. decreases only.
- J. decreases, then increases.

31. Suppose that a 10 mL blood sample from a fourth individual contains approximately 5 mL of plasma and approximately 5 mL of formed elements. The mass of this blood sample would most likely be:

- A. less than 10.0 g.
- B. between 10.0 and 12.0 g.
- C. between 12.0 and 14.0 g.
- D. greater than 14.0 g.

32. The phlebotomist varied which of the following techniques between Study 2 and Study 3 ?

- F. The volume of blood taken from each patient
- G. The mass of blood taken from each patient
- H. The instrument used to separate the elements of the blood samples
- J. The amount of time the samples were left in the centrifuge

33. The patient with the greatest mass of red blood cells is:

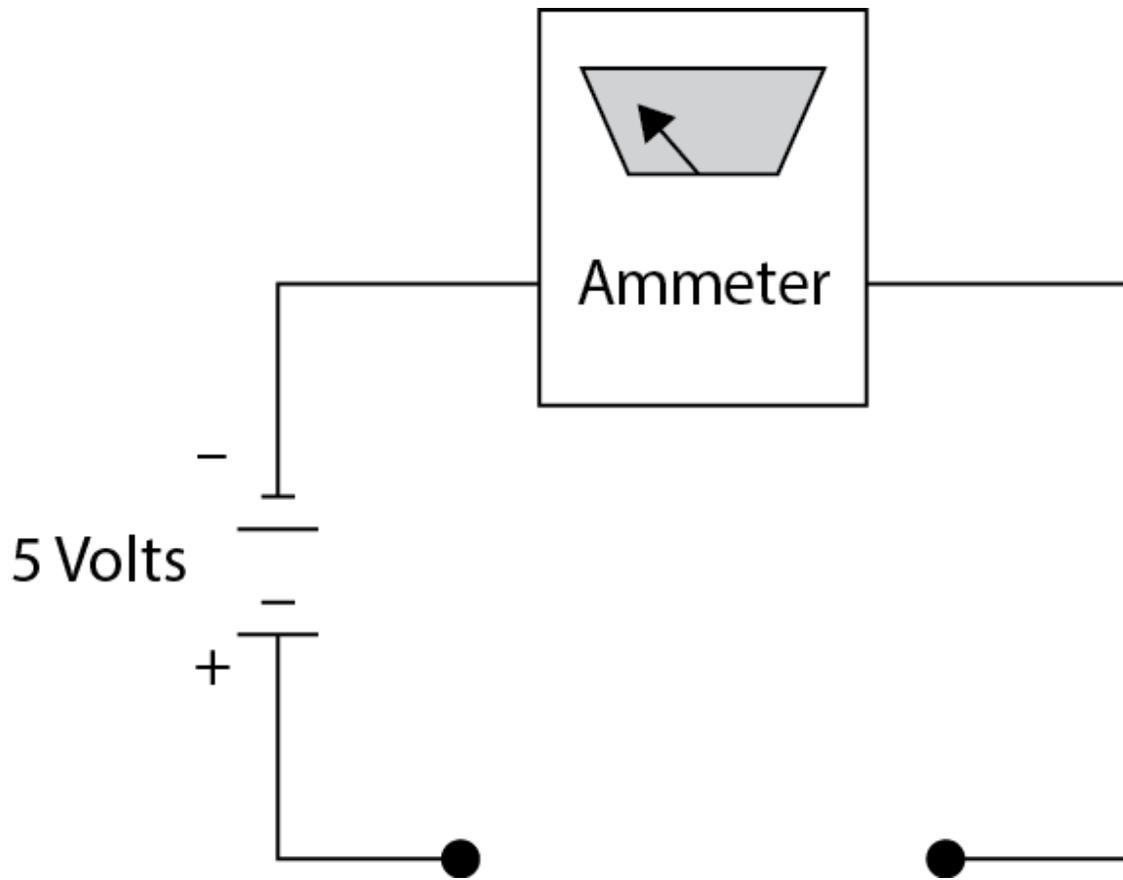
- A. Patient A.
- B. Patient B.
- C. Patient C.
- D. not possible to determine from the information given.

Passage VI

A student performed experiments to determine the relationship between the amount of electrical current carried by a material and the physical dimensions and temperature of a sample of that material. Current is measured in amperes (A) and the resistance to the flow of current is measured in ohms (Ω). Current and resistance are related to voltage, measured in volts (V), by Ohm's law: $V = A \times \Omega$. (Note that Ohm's law can also be written as $V = I \times R$, where V is voltage, I is current, and R is resistance.)

Experiment 1

The student used several lengths of an iron rod with a 1 cm diameter. The rods were heated or cooled to the specified temperatures and used to complete the circuit shown in the diagram. The circuit contains a battery and an ammeter, which measures current in milliamperes (mA). The results are presented in Table 1.



diagram

Table 1			
Trial	Length (cm)	Temperature (°C)	Current (mA)
1	16	80	20
2	16	20	40
3	12	80	27
4	12	20	53
5	10	80	32
6	10	20	64
7	8	80	40

Table 1			
Trial	Length (cm)	Temperature (°C)	Current (mA)
8	8	20	80

Experiment 2

The student then repeated the experiment, this time using 1 cm diameter rods made from either iron or copper. The results are presented in Table 2.

Table 2				
Trial	Material	Length (cm)	Temperature (°C)	Current (mA)
9	Iron	16	80	20
10	Copper	16	80	100
11	Iron	16	20	40
12	Copper	16	20	200
13	Iron	12	80	27
14	Copper	12	80	135
15	Iron	12	20	53
16	Copper	12	20	265

34. Based on the experimental results, which of the following most accurately describes the relationships between current and rod length and between current and temperature?

- F. Current is directly related to length and inversely related to temperature.
- G. Current is inversely related to both length and temperature.
- H. Current is inversely related to length and directly related to temperature.
- J. Current is directly related to both length and temperature.

35. Based on the information from the passage, which of the following rods would have the highest value for resistance?

- A. A 12 cm iron rod at 20°C
- B. A 16 cm copper rod at 20°C
- C. A 16 cm iron rod at 80°C
- D. A 12 cm copper rod at 80°C

36. The *conductivity* of a material is a measure of how readily a length of the material allows the passage of an electric current. Conductivity is represented by σ , the Greek letter sigma, with standard units of siemens per meter (S/m). Siemens are equivalent to inverse ohms (that is, $1/\Omega$). Based on this information, which of the following equations accurately describes the relationship between conductivity and resistance?

F. $\Omega = \frac{1}{\sigma}$

G. $\sigma = \Omega \times \mathbf{m}$

H. $\sigma = \frac{1}{\Omega \times \mathbf{m}}$

J. $\sigma = \Omega \times \mathbf{m}$

37. If the rod used in Trial 4 of Experiment 1 were heated to a temperature of 50°C, the current it then conducts would most likely be:

- A. less than 27 mA.
- B. between 27 and 53 mA.
- C. between 53 and 80 mA.
- D. greater than 80 mA.

38. What would happen to the results of Experiment 2 if the student replaced the 5 V battery with a 10 V battery instead?

- F. The recorded current values would increase for both the copper and the iron rods.
 - G. The recorded current values would increase for the copper rods but decrease for the iron rods.
 - H. The recorded current values would decrease for the copper rods but increase for the iron rods.
 - J. The recorded current values would decrease for both the copper and the iron rods.
39. Suppose the student took an iron rod of 8 cm and a copper rod of 8 cm, both with a 1 cm diameter, and attached them end to end, creating a composite rod with a length of 16 cm. Based on the results of Experiment 2, at a temperature of 20°C, this composite rod would most likely conduct a current of:
- A. less than 20 mA.
 - B. between 20 and 40 mA.
 - C. between 40 and 200 mA.
 - D. greater than 200 mA.
40. Which of the following variables was NOT directly manipulated by the student in Experiment 2 ?
- F. Material
 - G. Length
 - H. Temperature
 - J. Current

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.

Scientific Research

A great deal of pure research, undertaken without specific goals but generally to further humankind's understanding of themselves and their world, is subsidized at least partly, if not fully, by the nation's government to help drive progress and promote outcomes that improve overall quality of life for citizens. Though pure research often involves considerable time, energy, and money without any assurances of positive outcomes, it can result in economic, medical, and technological benefits. However, it can also result in negative, harmful, and perhaps irreversible outcomes, in which case taxpayer dollars can be wasted and society put at risk. Should governments fund research when the outcome is unclear? Given that taxpayers prefer that their dollars be spent efficiently and effectively, it may be unwise to allocate significant funding to endeavors that may not benefit society as a whole.

Read and carefully consider these perspectives. Each discusses government funding of scientific research.

**Perspective
One**

**Perspective
Two**

**Perspective
Three**

Governments should fund as much pure research as they can afford when the intent is to benefit the mass population. Without the government's money, many research projects would have to cease unless alternative funding is secured. Even research without clear, positive consequences should be

Governments should be very cautious and limit efforts to fund research programs with unclear consequences. Rather, these programs should demonstrate their worth and intended results when seeking government money. Governments should evaluate the merit and benefit of each program on a

Governments should partner with private contributors to fund research. Private contributors include companies doing research and development as well as nonprofit foundations. These partnerships will distance the government from taking responsibility for any unintended or undesired consequences

pursued because the outcome may prove beneficial, and the research can always be paused or stopped entirely if negative repercussions begin to emerge.

case-by-case basis and fund only those projects that are designed to create—and will likely achieve—clear and acceptable outcomes.

s and relieve the burden on the taxpayer for efforts that do not prove beneficial. Additionally, this approach incentivizes research teams to provide results-based research that can generate private funding, thus increasing the chance that the research will prove useful to multiple entities, including the government.



Essay Task

Write a clear, well-reasoned essay evaluating multiple perspectives on government funding of scientific research. 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 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?

Answers and Explanations

ENGLISH TEST

1. *My Old-Fashioned Father*

1. A

Difficulty: Low

Category: Sentence Structure

Getting to the Answer: When a period appears in the underlined portion, check to see if each sentence is complete. Here, each sentence is complete and correct; therefore (A), NO CHANGE, is correct. Choice B creates a run-on sentence. Choices C and D create sentences that are awkward and overly wordy.

2. J

Difficulty: Medium

Category: Sentence Structure

Getting to the Answer: The ACT tests very specific punctuation rules. If punctuation is used in a way not covered by these rules, it will be

incorrect. No commas are required in the underlined selection; (J) is correct. Choices F, G, and H all contain unnecessary commas.

3. **C**

Difficulty: Medium

Category: Sentence Structure

Getting to the Answer: When a verb is underlined, make sure it places the action properly in relation to the other events in the passage. This passage is written primarily in the present tense; *runs*, (C), is the best answer here. Choices A and B use verb tenses that do not make sense in context. The past tense verb in D is inconsistent with the rest of the passage.

4. **F**

Difficulty: Medium

Category: Conciseness

Getting to the Answer: Very rarely will a correct answer choice be significantly longer than the original selection. The underlined selection is grammatically and logically correct, so check the answer choices for a more concise version. You can eliminate G and H, both of which are wordier than the original. Choice J may be tempting because it's shorter than the underlined selection, but it changes the meaning of the sentence; the back office, not the reader, is what hasn't changed. Choice (F) is correct.

5. **B**

Difficulty: Medium

Category: Development

Getting to the Answer: When an English Test question contains a question stem, read it carefully. More than one choice is likely to be both relevant and correct, but only one will satisfy the conditions of the stem. This paragraph deals with the author's father's refusal to give up his old-fashioned ways. Choice (B) is the most consistent choice. Choices A and D describe the items being inventoried, which is irrelevant to the point of the paragraph. Choice C is redundant; since we already know he uses paper and pencil to keep his inventory, it's understood that he's writing it by hand.

6. **G**

Difficulty: Medium

Category: Sentence Structure

Getting to the Answer: Commas cannot be used to combine independent clauses. Here, the comma connects two independent clauses. Choice (G) correctly replaces the comma with a semicolon. Choice H corrects the run-on error but is unnecessarily wordy. Choice J leaves the meaning of the second clause incomplete.

7. **C**

Difficulty: High

Category: Sentence Structure

Getting to the Answer: Beware of answer choices that make changes to parts of the selection that contain no errors; these choices will rarely be correct. As written, this sentence uses incorrect grammatical structure; the verb “is” is incorrect here, so you should eliminate A. Choice (C) eliminates it without introducing additional errors. Choices B and D correct the sentence’s grammatical error, but neither uses the necessary contrast transition to relate this sentence to the one before it.

8. **H**

Difficulty: Low

Category: Sentence Structure

Getting to the Answer: Commas are used in a series of three or more; they are incorrect in compounds. “My sister and I” is a compound; no comma is needed, so F is incorrect. Choice (H) corrects the error without adding any new ones. Choice G uses the incorrect pronoun case; because you wouldn’t say “me bought him a brand-new computer,” “me” is incorrect in the compound as well. Choice J incorrectly separates the sentence’s subject and its predicate verb with a comma.

9. **A**

Difficulty: High

Category: Organization

Getting to the Answer: When a transition word or phrase is underlined, make sure it properly relates the ideas it connects. The underlined word is the transition between the offer to help transfer records and the information about other ways the computer could be helpful. The second sentence is a continuation of the first, so you can eliminate B and D, both of which suggest a contrast. Choosing between (A) and C is a little more difficult, but remember that new errors may be introduced in answer choices. Choice C, *In addition*, would be acceptable if it were followed by a comma, but as written, it's incorrect. Choice (A) is correct.

10. **G**

Difficulty: Medium

Category: Sentence Structure

Getting to the Answer: Semicolons can only combine independent clauses. Here, the second clause is not independent, so the semicolon is incorrect; eliminate F. Choice (G) correctly eliminates the semicolon. Choice H incorrectly places a comma after the conjunction. Choice J creates a run-on sentence.

11. **B**

Difficulty: High

Category: Development

Getting to the Answer: When asked about the purpose of particular information, consider the purpose of the larger section. This paragraph describes the father’s resistance to technology, which stems in part from his desire to be able to work even in blackout conditions. The information about the town’s history shows that blackout conditions seldom occur, making the father’s reason a bad one. Choice (B) reflects this reasoning, and it is correct. Choice A is too extreme; the father’s reason may be poor, but that does not make him delusional. Choices C and D do not relate to the purpose of the paragraph.

12. G

Difficulty: Medium

Category: Organization

Getting to the Answer: When asked to add new information, read it into the passage at the points suggested to choose its most logical placement. There are three pronouns in this new sentence; clarity requires that it be placed somewhere that these pronouns have logical antecedents. Placing it after Sentence 1, as (G) suggests, gives each pronoun a clear antecedent: *we* is the author and his sister, *him* is their father, and *it* is the computer. Choice F puts the siblings’ hopes about how a computer could help their father before the information that they bought him one. Choice H’s placement makes the antecedent for *it* Father’s *blackout scenario*, which doesn’t make sense in context. Placing the new sentence where Choice J suggests gives the pronoun the antecedent *blackout*, which is also illogical.

13. **C**

Difficulty: Medium

Category: Development

Getting to the Answer: Idiom questions often offer more than one idiomatically correct answer choice; use context to determine which is appropriate. “Sooner than later” is idiomatically incorrect, so you should eliminate A; these are comparison words, but nothing is compared here. Both B and (C) offer proper idioms, but (C) is the one that’s appropriate here. Choice D is also incorrect idiomatic usage.

14. **F**

Difficulty: Medium

Category: Development

Getting to the Answer: Remember to read for logic as well as for grammar and usage. The best version of this sentence is the way it is written; (F) is correct. Choice G redundantly uses the possessive *office’s* where possession has already been indicated by *of*. Choice H misstates the information in the passage; the writer’s father received the cell phone before the computer. Choice J incorrectly indicates that “the disorganized depths of that office” is where the writer’s father received his cell phone, not where the cell phone ended up, which is opposite of the writer’s intended meaning.

15. **B**

Difficulty: Low

Category: Organization

Getting to the Answer: When asked to add information, consider both the subject matter and the tone. This essay is about the author's father's resistance to technology. Choice (B) concludes the essay by referencing something stated at the beginning: that the writer's father tries to *hide* from the future. Choices A, C, and D, while relevant to the paragraph, do not provide strong conclusions to a passage about the father's aversion to technology.

7. *Breaking Baseball's Color Barrier*

16. **F**

Difficulty: Medium

Category: Agreement

Getting to the Answer: *More* or *-er* adjectives are used to compare two items; for more than two, use *most* or *-est*. This sentence is correct as written, (F); *farthest* is appropriate when comparing all areas of the globe. Choice G uses *most far*, but *most* is only correct with adjectives that don't have *-est* forms. Choice H combines *most* with the *-est* suffix, which is never correct. Choice J uses *farther*, which indicates a comparison that is not present here.

17. **C**

Difficulty: Medium

Category: Sentence Structure

Getting to the Answer: The fact that the underlined portion contains multiple prepositions (*among* and *for*) is a clue to look for a misplaced modifier. It makes the most sense to describe equality as being *among* *racers*, eliminating A and B. Choice D awkwardly places the noun *a* *er* its modifying phrases, so (C) is correct.

18. **H**

Difficulty: Medium

Category: Agreement

Getting to the Answer: Most ACT idioms questions will hinge on preposition usage. “Prevented . . . to participate” is idiomatically incorrect, so you can eliminate F. The proper idiom in this context is “prevented from participating,” (H). Choices G and J are both idiomatically incorrect.

19. **B**

Difficulty: Medium

Category: Development

Getting to the Answer: When you’re asked whether a piece of text is relevant, first determine the topic of the paragraph. This paragraph is

about the evolution of the “*color line*” in baseball. Therefore, information that talks about the development of the industry and the shift in authority is relevant to the paragraph; (B) is correct. Choice A is incorrect because, although the text does talk about previous associations, knowing that range doesn’t further the purpose of the paragraph. Choices C and D can be eliminated, since they indicate that the information is irrelevant.

20. **H**

Difficulty: Medium

Category: Sentence Structure

Getting to the Answer: A verb should not be separated from its object by a comma. As written, this sentence places an incorrect comma between the verb *had* and its object; eliminate F. Choice (H) eliminates the comma without introducing any additional errors. Choices G and J both add incorrect commas.

21. **B**

Difficulty: Medium

Category: Agreement

Getting to the Answer: When a preposition is underlined, you’re most likely being tested on idioms. Select the choice that sounds the most correct when read with the following noun phrase—in this case, *professional teams*. Because the leagues are made up of professional

teams, (B) is correct here. Choices A, C, and D all suggest an incorrect relationship between the leagues and the teams.

22. **J**

Difficulty: Medium

Category: Development

Getting to the Answer: Determining whether the underlined text should be deleted will help you quickly eliminate two answer choices. If you eliminate the underlined selection, the passage skips abruptly from the decree losing its force to a discussion of specific African American players. The underlined text introduces those players generally, as a result of the decree losing its impact, and therefore provides a necessary transition, as indicated in (J). Choices F and G can be eliminated, since they advocate deleting the selection. The reasoning in H is not supported by the passage.

23. **A**

Difficulty: Medium

Category: Sentence Structure

Getting to the Answer: Expect about 25% of your English Test questions to have no error. This sentence is correct as written, (A). Choices B, C, and D all create sentence fragments.

24. **F**

Difficulty: Medium

Category: Sentence Structure

Getting to the Answer: The phrase “including Walker’s brother Weldy” is properly used here to modify “a few other African Americans”; no change is needed, so (F) is correct. Choice G is incorrect because no comma is used to introduce a clause beginning with *that*. Choices H and J make the sentence wordier unnecessarily.

25. **B**

Difficulty: Medium

Category: Agreement

Getting to the Answer: Use context to determine appropriate verb tense usage. The previous sentence says that Walker *was* a catcher; the introductory phrase in this sentence refers us to the same time period. Only (B) uses a consistent tense. Choices A, C, and D all refer to future actions.

26. **H**

Difficulty: Medium

Category: Organization

Getting to the Answer: Since NO CHANGE is not presented as an option, you’ll need to find the most logical placement for the new

sentence. *Other teams* must contrast with teams already mentioned, and the only place that happens is in Sentences 2 and 3. Sentence 2 talks about one player for the Blue Stockings and Sentence 3 mentions some additional players for the same team. Sentence 4 turns to the time when segregation returned, so the information about African Americans playing for other teams must come before that, between Sentences 3 and 4, (H).

27. **B**

Difficulty: Low

Category: Conciseness

Getting to the Answer: When you don't spot an error in grammar or usage, check for errors of style. "At the time when" is a longer way of saying "when"; (B) is correct here. Choice C uses *while*, which indicates a continuing period of time, but this sentence refers to a specific moment when Jackie Robinson crossed the color line. Choice D is even wordier than the original.

28. **F**

Difficulty: Medium

Category: Development

Getting to the Answer: Make sure your selection reflects the meaning of the sentence. The best version of this sentence is the way it is written, (F). Choice G changes the meaning of the sentence, implying

that Robinson has yet to be recognized as a hero. Choice H also changes the sentence's meaning, indicating that Robinson is doing the recognizing rather than being recognized. Choice J is unnecessarily wordy.

29. **B**

Difficulty: High

Category: Development

Getting to the Answer: A question that asks about the essay's tone will likely include only answer choices that are grammatically correct. Be as picky as possible when determining which choice best fits the stated tone and emphasis. Choice A is too neutral, so it should be eliminated. Choice C does not emphasize the uniqueness of Robinson's role; eliminate it. Choice D mentions collaboration, which emphasizes teamwork rather than uniqueness, so it is also incorrect. Someone who blazes a path goes where no one has gone before. Thus, only (B) maintains a positive tone while showing that Robinson played a unique role.

30. **J**

Difficulty: Medium

Category: Development

Getting to the Answer: This question format appears frequently on the ACT; it's asking for the passage's main idea. This essay is about the

color barrier in baseball; it would not fulfill an assignment to write about the history of baseball, so you can eliminate F and G. The fact that baseball was played before 1868, H, is not the reason this essay does not fulfill an assignment on baseball's history. Choice (J) correctly states the reasoning: the essay focuses only on one aspect of the game.

3. *The Bear Mountain Bridge*

31. **A**

Difficulty: Medium

Category: Sentence Structure

Getting to the Answer: An introductory phrase should be separated from the rest of the sentence by a comma. This introductory phrase is set off by a comma; the sentence is correct as written, (A). Choices B and C incorrectly treat the introductory phrase as an independent clause. Choice D incorrectly connects a dependent and an independent clause with the conjunction *and*.

32. **H**

Difficulty: Medium

Category: Agreement

Getting to the Answer: When a pronoun is underlined, check whether it matches its antecedent. The underlined portion refers to the bridge,

so the correct answer will be singular; eliminate F and G. Choice J contains a subject-verb agreement error; the singular *it* requires the singular *was*. Choice (H) is correct.

33. **B**

Difficulty: Medium

Category: Agreement

Getting to the Answer: Make sure verb tenses make sense within the chronology of the passage. The past perfect is used in this sentence, but this tense is only correct when used to describe one past action completed before another. That is not the case here, so A is incorrect; (B) correctly replaces the verb with its past tense form. Choice C changes the meaning of the sentence (the legislature did the authorizing; it wasn't authorized by someone else) and creates a sentence that is grammatically incorrect. Choice D uses a conditional verb phrase, which is inappropriate in context.

34. **H**

Difficulty: Low

Category: Conciseness

Getting to the Answer: When the underlined selection contains a compound, check to see if the words mean the same thing. If so, the correct answer choice will eliminate one of them. *Build* and *construct* mean the same thing, so you can eliminate F and G right away. The

only difference between (H) and J is a comma, which is incorrect in a compound; eliminate J.

35. **A**

Difficulty: Medium

Category: Sentence Structure

Getting to the Answer: Where the only difference among the answer choices is comma placement, remember your tested rules. This sentence needs NO CHANGE, (A). Choice B incorrectly places a comma between items in a compound. Choice C places a comma after the conjunction in a compound, which is also incorrect. Choice D incorrectly inserts a comma between a preposition and its object.

36. **H**

Difficulty: Medium

Category: Development

Getting to the Answer: Read the sentence without the material in question to determine what it adds to the paragraph and therefore why it was included. Looking at the paragraph as a whole, you can see that the author mentions the amount of money invested, the prominence of the architects, and the accomplishments of the firm the architects brought in to help. Removing one of these details detracts from that description; (H) is the best choice here. Choice F can be eliminated because this is not the only detail that supports the larger

point; in and of itself, it's not critical. Removing this one phrase wouldn't impact the transition, as G suggests. Choice J is a trap. The segment in question does concern finances, but the text only mentions the amount of money invested, not how it was raised.

37. **D**

Difficulty: High

Category: Agreement

Getting to the Answer: On the ACT, “who” will only be correct when used to refer to people. Despite the fact that it's named after a person, “John A. Roebling and Sons” is the name of a company, so “who” isn't appropriate. That eliminates A and B. Choice C might be tempting because it's shorter than (D), but when C is read into the sentence, it creates a grammatical problem: “a company . . . and would later” requires another verb. Choice (D) is correct.

38. **J**

Difficulty: Medium

Category: Development

Getting to the Answer: Consider context when you're asked about the role a piece of text plays. A question that asks what would be lost if text were deleted is really just asking for the function of that text. If you read the paragraphs before and after the sentence in question, you'll see that what is missing is a clear transition; (J) is correct. Choice F

distorts the meaning of the sentence, which discusses how long the project actually took, not how long it was expected to take. Choice G is out of scope; danger is only mentioned in this one sentence and then only in terms of how few lives were lost constructing the bridge. Choice H overstates the significance of the detail regarding construction time.

39. **D**

Difficulty: Medium

Category: Organization

Getting to the Answer: When transition words are underlined, focus on the relationship between the sentences or clauses they combine. The preceding sentence talks about the length of the bridge, and the sentence in which the underlined segment appears goes on to describe the cables in more detail. Since the second sentence isn't a result of the first sentence, you can eliminate A. Choice B inaccurately suggests an inconsistent or contradictory relationship between the sentences. Choice C is illogical; these are facts about the bridge, not events occurring simultaneously. The best choice here is no transition at all, as in (D).

40. **G**

Difficulty: Low

Category: Development

Getting to the Answer: When you're tested on Usage, wrong answer choices may have the wrong word in context. They may also be wordy or passive. *Longer* means a comparison: one thing is longer *than* something else. Since this sentence doesn't offer a comparison, *longer* can't be correct. Eliminate F. Choices (G) and H are both grammatically correct in context, but H is unnecessarily wordy. *Lengthy*, in J, is not correct when used to describe a specific length.

41. **C**

Difficulty: Medium

Category: Sentence Structure

Getting to the Answer: When the underlined portion contains a comma, check for a run-on. Because the comma separates two independent clauses, A is incorrect. Choice B eliminates the subject of the second clause, so it is incorrect. Choice D incorrectly combines a semicolon and a FANBOYS conjunction. Choice (C) makes the second clause dependent and correctly separates the clauses with a comma. Choice (C) is correct.

42. **F**

Difficulty: Medium

Category: Sentence Structure

Getting to the Answer: Introductory phrases and clauses should be set off from the rest of the sentence by a comma. The comma here is

used correctly, so no change is needed; (F) is correct. Choice G eliminates the comma, making the sentence difficult to understand. Both the colon in H and the semicolon in J would work only if the first clause were independent, which it is not.

43. **D**

Difficulty: Medium

Category: Organization

Getting to the Answer: When a transition word is underlined, check to see what ideas are being connected by the transition. The previous sentence mentions that the bridge was renamed, and the sentence beginning with the underlined portion switches to the present tense to describe the number of vehicles that cross the bridge daily. There is no logical contrast between these ideas, so B and C can be eliminated. Choice A indicates a continuation of the previous thought, but that does not fit the context; eliminate it. Choice (D) is correct because it transitions from the past-tense description in the previous sentence to the present-tense description of the bridge's daily activity.

44. **F**

Difficulty: Medium

Category: Agreement

Getting to the Answer: Use *over* for physical location and *more than* for numbers or amounts. This sentence is correct as written, (F).

Choice G replaces *more than* with *over*, which, despite its common usage, is actually a preposition that indicates location, not amount. Choice H is unnecessarily wordy. Choice J is also wordy and uses *amount*, which is incorrect for a countable noun like *vehicles*.

45. **C**

Difficulty: Medium

Category: Development

Getting to the Answer: As you read ACT English passages, develop a sense of the topic or *big idea*, just like you do in Reading; this question format is very common on the ACT. This passage is about one specific bridge, so it would not satisfy the requirement set out in the question stem. You can therefore eliminate A and B right away. Now turn to the reasoning. Choice D misstates the topic of the passage; (C) is correct.

9. *The Dream of the American West*

46. **H**

Difficulty: Medium

Category: Agreement

Getting to the Answer: Verbs in a compound should be in the same tense. The compound verb in this clause is “was . . . rising . . . and painted.” Since the second verb is in the past tense, the first should be as well, so F is incorrect; (H) is correct. Choice G uses the gerund verb

form without the necessary helping verb. Choice J is unnecessarily wordy.

47. **A**

Difficulty: Medium

Category: Development

Getting to the Answer: Read English Test question stems carefully.

Often, all of the choices will be relevant and grammatically correct, but only one will fulfill the requirements of the stem. This question stem asks for a detail that shows a contrast between the quiet night streets and the daytime activity. The original text does this best. The verb in B does not convey the difference in the streets at these two times as well as *flood* in (A). Choice C is too general. Choice D does not provide the necessary contrast.

48. **H**

Difficulty: Medium

Category: Agreement

Getting to the Answer: Use your Kaplan resources to familiarize yourself with commonly tested idioms. Although all four answer choices form idioms that would be correct in some contexts, one smiles *at* someone or something; (H) is correct.

49. **D**

Difficulty: Medium

Category: Conciseness

Getting to the Answer: When you don't spot an error in grammar or usage, look for errors in style. Choice A is a wordy way of saying *traveled across*, (D). Choices B and C are unnecessarily wordy as well.

50. H

Difficulty: Low

Category: Sentence Structure

Getting to the Answer: Read question stems carefully. This one asks which answer choice would NOT be acceptable, which means that three of the choices will be correct in context. Choices F, G, and J are appropriate introductory clauses, but (H) is an independent clause, which makes the sentence a run-on.

MATHEMATICS TEST

- D.** Starting with $4x - 9 = 15$, we need to isolate x . First, add 9 to both sides: $4x - 9 + 9 = 15 + 9$, which gives us $4x = 24$. Now divide both sides by 4: $x = 24/4 = 6$.
- B.** To find 35% of 240, convert the percentage to a decimal by dividing by 100: $35\% = 0.35$. Then multiply: $0.35 \times 240 = 84$.
- A.** First distribute: $3(4x - 5) = 12x - 15$ and $-2(3x - 7) = -6x + 14$. Now combine like terms: $12x - 15 - 6x + 14 = (12x - 6x) + (-15 + 14) = 6x - 1$.
- D.** List the factors of each number. Factors of 48: 1, 2, 3, 4, 6, 8, 12, 16, 24, 48. Factors of 72: 1, 2, 3, 4, 6, 8, 9, 12, 18, 24, 36, 72. The greatest common factor is 24.
- C.** Let the five consecutive integers be $n, n+1, n+2, n+3, n+4$. The median (middle value) is $n+2 = 18$. Solving for n : $n = 16$. Therefore, the smallest integer is 16.
- C.** Factor out $3x$ from the left side: $3x(x - 4) = 0$. For a product to equal zero, at least one factor must be zero. So either $3x = 0$ (giving $x = 0$) or $x - 4 = 0$ (giving $x = 4$). The solutions are $x = 0$ or $x = 4$.
- C.** The absolute value of -12 is 12, and the absolute value of -7 is 7. Therefore: $|-12| - |-7| = 12 - 7 = 5$.
- B.** To add fractions, find a common denominator. The LCD of 8 and 4 is 8. Convert: $5/8 + 3/4 = 5/8 + 6/8 = 11/8$.
- C.** Average speed = total distance \div total time = 270 miles \div 4.5 hours = 60 mph.
- A.** We need two numbers that multiply to 30 and add to -11. These are -5 and -6, since $(-5)(-6) = 30$ and $-5 + (-6) = -11$. Therefore: $x^2 - 11x + 30 = (x - 5)(x - 6)$.
- C.** We need to find what number squared equals 196. Since $14 \times 14 = 196$, we have $\sqrt{196} = 14$.
- B.** Substitute $x = -2$ into $f(x) = 2x^2 + 3x - 4$: $f(-2) = 2(-2)^2 + 3(-2) - 4 = 2(4) + (-6) - 4 = 8 - 6 - 4 = -2$.
- B.** Using the slope formula: $m = (y_2 - y_1)/(x_2 - x_1) = (11 - 3)/(5 - 1) = 8/4 = 2$.
- B.** In a 45-45-90 triangle, the sides are in the ratio $1:1:\sqrt{2}$ (leg:leg:hypotenuse). If one leg is 8, the hypotenuse = $8\sqrt{2}$.
- C.** Starting with $2x - 7 < 9$, add 7 to both sides: $2x < 16$. Divide both sides by 2: $x < 8$.
- C.** If the diameter is 10, the radius is 5. Area of a circle = $\pi r^2 = \pi(5)^2 = 25\pi$.
- A.** To convert to scientific notation, move the decimal point 4 places to the right to get 7.2. Since we moved right, the exponent is negative: $0.00072 = 7.2 \times 10^{-4}$.

18. D. Calculate: $2^5 = 2 \times 2 \times 2 \times 2 \times 2 = 32$.

19. C. If $\log_3(x) = 4$, this means $3^4 = x$. Calculate: $3^4 = 3 \times 3 \times 3 \times 3 = 81$.

20. B. Using the Pythagorean theorem for the diagonal: $d^2 = 15^2 + 9^2 = 225 + 81 = 306$. So $d = \sqrt{306} \approx 17.5$.

21. D. Lines m and l are parallel with a transversal cutting through them. Angles a and f are co-interior angles (same side of the transversal), which are supplementary. Therefore: $\angle f = 180^\circ - 68^\circ = 112^\circ$.

22. B. Mean = sum of all values \div number of values = $(4 + 7 + 9 + 12 + 18) \div 5 = 50 \div 5 = 10$.

23. B. Parallel lines have identical slopes. The line $y = 3x - 5$ has slope 3, so any line with slope 3 is parallel to it. Only $y = 3x + 7$ has slope 3.

24. B. Complementary angles add up to 90° . If one angle is 38° , the other is $90^\circ - 38^\circ = 52^\circ$.

25. A. $\sin(30^\circ)$ is a standard angle value from the unit circle or 30-60-90 triangle. $\sin(30^\circ) = 1/2$.

26. A. Total marbles = $3 + 5 + 7 = 15$. Probability of drawing red = (number of red marbles)/(total marbles) = $3/15 = 1/5$.

27. B. When multiplying terms with the same variable, multiply coefficients and add exponents: $(3x^4)(4x^3) = (3 \times 4)(x^{4+3}) = 12x^7$.

28. D. Draw a perpendicular from the center to the chord, which bisects the chord. This creates a right triangle with one leg = 3 (distance to center) and another leg = 4 (half of 8). Using Pythagorean theorem: $r^2 = 3^2 + 4^2 = 9 + 16 = 25$, so $r = 5$. Area = $\pi r^2 = 25\pi$.

29. B. Distance formula: $d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} = \sqrt{(-4 - 2)^2 + (5 - (-3))^2} = \sqrt{(-6)^2 + (8)^2} = \sqrt{36 + 64} = \sqrt{100} = 10$.

30. C. We need to find what power of 3 equals 243. Testing: $3^3 = 27$, $3^4 = 81$, $3^5 = 243$. Therefore $x = 5$.

31. D. Volume of rectangular prism = length \times width \times height = $4 \times 6 \times 9 = 216$ cubic units.

32. C. Perpendicular lines have slopes that are negative reciprocals. The slope of $y = 4x - 3$ is 4, so a perpendicular line has slope $-1/4$. Only $y = -1/4x + 5$ has this slope.

33. A. In a 30-60-90 triangle, sides are in ratio $1:\sqrt{3}:2$ (shortest:middle:hypotenuse). If hypotenuse = 10, then shortest side = $10/2 = 5$.

34. B. 18% of $150 = 0.18 \times 150 = 27$.

35. B. The mode is the value that appears most frequently. In $\{3, 5, 7, 5, 9, 11, 5, 13\}$, the number 5 appears three times, more than any other value.

- 36. H.** From the coordinate plane, A is at approximately (1, 4) and C is at (1, 0). Using the distance formula or simply counting: $AC = |4 - 0| = 5$ units.
- 37. B.** If $\tan \theta = 5/12$, we can construct a right triangle with opposite = 5 and adjacent = 12. Using Pythagorean theorem: hypotenuse = $\sqrt{5^2 + 12^2} = \sqrt{25 + 144} = \sqrt{169} = 13$. Therefore $\cos \theta = \text{adjacent/hypotenuse} = 12/13$.
- 38. B.** If area = 36π , then $\pi r^2 = 36\pi$, so $r^2 = 36$ and $r = 6$. Circumference = $2\pi r = 2\pi(6) = 12\pi$.
- 39. C.** The equation $|2x - 4| = 10$ means either $2x - 4 = 10$ or $2x - 4 = -10$. Solving the first: $2x = 14$, $x = 7$. Solving the second: $2x = -6$, $x = -3$. Solutions are $x = 7$ or $x = -3$.
- 40. B.** If $(x + 3)$ is a factor, then $x = -3$ is a root. Substituting into $x^2 + 7x + k = 0$: $(-3)^2 + 7(-3) + k = 0$, which gives $9 - 21 + k = 0$, so $k = 12$.
- 41. B.** From the triangle with two sides of length 5 and base S, this appears to be isosceles. Using the Law of Cosines or recognizing this is a special triangle, $\cos R = \sqrt{3}/2$.
- 42. B.** For a quadratic to have exactly one solution, the discriminant must equal zero. For $x^2 - 10x + k = 0$, discriminant = $b^2 - 4ac = 100 - 4k = 0$. Solving: $4k = 100$, $k = 25$.
- 43. C.** Calculate: $i^2 = -1$ (by definition), so $i^4 = (i^2)^2 = (-1)^2 = 1$.
- 44. D.** If $\cos \angle BAC = 0.6$ and hypotenuse $AC = 15$, then the adjacent side $(AB) = 15 \times 0.6 = 9$. Using Pythagorean theorem: $BC^2 = 15^2 - 9^2 = 225 - 81 = 144$, so $BC = 12$.
- 45. C.** Let the three consecutive even integers be $n, n+2, n+4$. Their sum: $n + (n+2) + (n+4) = 78$. Simplifying: $3n + 6 = 78$, so $3n = 72$, $n = 24$. The integers are 24, 26, 28. The largest is 28.

READING TEST

Passage I

1. Suggested Passage Map notes:

¶1: Countess Olenska (CO) no longer pretty

¶2: CO 1st in NY as little girl adopted by aunt Medora (M)

¶3: M repeatedly widowed, NY accepting of M's eccentricities

¶4: All kind to Ellen (E) [aka CO], M not follow mourning rules

¶5: E was well-liked, fearless child; E's odd edu.

¶6: E married Polish nobleman, ended in disaster

¶7: NY expected CO to be more stylish and vibrant

1. C

Difficulty: Low

Category: Detail

Getting to the Answer: Remember that the correct answer to Detail questions will be directly stated in the passage. Your notes should guide you as you locate specific references to the details in question. Line 23 mentions Ellen’s parents’ “regrettable taste for travel” in the context of lines describing what the people of New York thought. Predict something like “travel.” Choice (C) matches this prediction. Choice A is a misused detail; Medora does teach her niece to play the piano, but nothing in the passage suggests that this was undesirable. Choice B is a misused detail; Spanish shawl dances are described as “outlandish,” but this is within the context of Medora and Ellen’s eccentric, but accepted, behaviors. Choice D is a misused detail; while Medora often adopted children, this is never described as undesirable.

2. J

Difficulty: High

Category: Inference

Getting to the Answer: Consider how the author writes about New York society. In lines 24–25, she writes that “people thought it a pity that the pretty child [Ellen] should be in such hands,” meaning that they did not feel the eccentric Medora was a good influence on Ellen. People call Medora “misguided” (line 30), and the author notes that she scandalized her family by not adhering to the “unalterable rules” of mourning (line 31–32). All in all, New York society seems to have some rigid and snobbish rules. On the other hand, New York society “looked indulgently on her [Medora’s] eccentricities” (line 20–21) and “resigned itself to Medora” (lines 38–39). The author’s view of New

York society as it pertains to Medora seems to be mixed, which matches (J). Choice F doesn't take into account New York society's acceptance of Medora's odd behavior, G is opposite, and H is not mentioned in the passage.

3. **A**

Difficulty: Medium

Category: Inference

Getting to the Answer: To answer Inference questions, you will have to go beyond what is directly stated in the passage. However, the correct answer choice will be supported by evidence from the passage, so make sure you make a prediction that has solid textual support. You can predict, based on lines 56–66, that Ellen was unable to help her aunt because her own marriage to the immensely rich Polish nobleman “had ended in disaster.” Choice (A) matches this prediction. Choice B is a distortion; since both Medora and Ellen left New York, their communication over the years is unknown. Choice C is a distortion; while the author tells you that Ellen had an incoherent education, nothing in the passage suggests that she resented this. Choice D is a distortion; though the passage makes it clear that Medora was eccentric, this is in no way related to receiving help from her niece.

4. **F**

Difficulty: Medium

Category: Inference

Getting to the Answer: Predicting an answer is particularly important for Inference questions like this. Make sure you can support your prediction with information in the passage. Lines 68–70 suggest that Newland has spent time thinking about Ellen, and lines 74–93 all describe Newland’s observations of Ellen. Newland is not disappointed that Ellen is not as “stylish” as others expected (lines 84–86). You can predict that Newland is thoughtful and, unlike many of the other characters in the passage, non-judgmental. Choice (F) matches this prediction. Choice G is out of scope; it might seem reasonable to conclude that Newland is likeable, but the passage does not provide any evidence to directly support this. Also, there is nothing to suggest that he is withdrawn. Choice H is opposite; Newland’s observations about Ellen in the last paragraph clearly indicate that he is interested in her. Choice J is a distortion; Newland’s observation that Ellen is not as stylish as New York society might expect says nothing about his own stylishness, nor does the author ever describe Newland’s level of sociability.

5. **A**

Difficulty: Medium

Category: Function

Getting to the Answer: Wharton writes that Medora has “many peculiarities,” (line 31), and that “New York looked indulgently on her eccentricities” (line 20–21). This matches the first part of answer choice (A). Since you may not know what peripatetic means, hold on to (A) while you research the other answers. Though Wharton states that

each time Medora returns to New York she looks for a less expensive house, indicating reduced circumstances, this doesn't necessarily mean that Medora is impoverished, and there is no suggestion that she is resentful. Eliminate B. Medora may be kind (she does, after all, take in orphaned Ellen), but loyal doesn't describe someone who "invariably parted from her husband or quarrelled with her ward" (lines 15–16), eliminating C. Choice D mixes up Medora with Ellen; these words describe Ellen as a child, so D is incorrect. Choice (A) must be correct, even if you don't know that *peripatetic* means "traveling from place to place."

6. **H**

Difficulty: Medium

Category: Vocab-in-Context

Getting to the Answer: The word *flout* is used in the author's description of Medora wearing a veil considered too short for acceptable mourning and dressing Ellen in "a crimson dress and amber beads" (lines 36–37). Both of these are examples of Medora's "misguided . . . many peculiarities" (lines 30–31), which go against accepted New York behavior. Thus (H), disregard, is a good match. Choice F is too strong to describe Medora's behavior, as she does partially follow, rather than totally eliminate, the rules of mourning. Choice G is opposite, and while J looks close to the word *flout*, it doesn't make sense in the passage.

7. **C**

Difficulty: Medium

Category: Inference

Getting to the Answer: Make sure you have good evidence for your prediction, and the right answer choice will be easy to find. Line 21 mentions Medora’s *eccentricities*, line 31 mentions her *peculiarities*, and line 44 mentions the *outlandish arts* that Medora teaches Ellen. From these descriptions, you can predict that Medora is unconventional or eccentric. Choice (C) matches this prediction. Choice A is out of scope; although Medora does not adhere to conventions, as indicated by lines 31–32, there is nothing to suggest that this is attributable to arrogance. Choice B is a distortion; the description of the short veil that Medora wore to her brother’s funeral in lines 34–36 might suggest immodesty, but the author makes clear that this is evidence of Medora’s willingness to flout social conventions and never mentions any immodest dress or behavior. Choice D, which means following established practice, is opposite; you are told in lines 31–32 that one of her peculiarities is to “flout the unalterable rules that regulated American mourning.”

8. **F**

Difficulty: Low

Category: Detail

Getting to the Answer: Detail questions like this one are straightforward, but it can sometimes be difficult to find exactly where

in the passage the relevant information comes from. Make sure that you are answering the specific question being asked, so that other details don't distract you. Medora teaches Ellen "drawing from the model" (line 49), which is described as "a thing never dreamed of before," so predict Ellen or Countess Olenska. Choice (F) matches your prediction. Choice G is out of scope; Newland is not described as having learned anything at all, let alone something controversial. Choice H is a distortion; Medora teaches Ellen, but the passage does not mention Medora learning anything herself. Choice J is a distortion; Count Olenska is only mentioned indirectly as the rich nobleman whom Medora marries. The passage makes it clear that Ellen is Countess Olenska; don't be fooled by this initially tempting, but incorrect, choice.

9. **B**

Difficulty: Medium

Category: Function

Getting to the Answer: Locate where the author mentions Medora's mother and read the next few lines. The author writes that "her mother had been a Rushworth," (line 18), that Medora married "one of the crazy Chiverses" (lines 19–20), and that because of these two conditions, "New York looked indulgently on her eccentricities" (lines 20–21). In other words, given her mother and her marriage, people were not surprised by Medora's unconventional life, which matches (B). There is no support for A, so it is out of scope. Choice C is opposite; New Yorkers "thought it a pity that the pretty child should be in such

hands” (lines 24–25), and D is true but not relevant to Medora’s eccentricities.

10. **F**

Difficulty: High

Category: Inference

Getting to the Answer: Remember that Inference questions will have details in the wrong answer choices that are meant to throw you off. Making a good prediction before reviewing the choices will guard against this. The beginning of the passage (line 4) implies that Newland knew Ellen when he was young. Lines 55–59 state that no one had heard from Ellen for some time, and after a few years, she came back to New York, as Medora had done before her. Predict that at the dinner, Newland and Ellen had not seen one another for an extended period of time. Choice (F) matches your prediction. Choice G is extreme; although Newland is clearly paying attention to Ellen in the last paragraph, there is nothing to suggest that either of them is interested in a romantic relationship. Choice H is extreme; while Ellen’s lack of *stylishness* (lines 85–86) might suggest that she is not interested in New York society’s conventions, it goes too far to say that she is disappointed. Choice J is opposite; the passage clearly portrays Ellen and Newland’s encounter as a re-acquaintance.

2. *Passage II*

Suggested Passage Map notes:

- ¶1: Researchers in Junagadh, India, attempt accurate forecast
- ¶2: 1st trad. rule: monsoon begins 45 days after Cassia fistula tree blooms
- ¶3: 2nd trad. rule: north or west wind = good monsoon, east = drought
- ¶4: Trad. rules not exact, but general trend is correct
- ¶5: Dr. K started in 1990 when old saying was exactly correct
- ¶6: Meteorologist Sahu disagrees w/ Dr. K
- ¶7: Dr. K hopes research will show trad. methods are valid; holds conference
- ¶8: Dr. K started N G O to support further research

11. **B**

Difficulty: Medium

Category: Global

Getting to the Answer: This is a global question because it asks for the purpose of the passage as a whole. Review your passage map and predict that the passage describes probable challenges to Florida's economy due to climate change and how the state is preparing to meet those challenges. The correct answer is (B).

Choice A is a distortion; while the passage does occasionally mention harm that has already occurred, it is primarily focused on future issues. Choice C is both out of scope and extreme; combating climate change itself is not addressed in the passage, and the author doesn't argue for any particular course of action. Choice D is also out of scope;

the passage is focused on economic impacts, not on multiple ways climate change can impact people's lives.

12. **J**

Difficulty: Low

Category: Detail

Getting to the Answer: The clue “According to the passage” marks this as a detail question. Locate where the passage discusses Hurricane Irma (in paragraph 2) and research what made it significant. The passage states that it was “the costliest hurricane in Florida’s history,” so (J) is correct. It is worth noting that this is a case in which absolute language (“more...than any other”) does not mark a too-extreme answer; the passage itself does make that strong a statement.

Choice F is a misused detail; Irma could hypothetically have cost that much if it had hit Miami more directly, but in reality, it cost approximately \$50 billion. Choice G is a distortion; the paragraph certainly suggests that climate change increased Irma’s destructiveness but not that it was the first hurricane for which that was true. Finally, H is a misused detail; while the paragraph mentions the dangers of rising sea levels, demonstrating them is not what made Irma significant.

13. **A**

Difficulty: Medium

Category: Inference

Getting to the Answer: The word *implies* is a clue that this is an inference question. Research what the second paragraph says about South Florida. It lost a great deal of money as a result of a hurricane, which could have been far worse if Miami, “Florida’s second-most popular tourist destination” (lines 23–24), had been directly hit. You can predict that the area generates a lot of money from tourism. Choice (A) is correct.

Choice B is extreme; while the paragraph mentions rising sea levels as a concern, it does not suggest that South Florida is likely to become submerged. Choice C is out of scope; the passage does not discuss northern Florida at all. Finally, D is incorrect because there is no evidence in the paragraph linking South Florida with agriculture.

14. **G**

Difficulty: Medium

Category: Detail

Getting to the Answer: “The passage makes clear” shows that this is a detail question. Use your passage map to find where the passage discusses the Everglades and identify how climate change threatens it. Using paragraph 3, predict that the Everglades is likely to become submerged since much of it is barely above sea level. Choice (G) is correct.

Choice F is extreme; while paragraph 3 does mention salt water pushing inland, it does not say that this will poison fresh water. Choice H is a misused detail; the fifth paragraph mentions degradation of grasslands but not in reference to the Everglades. Choice J is a distortion; although paragraph 3 predicts problems for visitors, it does not suggest they will be entirely cut off from the park.

15. **D**

Difficulty: High

Category: Function

Getting to the Answer: The wording “author references . . . in order to” identifies this as a function question. Examine the surrounding text to understand why the author includes these references. The paragraph discusses how lack of water could harm agriculture; the EPA report explains how water shortages could come about, and the study demonstrates the impact of insufficient water on citrus crops. Predict that both provide support from scientific sources for the paragraph’s main idea. The correct answer is (D). This choice doesn’t match the exact wording of the prediction, but correct answer choices rarely will. Look for the choice that matches the general idea of the prediction rather than its specific wording. In this case, D includes supporting the main idea, and most readers are likely to find scientific studies and reports authoritative; thus, D fits the prediction even without exactly matching it.

Choice A is true of the study but not the EPA report, while C is true of the EPA report but not the study, so both are incorrect. Nothing in the paragraph is countering an argument, so B is also incorrect.

16. **J**

Difficulty: Low

Category: Detail

Getting to the Answer: “The passage states” is a clue that this is a detail question. Since the question asks for a comparison between the two industries, research towards the middle and end of the passage, after both industries have been discussed. The fifth paragraph states that livestock brings in a smaller portion of Florida’s agriculture revenue. Choice (J) is correct.

Although the passage mentions both water consumption and exports, it does not compare the two industries for either, so F and H are incorrect. The passage does not discuss pollution at all, so G is out of scope.

17. **B**

Difficulty: Low

Category: Detail

Getting to the Answer: The phrase “According to the passage” shows that this is a detail question. The fifth paragraph discusses issues

facing the livestock industry, including heat stressing the animals, loss of grasslands, and increased insect-borne diseases. Choice (B) matches the first of these and is correct.

Choice A is a misused detail; while the passage predicts reduced crop yields, it says nothing about these crops being used to feed livestock. Choice C is a distortion; the passage says that animals are likely to get sick because of increased mosquito populations, not because of the weather itself. Choice D is a misused detail similar to A; while water shortages may occur, the passage does not discuss their impact on the livestock industry.

18. **H**

Difficulty: Medium

Category: Global

Getting to the Answer: This question asks for the purpose of a paragraph, which requires an understanding of both the paragraph itself and how it fits into the passage as a whole. Thus, this is a global question. While the passage so far has described problems raised by climate change, paragraph 6 discusses some potential solutions to these problems. Choice (H) is correct.

Choice F is a misused detail; only some of the paragraph is about infrastructure adaptations. Choice G is incorrect because this paragraph has moved on from describing the problems. Finally, J is a

distortion; while parts of the paragraph involve directing water supplies, it does not refer to imbalances in rainfall.

19. **C**

Difficulty: Medium

Category: Detail

Getting to the Answer: The phrase “According to the passage” marks this as a detail question. Paragraph 6 describes ways to counteract climate change problems; do some research there to find what solutions are being put forward for agriculture. The last sentence of the paragraph says that farms are switching to more water-efficient subsurface irrigation and mixed crop-livestock farms. The second part matches (C), which is correct.

Choice A may be tempting, but this answer choice says that subsurface irrigation is less efficient and being replaced, the opposite of what the passage states. Choices B and D are both out of scope; neither is discussed as a solution in the passage.

20. **H**

Difficulty: Medium

Category: Function

Getting to the Answer: The phrase *serves to* in the question stem indicates that this is a function question. Read around the lines in

question for context to determine why the author includes this detail. The paragraph states that policymakers want to diversify Florida's economy and international trade seems like a good way to do so. Predict that the fact that Florida already exports a great deal provides a reason *why* policymakers see this as a suitable area to expand. The correct answer is (H).

Choice F is extreme; although the passage makes clear that exports are important to Florida's economy, it does not suggest that they are a primary driver of expansion. Choice G is out of scope; the passage does not compare Florida's trade balance with any other state. Finally, J is a distortion; while the paragraph does explain the importance of diversification, that is not the purpose of this detail.

3. *Passage III*

Suggested Passage Map notes:

Passage A

- ¶1: Country music (C) born in central & southern Appalachians
- ¶2: Originated in 1920s from multiple sources
- ¶3: The term "country" replaced "hillbilly"
- ¶4: Hank Williams 1st to take country national; artists
- ¶5: Nashville, TN = country home w/ Grand Ole Opry (1925)
- ¶6: C relatives = honky tonk, Western Swing
- ¶7: C expresses Am. identity

Passage B

¶1: Bluegrass (B) origin and description

¶2: B diff. from C: highlight 1 musician at a time, diff. instruments, vocal harmonies

¶3: own category in late 1950s, named after Bill Monroe's band

¶4: today: movies, festivals

¶5: B themes = working class; reflects Am.

21. C

Difficulty: Medium

Category: Detail

Getting to the Answer: Use your Passage Map to locate this detail; the second paragraph should include the necessary information. Use the list of the sources of country music (“spirituals as well as folk music, cowboy songs, and traditional Celtic melodies”) to make your prediction. Choice (C) is correct because country music is not rooted in jazz. Rather, jazz was combined with country music to create Western Swing. Paragraph 6 states, “Additionally, Western Swing emerged as one of the first genres to blend country and jazz musical styles, which required a great deal of skill and creativity.” Choice A is opposite; paragraph 2 describes the many sources of country music with the sentence, “Rooted in spirituals as well as folk music, cowboy songs, and traditional Celtic melodies, country music originated in the 1920s.” Choice B is opposite; spirituals influenced the development of

country music. Choice D is opposite; country music is rooted in cowboy songs.

22. **J**

Difficulty: Medium

Category: Inference

Getting to the Answer: The answer to an Inference question is supported by the passage. However, because all answer choices are in the passage, be careful to assess each one in terms of the actual question asked. A look at your notes or a quick scan of the passage should provide enough information to make a prediction about where to find the best country music. Match that prediction to the correct answer. Choice (J) is correct; in paragraph 5, the author writes “Country singers are considered to have reached the pinnacle of the profession if they are asked to become members of the Opry.” To hear the best music, it makes sense to go to the place where those at the pinnacle, or top of their field, perform. Choice F is a misused detail; one would hear honky-tonk music, a derivative of country, but not country music itself, in these bars. Choice G is a misused detail; Ireland is the original home of the Ulster Scots, many of whom settled in Appalachia. Choice H is a misused detail; though country music had its origins in the mixture of music created in Appalachia, the author does not state that it is the place to hear the best music.

23. **C**

Difficulty: High

Category: Vocab-in-Context

Getting to the Answer: As with all Vocab-in-Context questions, use the surrounding clues to define the word in question. The word appears in paragraph three, where the original term “hillbillies” is used to describe “Appalachian inhabitants who were considered poor, uneducated, isolated, and wary.” The more accepting word “country” has replaced “hillbillies,” indicating that pejorative is a negative word, an adjective used to highlight the negative characteristics described in the paragraph. This matches (C), since disparaging means belittling, or bad. Choice A is a synonym for *original* rather than a word that means *negative*. Choice B is out of scope, as the author never expresses that the negative view is accurate, and D refers to where the people live rather than fitting the context of describing the term (i.e., it is not a “mountain-dwelling term”).

24. F

Difficulty: Low

Category: Inference

Getting to the Answer: Both passages introduce several genres of American music, but this question refers to Passage B, so research the passage carefully. In the first paragraph the author introduces bluegrass music and writes that it is “a mixture of Scottish, Welsh, Irish, and English melodic forms, infused, over time, with African-American influences.” (lines 72–75), and that laments “are common themes.” (lines 79–80). These are exactly the components of the song in the

question, making (F) correct. The other answers refer to Passage A and are described as having different derivations.

25. **A**

Difficulty: Medium

Category: Detail

Getting to the Answer: Locate the paragraph in which bluegrass instruments are described, and match those descriptions with the correct answer choice. Your notes point to only one paragraph in which musical instruments are mentioned. Scan the answer choices, then re-read the information in that paragraph to determine which answer choice characterizes the information given. Choice (A) is correct; musical instruments are described in the second paragraph and include typical ones such as “banjo, guitar, mandolin, bass, harmonica, and Dobro (resonator guitar).” But the paragraph goes on to include far less typical ones, such as “household objects, including washboards and spoons,” which are not usually considered musical instruments, but are sometimes included in a bluegrass band. Choice B is a misused detail; African-American influences are provided as one more source of the bluegrass genre but instrumentation is not referenced. Choice C is a misused detail; this is an example of a bluegrass piece used in a movie soundtrack. Choice D is out of scope; the reference to the Ozark mountains concerns the origin of bluegrass and has nothing to do with a description of musical instruments.

26. **F**

Difficulty: High

Category: Detail

Getting to the Answer: The answer to a Detail question is stated in the passage. Locate the paragraph in which the differences between country and bluegrass music are discussed. Paragraph 2 includes the information you need to answer the question. Be sure to keep straight which details describe each genre of music. Choice (F) is correct. Paragraph 2 details two characteristics of bluegrass music: first, that “bluegrass highlights one player at a time, with the others providing accompaniment,” and second, that “bluegrass incorporates baritone and tenor harmonies.” Choice G is opposite; country music features a single voice. Choice H is opposite; country musicians commonly play the same melodies together. Choice J is a distortion; which instruments are used is not cited as a difference between the music styles.

27. **B**

Difficulty: Medium

Category: Inference

Getting to the Answer: Locate the paragraphs that mention laments and high, lonesome sound, and consider what the author means by including these two details. The reference to *laments* is in the first paragraph and the reference to “high, lonesome sound” in the last paragraph are examples of “the hard-scrabble life of the American

worker,” which matches (B). Choice A is out of scope; the elements mentioned in the question stem do not necessarily reflect Irish music; bluegrass has multiple sources. Choice C is a misused detail; Shania Twain is an example of a country singer and is mentioned in Passage A only. Choice D is a misused detail; though bluegrass was originally called “hillbilly,” this is the name for the genre, not the theme.

28. **G**

Difficulty: Medium

Category: Vocab-in-Context

Getting to the Answer: Vocab-in-Context questions require that you understand the context of a cited word or phrase. Locate the reference and focus your research on the text immediately preceding and immediately following the word or phrase in question. The introductory paragraph states, “One of the most enjoyable ways to analyze culture is through music.” Look for an answer choice that indicates that music can provide specific insight about a culture as a whole. Choice (G) matches this prediction. Choices F, H, and J are a distortion; *quintessential* does not mean old-fashioned, charming, or conventional (typical).

29. **C**

Difficulty: Medium

Category: Inference

Getting to the Answer: When asked to use a quote to find support in one paragraph for information in another, be sure to read the quote in the context of the paragraph. First find the paragraph in which the quote from Passage A appears, then match the quote to one in Passage B. Choice (C) is correct; Flatt and Scruggs are mentioned in Passage B, paragraph 3, in which they are characterized as “the foremost artists on their instruments.” The best artists are certainly “talented and sophisticated.” Choice A is a misused detail; this quote refers to bluegrass themes, whereas the question asks for one that supports talented and sophisticated musicians. Choice B is out of scope; the “pace and complexity” of the music does not necessarily relate to the skill of the musicians themselves. Choice D is out of scope; the relation between bluegrass and country music refers to the kinship of the genres, not the musicians.

30. H

Difficulty: Medium

Category: Global

Getting to the Answer: When looking for something on which both authors would agree, first determine what each one actually states in the passage, then consider what must be true based on those statements. The evolution, or gradual change, in music, as with anything else, must start from somewhere, so look to the parts of each passage that detail the genesis of the music genres, then consider the progression from there. Choice (H) is correct; both authors detail the various music sources that became either country or bluegrass. In the

first passage, the author mentions “folk music, cowboy songs, and traditional Celtic melodies,” and in the second passage, the author refers to “Scottish, Welsh, Irish, and English melodic forms, infused, over time, with African-American influences.” Both authors affirm that the two music genres are “indigenous.” Thus, it must be true that both country and bluegrass music have evolved from their various roots to become American music, supporting agreement on the fact that music can evolve. Choice F is out of scope; each passage mentions how its particular music genre is popular (as explained in the next sentence in the explanation—the Czech festivals and international growth), but both authors don’t describe why *both* genres are popular, only their own. Choice G is a misused detail; the Grand Ole Opry showcases country music only, not bluegrass. Choice J is out of scope; the passages don’t each discuss both genres, only their own.

Passage IV

4. Suggested Passage Map notes:

- ¶1: CubeSats good for space exploration
 - ¶2: improved radios
 - ¶3: testing for longer missions
 - ¶4: consumer cameras → less expensive
 - ¶5: less expensive → more experiments possible
 - ¶6: plans to deal w/ problems
 - ¶7: CubeSats improve future space exploration
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BIG PICTURE SUMMARY:

Main idea: CubeSats offer many advantages for exploration and experimentation in deep space.

Author's purpose: To explore the benefits of using CubeSats

31. **D**

Difficulty: Medium

Category: Global

Getting to the Answer: The clues *author's attitude* and *main topic* identify this as a Global question. Review your notes to determine the author's tone and predict that the author is positive about the CubeSats and looking forward to their future. This matches (D).

Choice A is a distortion; the author is optimistic, but not cautious. Choice B is too neutral, and C is too negative.

32. **H**

Difficulty: Low

Category: Detail

Getting to the Answer: The phrase "According to the passage" marks this as a Detail question. Think about where in the passage you might find the original designers of the CubeSat and use your notes to help.

The first sentence states that researchers at California Polytechnic and Stanford Universities “determined the specifications of the CubeSat design.” This matches (H).

Choices F, G, and J all refer to other people in the passage who made use of the CubeSats, but who were not the original designers. NASA used the design for the MarCO mission, for which Joel Krajewski was a project manager and Cody Colley was a mission manager.

33. **D**

Difficulty: Medium

Category: Vocab-in-Context

Getting to the Answer: The clue words “most nearly means” show that this is a Vocab-in-Context question. Refer to the passage to see how radical is used in the sentence. It describes scientific experiments, so predict that it means ground-breaking. Choice (D) is correct.

Choices A and B refer to alternate meanings of radical that are not supported by the passage; there is no evidence that the experiments are ideologically motivated or involve militarization or aggression. Choice C, “primitive and organic,” is the exact opposite of a scientific experiment in space.

34. **F**

Difficulty: Medium

Category: Detail

Getting to the Answer: The words “According to the passage” identify this as a Detail question. Use your notes to find where the passage discusses communication technology. Research in paragraph 2 and predict that the satellites’ radios and antennae were faster and more efficient. The correct answer is (F).

Choice G is incorrect because it describes the InSight lander’s communication technology. Choice H is incorrect because it describes the MarCO satellites’ cameras, not their radios. Choice J is incorrect because, although the passage mentions that the MarCO radios are the size of so balls, it does not discuss whether the radios were unusually small.

35. **C**

Difficulty: High

Category: Inference

Getting to the Answer: You can easily tell that this is an Inference question because of the word *inferred* in the question stem. Research in the second paragraph to determine how the MarCO satellites compared to the InSight lander. The passage says that their communications are faster, but the answers to inference questions are never explicitly stated in the passage. The paragraph goes on to say that they offered “more efficient monitoring of the landing process” and that their data would “help engineers design better landing

technology for future missions.” Since these sentences draw comparisons, you can predict that the MarCO satellites accomplished these tasks more effectively than the InSight lander itself. The correct answer is (C).

You may have had difficulty predicting for this question. If so, remember that you can eliminate incorrect answers to find the correct one. Choice A is out of scope; the passage does not discuss the resolution of photos or their distances. Choice B is incorrect because the passage does not mention miniaturized technology. Finally, choice D is incorrect because the satellites themselves do not land.

36. **G**

Difficulty: Medium

Category: Function

Getting to the Answer: The phrase *serves to* in the question stem indicates that this is a function question. Review your notes to identify the purpose of the fourth paragraph and predict that it describes how using commercially available cameras made the satellites less expensive. Choice (G) is correct.

Choice F is extreme; the author is not arguing for anything in this paragraph, much less for using off-the-shelf components wherever possible. Choice H is too broad; the paragraph describes only one reason why the project was less costly. Choice J is a misused detail;

although the paragraph does briefly praise the images, that is not its main purpose.

SCIENCE TEST

Passage I

1. A

Difficulty: Low

Category: Inference & Calculation

Getting to the Answer: The question stem tells you that you're looking for a mineral composed of 32% zinc and 12% calcium. Table 1 lists the percentages of calcium and zinc in a variety of minerals, so look there for an answer. According to Table 1, hornblende is composed of 30 to 35 percent zinc and 10 to 20 percent calcium. Choice (A) is thus correct.

2. **J**

Difficulty: Low

Category: Detail & Interpretation

Getting to the Answer: Diagram 1 presents the most common minerals in each soil horizon. A geologist digging down into the A horizon would encounter mostly quartz and mica. Quartz isn't included as a possible answer, but mica is. Choice (J) is thus correct. Choice F is incorrect because limestone isn't commonly found until the C horizon. Choice G is incorrect because shale isn't common until the final horizon. Choice H is incorrect because serpentine is commonly found in the B horizon.

3. **B**

Difficulty: Medium

Category: Detail & Interpretation

Getting to the Answer: Based on Diagram 1, you can see that the minerals are arranged in Table 1 so that the shallowest are at the top of the table and the deepest are at the bottom. However, as you move down the table, you'll notice that zinc content decreases, which indicates an inverse relationship between depth and zinc content. In other words, as zinc content *increases*, depth *decreases*. Choice (B) is thus correct.

4. **H**

Difficulty: Low

Category: Detail & Interpretation

Getting to the Answer: Based on Diagram 1, the only minerals geologists wouldn't commonly find at a depth of 30 feet or lower (to the bottom of the B Horizon) are limestone and shale. You can eliminate F, G, and J because each contain one of these minerals. Choice (H), then, is correct.

5. **A**

Difficulty: Medium

Category: Inference & Calculation

Getting to the Answer: The mineral content of granite is located in Table 2, so start there. Table 2 shows that granite is composed of feldspar, quartz, mica, and augite. If augite is found close to the other minerals in granite, then it should be located at roughly the same

depth as feldspar, quartz, and mica. Now use Diagram 1 to find the depths at which those three minerals are most commonly found. Feldspar is found in the O horizon, at a depth of 2 feet or less, while quartz and mica are found in the A horizon, at a depth of 2 to 10 feet. So you should definitely expect to find augite at depths of less than 10 feet, as in (A).

6. **G**

Difficulty: Low

Category: Detail & Interpretation

Getting to the Answer: Zinc content percentage and calcium content percentage are found in Table 1, so examine it for an answer. Moving down the table, zinc content steadily decreases as calcium content steadily increases. The two quantities are inversely related, making (G) correct.

Passage II

7. **D**

Difficulty: Medium

Category: Inference & Calculation

Getting to the Answer: To answer this question, examine the formula that is provided at the beginning of the passage: $\Delta T_b = K_b \times m \times i$. This equation indicates that the boiling point will increase more if K_b , m , or

i is increased. Item I would increase K_b , item II would increase m , and item III would increase i (because CaCl_2 splits into 3 ions, while NaCl only splits into 2 ions). Because all three items would increase the boiling point of Solution 5, (D) is correct.

8. **H**

Difficulty: Low

Category: Detail & Interpretation

Getting to the Answer: The results for Study 1 are presented in Table 1. Table 1 shows that for 0.171 mol of NaCl , the boiling point is increased to 101.75°C . Choice (H) is thus correct.

9. **C**

Difficulty: Medium

Category: Synthesizing Data

Getting to the Answer: This question asks about the melting point of Material 5. Table 3 provides data about when Material 5 melted, indicating that it did not melt in Solution 5, but that it did melt in Solution 6. Therefore, its melting point will be somewhere between the boiling points of those solutions. Table 1 shows that Solution 5 has a boiling point of 103.50°C and Table 2 shows that Solution 6 has a boiling point of 104.15°C , so Material 5's melting point must fall somewhere in between those values. Choice (C) is thus correct.

10. **G**

Difficulty: Medium

Category: Inference & Calculation

Getting to the Answer: Table 2 provides the boiling points for solutions consisting of various amounts of CaCl_2 added to water. The trend seems linear: for each increase of roughly 0.9 mol CaCl_2 , the boiling point increases by roughly 1.4 degrees Celsius. The highest amount of CaCl_2 on the table is 0.631 mol, roughly 0.9 less than the amount in the question stem. Therefore, the increase will be roughly 1.4 degrees higher than 109.67°C , or 111.07°C . Choice (G) is thus correct. Choice F is between the boiling points for Solutions 9 and 10, which is too low. Choices H and J are too high.

11. **A**

Difficulty: Medium

Category: Synthesizing Data

Getting to the Answer: Table 3 gives an indication of the points at which each material begins to melt. Based on the information from Tables 1 and 2, a higher-numbered solution corresponds to a higher boiling point. It would be highly implausible for a material to melt at a low temperature but not at a higher temperature, which is the trend depicted in (A). The other choices are incorrect because they are all possibilities already revealed in Study 3's results: B corresponds to the

results for Material 1, C to the results for Material 4, and D to the results for Materials 6, 7, and 8.

12. **H**

Difficulty: High

Category: Experimental Design & Methodology

Getting to the Answer: The equation for boiling point elevation given in the passage indicates that the increase in temperature depends upon the molality of the solution. As noted in the explanation of the equation, molality is defined as moles (mol) of solute over kilograms (kg) of solvent. Thus, the students recorded the moles of a solute, rather than its mass, in order to make the calculation of molality—and the subsequent calculation of change in boiling point—easier. Choice (H) is correct. Choice F makes little sense; measuring the solvent’s mass does nothing to prevent measuring the solute’s mass. Choice G is a false statement; moles are usually calculated on the basis of mass, so if anything mass measurements are more accurate. Choice J is true but irrelevant to the question.

13. **A**

Difficulty: Medium

Category: Synthesizing Data

Getting to the Answer: Table 3 shows that Material 7 melted in Solution 10, whereas Material 8 did not. That means that Material 7

must have a melting point of no more than 109.67°C (the boiling point of Solution 10), while Material 8 must have a melting point higher than that temperature. Thus, the results do support the claim that Material 7 has the lower melting point, making (A) correct. Choice B is incorrect because it reverses the results for the materials. Choice C is incorrect because the exact melting point of Material 8 does not need to be determined to support the claim—it only has to be shown to have a higher melting point than Material 7. Choice D is incorrect because the approximate melting point of Material 7 can be determined: it must be between the boiling point temperatures of Solutions 9 and 10.

Passage III

14. **G**

Difficulty: Medium

Category: Evaluating Hypotheses

Getting to the Answer: According to Table 1, the concentrations of nitrogen, phosphorus oxide, and zinc all tend to increase as humidity level increases, regardless of which of the three data sources is considered. For potassium oxide, however, the trend is reversed: the concentration decreases as humidity increases. Choice (G) is thus correct.

15. **A**

Difficulty: Low

Category: Detail & Interpretation

Getting to the Answer: To answer this question, compare the System B data to the USGS data at 25% humidity for the 4 compounds given as answer choices. For nitrogen (N), the USGS concentration is 236 mg/L, while System B measures it as 408 mg/L, which is close to double. For calcium (Ca), USGS has 24.7 mg/L and System B has 23.2 mg/L, a much smaller difference, meaning B can be eliminated. For potassium oxide (K_2O), USGS has 9.2 mg/L and System B has 9.1 mg/L, a very small difference, allowing you to eliminate C too. Finally, for phosphorus oxide (P_2O_5), USGS has 71.2 mg/L and System B has 75.6 mg/L, still smaller than the difference seen in nitrogen, meaning D can also be eliminated. Nitrogen shows by far the biggest difference, whether this is calculated in absolute or relative terms, so (A) is correct.

16. J

Difficulty: Low

Category: Evaluating Hypotheses

Getting to the Answer: From Table 1, you can see that the potassium oxide concentration continually decreases from 9.4 mg/L to 8.2 mg/L as humidity increases from 10% to 80% in the USGS data, continually decreases from 9.4 to 8.0 in System A, and continually decreases from 9.5 to 8.3 in System B. Because the data from all 3 sources supports the hypothesis that potassium oxide levels decrease with increasing humidity, (J) is correct.

17. **D**

Difficulty: Medium

Category: Synthesizing Data

Getting to the Answer: The question asks you to determine which system is more accurate, so ultimately you're trying to find the one that is closer to the USGS data, which is described in the passage as "extremely accurate." Looking at the data for zinc, you can see that the measurements from System B are always closer to the data from the USGS than are the measurements from System A. Therefore, you know the answer to the question is yes, allowing you to eliminate A and B. Choice C, though, is incorrect because it gives the wrong reasoning: System B does give lower measurements than System A, but that alone doesn't make it more accurate. The measurements from System B are more accurate because they are closer to the data from the USGS than are the measurements from System A. Choice (D) is thus correct.

18. **H**

Difficulty: Medium

Category: Synthesizing Data

Getting to the Answer: To answer this question, look at the row in the table that represents calcium concentrations for System B. You can see that the numbers gradually decrease from 10% humidity to 65% humidity, then increase quickly from 65% to 85% humidity. The only graph that shows values decreasing and then rapidly increasing is (H).

19. **B**

Difficulty: High

Category: Inference & Calculation

Getting to the Answer: Examine the System B data in Table 1 to answer this question. According to the table, a potassium oxide level of 9.1 mg/L falls between the values for 25% humidity (9.2) and 45% humidity (9.0), a calcium level of 17.3 mg/L also falls between the values for 25% (23.2) and 45% (11.6), and a zinc level of 0.57 mg/L likewise falls between the values for 25% (0.48) and 45% (0.62). Therefore, the level of humidity for this sample should almost certainly be some value between 25% and 45%. Only (B) falls within this range.

Passage IV

20. **G**

Difficulty: Low

Category: Evaluating Hypotheses

Getting to the Answer: What are Scientist 1's and Scientist 2's viewpoints? Scientist 1 believes that type 2 diabetes is caused by excess sugar consumption, and Scientist 2 says that type 2 diabetes is caused by obesity as a result of a high-fat diet and lack of exercise. If new research suggested that 80% of people with diabetes have buildup of fat in the liver, this information would support the view of Scientist 2 only. The correct answer is (G).

21. **B**

Difficulty: Low

Category: Evaluating Hypotheses

Getting to the Answer: Scientist 1 states that “the cause of type 2 diabetes is an overconsumption of sugar,” while Scientist 2 states that “diets high in fat but not high in sugar are associated with an increased risk of type 2 diabetes.” Thus, both scientists would mostly likely agree that the occurrence of type 2 diabetes in an individual is associated with the patient’s diet. The correct answer is (B). Choice A is only mentioned by Scientist 2, and C is only mentioned by Scientist 3. Age is mentioned in the introductory text, but even though type 2 diabetes is more prevalent in adults, the passage does not suggest that age causes type 2 diabetes, so D is also incorrect.

22. **H**

Difficulty: Medium

Category: Evaluating Hypotheses

Getting to the Answer: The passage states that type 2 diabetes occurs “when the body does not produce enough insulin,” and explains that “Insulin is a hormone produced in the pancreas that helps regulate blood glucose levels.” If the pancreas is removed, the body would not produce insulin, and would thus be unable to regulate blood glucose levels, thereby causing type 2 diabetes to develop. None of the answer choices state this explicitly, but (H) gives the major symptom of

diabetes that was stated in the introductory paragraph: elevated blood glucose levels (hyperglycemia). Choices F and G are incorrect because they state the opposite of what you should expect. You can also eliminate J because you're given no reason to suspect a link between the pancreas and body fat content.

23. **C**

Difficulty: Medium

Category: Evaluating Hypotheses

Getting to the Answer: According to Scientist 3, type 2 diabetes is inherited. Eliminate A and B, which correspond to the hypotheses of Scientists 1 and 2, respectively. Scientist 3 states “individuals have about a 15–20% chance of developing type 2 diabetes if one of their parents has it and a roughly 50% chance if both parents have it.” 18% falls within the 15–20% range. Therefore, Scientist 3 would probably predict that an individual with an 18% chance of developing type 2 diabetes has one parent with type 2 diabetes. The correct answer is (C).

24. **J**

Difficulty: Medium

Category: Evaluating Hypotheses

Getting to the Answer: Remember to keep straight who said what. If a 50-year-old developed type 2 diabetes, Scientist 1 would likely

conclude the patient has a high-sugar diet, Scientist 2 would likely conclude the patient has a high-fat diet and/or lacks exercise, and Scientist 3 would likely conclude the patient inherited it from one or more parents. The only answer choice that correctly matches one of these predictions is (J).

25. **A**

Difficulty: High

Category: Evaluating Hypotheses

Getting to the Answer: According to Scientist 1, the elevated blood glucose levels in individuals with normal insulin levels did not return to normal when they received small injections of supplemental insulin. It can thus be inferred that although insulin levels were normal, the body had a lowered response to insulin, indicating insulin resistance. Look for a choice that supports the idea that a high-sugar diet is caused by or otherwise related to lowered response to insulin. Choice (A) does just that. Choices B and D are incorrect because they mention fat intake and free radical production, respectively, which were only discussed by Scientist 2. Choice C is incorrect because Scientist 1 discussed the effects of a high-sugar diet, not a low-sugar one.

26. **F**

Difficulty: High

Category: Evaluating Hypotheses

Getting to the Answer: Scientist 3 believes that “type 2 diabetes is not caused by lifestyle or diet but inherited.” To challenge Scientist 2’s claim that the lack of exercise causes 7% of type 2 diabetes cases, Scientist 3 would have to explain how the actual cause of the occurrence of type 2 diabetes in these individuals is due to inheritance, rather than lifestyle. Choice (F) does precisely that: if the individuals who didn’t exercise also had family histories of diabetes, then Scientist 3 could claim that the patients actually developed diabetes because of their genetics, not their lifestyles. Even though Scientist 3 actually states the information in G, it does not directly address Scientist 2’s claim from the question stem. Choice H is incorrect because insulin injections are only discussed by Scientist 1. Choice J is incorrect because Scientist 2 does not suggest that type 2 diabetes solely results from lack of exercise, but also blames diets high in fat.

Passage V

27. A

Difficulty: Low

Category: Detail & Interpretation

Getting to the Answer: To answer this question, turn to the results of the studies in Table 1. According to the table, the lowest-density blood sample is 1.050 g/mL, that of Patient C. Looking at each column, you can see that Patient C has more platelets than Patient A but fewer than Patient B, fewer white blood cells than Patient A, the fewest red blood cells, but the most plasma. Choice (A), then, is correct.

28. **H**

Difficulty: Medium

Category: Experimental Design & Methodology

Getting to the Answer: According to the passage, the purpose of the studies was “to determine the composition and mass of blood - samples.” Thus, the phlebotomist has an interest in avoiding anything that could alter the composition or mass of the blood on a temporary basis because it would skew the results of the studies. The passage also states that diet can affect the composition of blood, so it would make sense that the phlebotomist would try to control this factor by requiring the patients to fast. Choice (H) is thus correct. Choice F is incorrect because you’re given no reason to suspect that taking blood is easier if a patient has fasted. Choice G is incorrect because if fasting could greatly change the composition of blood, then the phlebotomist would likely have made sure the patients avoided it by eating something beforehand. Choice J is incorrect because you’re given no indication in the passage that anything the patient does can affect the ability of blood to separate in a centrifuge.

29. **D**

Difficulty: High

Category: Applying Core Knowledge

Getting to the Answer: According to Table 1, Patient C had a density of 1.050 g/mL, which amounts to a 10.50 g mass for a 10 mL sample.

However, if you add up the masses of the components listed in Table 1, you get a total of less than 10.50 g (9.71 g, to be specific). The question is asking you to explain this discrepancy. To find the best explanation, consider each of the possibilities offered in the answer choices. Choice A does not offer an adequate explanation, because if some red blood cells remained in the plasma, then they would have been weighed along with the plasma, which means their mass would have been included. Choice B also falls short; the mass of the platelets would have been included when the white blood cells were weighed. Choice C suffers from a similar problem: if some of the formed elements remained in the plasma, their masses would simply be included when the plasma was weighed. By process of elimination, (D) must be correct. And this makes sense because the only components that were weighed were plasma, red blood cells, white blood cells, and platelets. If there were additional components, their masses would not be included in Table 1. This is also consistent with the opening of the passage, which claims that blood is 45% formed elements and 50% plasma, leaving 5% of the blood unaccounted for.

30. **F**

Difficulty: Low

Category: Detail & Interpretation

Getting to the Answer: Go back to Table 1 and look at the columns for total density and red blood cell mass. (Circle each column if you tend to get distracted by the other information.) Reading the table from the

bottom up, you can see that, as total density increases, the mass of the red blood cells also increases, (F).

31. **B**

Difficulty: Medium

Category: Inference & Calculation

Getting to the Answer: The introduction to the passage states that “formed elements weigh approximately 1.10 grams per milliliter (g/mL) and plasma approximately 1.02 g/mL.” Here, you have about 5 mL of plasma, so the total mass of plasma is roughly $5 \text{ mL} \times 1.02 \text{ g/mL} = 5.1 \text{ g}$. You also have about 5 mL of formed elements, so the total mass of formed elements is about $5 \text{ mL} \times 1.10 \text{ g/mL} = 5.5 \text{ g}$. The total mass of the sample would then be around $5.1 \text{ g} + 5.5 \text{ g} = 10.6 \text{ g}$. It may be a bit higher due to elements other than the plasma and formed elements, but the total mass is still likely to be between 10.0 and 12.0 g, as in (B).

32. **J**

Difficulty: Low

Category: Experimental Design & Methodology

Getting to the Answer: The passage explains that the phlebotomist placed the blood samples in a centrifuge for 20 minutes in Study 2 and at a slower speed for 45 minutes in Study 3. Only (J) captures any element of this difference. Choice F is incorrect because you’re told at

the beginning of the passage that 10 mL of blood were taken from each patient. Choice G is incorrect because, while the mass of the blood samples did vary from patient to patient, the masses weren't intentionally varied by the phlebotomist from Study 2 to Study 3. Choice H is incorrect because a centrifuge was used in both Studies 2 and 3.

33. **A**

Difficulty: Low

Category: Detail & Interpretation

Getting to the Answer: To answer this question, simply compare the masses in the red blood cell column of Table 1. According to the table, Patient A has a red blood cell mass of 2.75 g, Patient B a mass of 2.70 g, and Patient C a mass of 2.65 g. Because Patient A has the greatest mass of red blood cells, (A) is correct.

Passage VI

34. **G**

Difficulty: Medium

Category: Detail & Interpretation

Getting to the Answer: Since the question asks about length and temperature, the simplest data set to consider is Table 1, because Table 2 includes another variable, type of material. Comparing the odd

numbered trials (all conducted at 80°C) or the even numbered trials (all conducted at 20°C) shows that the shorter the rod, the higher the current, which is an inverse relationship. Choices F and J can be eliminated. Comparing any trials which hold length of the rod constant while changing the temperature, such as Trials 1 and 2, show that as temperature goes down, current through the rod goes up, which is another inverse relationship. Because both length and temperature are inversely related to current, (G) is correct.

35. **C**

Difficulty: Medium

Category: Inference & Calculation

Getting to the Answer: The passage states that voltage, current, and resistance are related through Ohm's law, $V = A \times \Omega$, where Ω stands for resistance in ohms and A stands for current in amperes. In the circuit used for these experiments, the voltage is held constant at 5 V, as indicated by the battery in Figure 1. This means that if current goes up, resistance must have gone down. Conversely, the lowest current will result from the highest resistance. Because each of the rods featured in the answer choices were tested in Experiment 2, to find the rod with the highest resistance, you merely need to find the one with the lowest recorded current in Table 2. The rod in Trial 9 conducted a current of only 20 mA, less than any of the others, so it must have the highest resistance. Choice (C) is thus correct.

36. **H**

Difficulty: High

Category: Inference & Calculation

Getting to the Answer: According to the question stem, conductivity uses the units of siemens per meter ($\sigma = \text{S/m}$) and siemens are equal to inverse ohms ($\text{S} = 1/\Omega$). Putting these two equations together, you can see that the units of conductivity are equivalent to inverse ohms divided by meters ($\sigma = [1/\Omega]/\text{m}$), which simplifies to $\sigma = 1/(\Omega \times \text{m})$. Choice (H) is thus correct.

37. **B**

Difficulty: Low

Category: Inference & Calculation

Getting to the Answer: According to Table 1, the rod in Trial 4 conducted 53 mA of electricity at 20°C. A rod of the same length was used in Trial 3, but it was heated to 80°C and conducted only 27 mA. Because 50°C is in between these two values, it is reasonable to assume that the current conducted will fall somewhere between 27 and 53 mA. Choice (B) is therefore correct.

38. **F**

Difficulty: Medium

Category: Inference & Calculation

Getting to the Answer: The introduction to the passage mentions Ohm's law, $V = I \times R$, which shows that voltage and current are directly related. Because the resistance values wouldn't change (the same rods would be used), the increase in voltage with the 10 V battery would lead to higher recorded values for current, regardless of the material of the rods. Thus, since both the copper and iron rods would conduct larger currents with a 10 V battery, (F) is correct.

39. **C**

Difficulty: Medium

Category: Inference & Calculation

Getting to the Answer: According to the results of Experiment 2, copper conducts electricity more effectively than iron. Thus, a 16 cm composite rod that was half-copper and half-iron would be expected to conduct electricity better than a 16 cm iron rod but worse than a 16 cm copper rod. According to Table 2, a 16 cm iron rod at 20°C conducts 40 mA, while a 16 cm copper rod at that temperature conducts 200 mA. Thus, the composite rod should conduct a current of somewhere between 40 and 200 mA, as in (C).

40. **J**

Difficulty: Low

Category: Experimental Design & Methodology

Getting to the Answer: The variables that are directly manipulated in an experiment are the independent variables, so this question is asking for the one variable that is not an independent variable. In both experiments, the dependent variable—in other words, the variable that was observed and measured—was the current recorded by the ammeter. Thus, current was not directly manipulated by the student, so (J) is correct.

WRITING TEST

Model Essay

Below is an example of what a high-scoring essay might look like. Notice the author states her position clearly in the introductory paragraph and supports that position with evidence in the following paragraphs. This essay also uses transitions, some advanced vocabulary, and an effective “hook” to draw in the reader.

I fully agree that pure scientific research is vital to increase our understanding of ourselves and our world, and that this research, even without specific goals, can result in important benefits to society. To fund this research, a consortium of government, pharmaceutical companies, and non-profit agencies should be formed, pooling money but giving no one group entire oversight or responsibility.

Many life-changing discoveries have been found without purposely looking for them. Alexander Fleming did not set out to discover penicillin,

but in doing so accidentally saved millions of people from death. Putting a man on the moon did not help people on Earth, but it certainly taught us a lot about our universe. This kind of pure research must continue, and the cost should be shared by the government, drug companies, and non-profit groups. This type of research can be prohibitively expensive; thus, monies must be drawn from various sources, each contributing as much as possible. No single organization can completely fund ongoing research, especially if there is no stated goal other than to hopefully discover something beneficial. Tax payers, pharmaceutical company investors, and non-profit group members expect results, which may be long in coming, or, indeed, continually elusive. However, efforts must continue. As Thomas Edison said, "Just because something doesn't do what you planned it to do doesn't mean it's useless."

Consider also that pharmaceutical companies are always searching for new therapeutic drugs. They send scientists out into the field to come back with anything interesting, which is then researched and, if promising, developed into a new drug. Such is the relation between blood sugar and diabetes, leading to the insulin that my diabetic cousin takes; without insulin, he would not survive. If a drug company develops an important drug, it can make millions of dollars from the sale of it, leading to funding more research. Non-profit organizations also have a stake in pure research, since another accidental discovery could prove to be financially beneficial. Finally, if the government shares the burden of underwriting research, it is not at risk for being fully blamed if the research does not produce positive results. Taxpayers would be more liable to accept a minimal loss in a good cause rather than a major loss in an unsure

endeavor. A partnership would ensure continued funding and the funders, as well as all citizens, would benefit from discoveries.

On the other hand, people who say the government should fund only research which has demonstrated its worth do not understand the function of pure research. It is not possible for researchers to say with certainty that they are going to find a cure for cancer. Researchers have to be able to say they are searching for something as yet unknown with the hope that it will be beneficial. And what is a clear and acceptable outcome? If cancer researchers find a cure for diabetes, but not cancer, is that acceptable if it is not the stated intention? A great deal of science is luck and perseverance. According to this perspective, if a researcher wanted government funding to work in the Amazonian rain forest with the general intent of exploring indigenous plants, the government would be unable to fund the project because there is no clearly beneficial objective. But that is exactly how quinine, a now widely-used treatment for malaria, was found, and the general exploration was certainly worth funding. Finally, it is unlikely that pure research, no matter who funds it, will result in disaster. Researchers are very careful to prevent this, and even if a disaster did happen, it would not be the fault of whom is funding the research.

It is quite clear that pure research is invaluable, as the examples of penicillin, quinine, and insulin support. It cannot be dependent on the whims, finances, and oversight of any one group but must be a concerted effort among all and for all who may benefit.

You can evaluate your essay and the model essay based on the following criteria:

- Is the author's own perspective clearly stated?
- Does the body of the essay assess and analyze each perspective?
- Is the relevance of each paragraph clear?
- Does the author start a new paragraph for each new idea?
- Is each sentence in a paragraph relevant to the point made in that paragraph?
- Are transitions clear?
- Is the essay easy to read? Is it engaging?
- Are sentences varied?
- Is vocabulary used effectively?
- Is college-level vocabulary used?