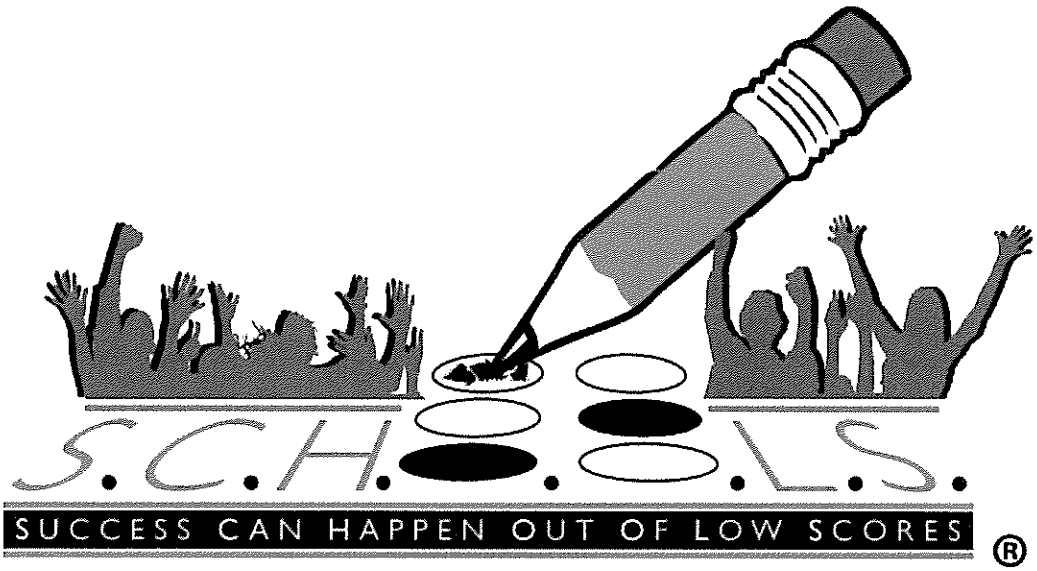

2017 – 2018

ACT PRACTICE TEST 6

ENGLISH TEST

45 Minutes—75 Questions

Directions: In the following five passages, certain words and phrases are underlined and numbered. In the right-hand column are alternatives for each underlined portion. Select the one that best conveys the idea, creates the most grammatically correct sentence, or is the most consistent with the style and tone of the passage. If you decide that the original version is best, select NO CHANGE. You may also find questions that ask about the entire passage or a section of the passage. These questions will correspond to small, numbered boxes in the test. For these questions, decide which choice best accomplishes the purpose set out in the question stem. After you've selected the best choice, fill in the corresponding oval on your Answer Grid. For some questions, you'll need to read the context in order to answer correctly. Be sure to read until you have enough information to determine the correct answer choice.

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 (1) general mistrust of any innovation or technology that he can't immediately grasp, and he always tells us, that (2) if something isn't broken, then you shouldn't fix it.

He has run (3) 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 (4). He is the most disorganized person I know and still uses a pencil and paper to

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

GO ON TO THE NEXT PAGE

keep track of his inventory. His small office is about to
5
burst with all the various documents, notes, and receipts

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.

he has accumulated over the years, his filing cabinets
6
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,
7
is that the "upgrade" people are speaking of is not to an
7
electric typewriter but to a computer.

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,

[1] Hoping to bring Father out of the dark ages, my
8
sister, and I bought him a brand new computer for his
8
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]

8. F. NO CHANGE
   G. me and my sister
   H. my sister and I
   J. my sister and I,

GO ON TO THE NEXT PAGE

Eagerly, we told him about all the new spreadsheet
9
programs that would help simplify his recordkeeping

and organize his accounts; and emphasized the advan-
10
tage of 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
13
disappear under the mounting files and papers in the

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

GO ON TO THE NEXT PAGE

back office. In the depths of that disorganized office, the
14
computer will join the cell phone my mom gave him
14
a few years ago. Interestingly enough, every once in a
14
while, that completely forgotten cell phone will ring

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.

from under the heavy clutter of the past. [15]

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.

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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 <u>from the farthest</u> reaches of the globe.
16
Second only to soccer, baseball has evolved into a global sport and <u>a symbol among races for equality</u>.
17
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 <u>to participate</u> in
18
the major leagues. 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, <u>which was the precursor to today's National League.</u>
19
On December 11, 1868, the governing
19
body of this association had unanimously adopted a rule

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.

GO ON TO THE NEXT PAGE

that effectively barred any team that had, any "colored persons" on its roster. However, when baseball started to

organize into leagues by 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

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

GO ON TO THE NEXT PAGE

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 [27] he debuted for the Brooklyn Dodgers in 1947. For Robinson's landmark achievements on and off the diamond, he will forever be recognized as [28] a hero of the civil rights movement and a sports icon. His response to [29] 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.

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

GO ON TO THE NEXT PAGE

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.

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Passage III

The Bear Mountain Bridge

When the gleaming Bear Mountain Bridge officially opened to traffic on Thanksgiving Day in 1924, it[31] was known as the Harriman Bridge, after Edward H. Harriman, wealthy philanthropist and patriarch of the family most influential in the bridge's construction. Before they were[32] 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 had authorized[33] 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 build, construct, and maintain[34] the structure, at which time the span would be handed over to New York State.[34]

The BMHBC invested almost $4,500,000 into the suspension bridge and hired the world-renowned design team of Howard Baird and George Hodge[35] as

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

GO ON TO THE NEXT PAGE

architects. [36] Baird and Hodge enlisted the help of John A. Roebling and Sons, who 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, the 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

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 lose primarily:
    - 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

GO ON TO THE NEXT PAGE

cables would be 7,377 miles <u>longer</u>. The bridge links
40
Bear Mountain on the western bank of the Hudson

40. F. NO CHANGE
G. long
H. in total length
J. lengthy

to Anthony's Nose on the eastern <u>side, it lies</u> so precisely
41
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.

41. A. NO CHANGE
B. side, lies
C. side, lying
D. side; and it lies

In an attempt to recoup some of its investment after the bridge <u>opened, the BMHBC charged</u> an exorbitant
42
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. <u>Moreover</u>, the Bear Mountain Bridge sees
43

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

<u>more than</u> six million vehicles cross its concrete decks
44
each year.

44. F. NO CHANGE
G. over
H. even more than
J. a higher amount than

GO ON TO THE NEXT PAGE

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.

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Passage IV

The Dream of the American West

As the sun was slowly rising (46) 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. (47)

I smiled with (48) 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 (49) the country.

As the morning sun climbed into the sky, (50)

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,

GO ON TO THE NEXT PAGE

I shuddered with excitement <u>to think that my final stop</u> 51
<u>would be in California, where the sun itself ends its</u> 51
<u>journey across America.</u> Like the sun, however, I still 51
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 <u>Eiffel</u> 52
<u>Tower, marveled in the desert heat at the Pyramids</u> 52
<u>of Giza,</u> I'd never seen any of the wonders of my own 52
country, except those found in my hometown of New York City. All of that was about to change.

<u>As I left the city, the tall buildings began to give way</u> 53
<u>to smaller ones, then to transform into the quaint rows of</u> 53
<u>houses that clustered in the crowded suburbs.</u> Trees and 53
grass, then the yellow-green of cornfields and the golden

wash of wheat were slowly <u>replacing the familiar mazes</u> 54
<u>of cement and steel.</u> My world no longer stretched 54

51. The writer is considering revising this sentence by deleting the underlined portion. If she did so, the paragraph would primarily lose:

A. information about the reasons for the writer's trip.
B. information about the writer's destination.
C. a description of the writer's planned route.
D. a comparison between the sunrise in New York and the sunset in California.

52. F. NO CHANGE
G. Eiffel Tower and had marveled in the desert heat at the Pyramids of Giza,
H. Eiffel Tower and marveled in the desert heat at the Pyramids of Giza
J. Eiffel Tower, and had marveled, in the desert heat, at the Pyramids of Giza

53. Given that all are true, which of the following provides the most effective transition between the third paragraph and the description of the Midwest in the fourth paragraph?

A. NO CHANGE
B. In fact, there were changes on the horizon almost immediately.
C. My excitement hadn't diminished.
D. I realized that people who lived in other areas might feel the same way about visiting New York.

54. Assuming that all are true, which of the following provides information most relevant to the main focus of the paragraph?

F. NO CHANGE
G. appearing before me
H. racing past my window
J. becoming monotonous

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vertically toward the sky, it now spread horizontally
55
toward 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
56
everything.

55. A. NO CHANGE
B. the sky but it now spread
C. the sky; it now spread
D. the sky spreading

56. F. NO CHANGE
G. simple
H. simplest
J. simpler

Then, as the night's shadows gave way to light, there
57

57. A. NO CHANGE
B. nights shadows
C. shadows from the night
D. night shadow

seemed to be a great force rising to meet the sun as it
58
made its reappearance.
58

58. F. NO CHANGE
G. sun as it reappeared
H. reappearing sun
J. sun as it was also rising

Still, I had no idea what I was looking at. Then, there
59

59. A. NO CHANGE
B. Even so,
C. At first,
D. Eventually,

was no mistaking it. The unbroken lines of Mid-America
60
had given way to the jagged and majestic heights of the Rockies and the gateway to the American West.

60. F. NO CHANGE
G. mistake to be made
H. chance to mistake it
J. having made a mistake

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Passage V

Traveling at the Speed of Sound

The term "supersonic" refers to anything that travels faster than the speed of sound. When the last of the supersonic Concorde passenger planes made its final trip across the Atlantic in November of 2003, an interesting chapter in history was finally closed. The fleet of supersonic Concorde SSTs, or

"Supersonic Transports," they were jointly operated by Air France and British Airways, had been making the intercontinental trip across the Atlantic for almost thirty years. These amazing machines cruised at Mach 2, more than twice the speed of sound. They flew to a height almost twice that of standard passenger airplanes. The Concorde routinely made the trip from New York to London in less than three hours and was much more expensive than normal transatlantic flights. Furthermore, the majority of the passengers who traveled on the Concorde were celebrities or the extremely wealthy, it also attracted ordinary people who simply wanted to know how it felt to travel faster than the speed of sound. Some would save money for years just to gain that knowledge.

What is the speed of sound? Many people are surprised to learn that there is no fixed answer to this question. The speed that sound travels through a given medium depends on a number of factors. To understand

61. A. NO CHANGE
    B. November, of 2003 an interesting
    C. November of 2003 an interesting
    D. November of 2003; an interesting

62. F. NO CHANGE
    G. those were
    H. which were
    J. which being

63. A. NO CHANGE
    B. at an altitude
    C. toward an altitude
    D. very high

64. F. NO CHANGE
    G. Despite
    H. Though
    J. Along with

65. A. NO CHANGE
    B. to which
    C. at which
    D. where

GO ON TO THE NEXT PAGE

the speed of sound, we must first understand what a "sound" really is. [66]

The standard dictionary definition of sound is "a vibration or disturbance transmitted, like waves through water, through a material medium such as a gas." Our ears are able to pick up those sound waves and convert (67) them into what we hear. This means that the speed at which sound travels through gas directly depends on (68) what gas it is traveling through, and the temperature and pressure of the gas. (68) When discussing aircraft breaking the speed of sound, that gas medium, of course, is air. As air temperature and pressure decrease with altitude, (69) so does the speed of sound. An airplane flying at the speed of sound at sea level is traveling

66. The purpose of this paragraph, as it relates to the surrounding paragraphs, is primarily to:
   - F. provide an example of the main idea before continuing discussion of that idea.
   - G. transition from a discussion of certain aircraft to the science behind them.
   - H. present a counterargument to the main thesis before refuting that counterargument.
   - J. transition from the general topic of aircraft to a story about specific airplanes.

67. Which of the following alternatives to the underlined portion would be the LEAST acceptable?
   - A. change
   - B. translate
   - C. alter
   - D. transform

68. F. NO CHANGE
   - G. depends directly on the type, temperature, and pressure of the gas it is traveling through
   - H. directly depends on what gas it is and also on the temperature and pressure of that gas
   - J. depends directly on the type, temperature, and pressure of the gas

69. A. NO CHANGE
   - B. with height
   - C. with a drop in altitude
   - D. at higher altitudes

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roughly at 761 mph; however (70) when that same plane climbs to 20,000 feet, the speed of sound is only about 707 mph. This is why the Concorde's cruising altitude was so much higher than that of a regular passenger aircraft; planes can reach supersonic speeds more easily (71) at higher altitudes. (71)

70. F. NO CHANGE
G. however,
H. and so,
J. even so

71. Given that all are true, which of the following provides the most logical conclusion for this sentence?
A. NO CHANGE
B. they're much faster
C. they use much more fuel than regular aircraft
D. they're rarely visible because they fly above the cloud cover

In the years since the Concorde has been (72) decommissioned, only fighter pilots and astronauts have been able to experience the sensation of

72. F. NO CHANGE
G. came to be
H. was
J. had been

breaking "the sound barrier." But that is all about (73) to change very soon. (73) Newer and faster supersonic passenger planes are being developed that will be technologically superior to the Concorde

73. A. NO CHANGE
B. Soon, however, that is about to change.
C. Soon, however, that will change.
D. That is about to change soon.

and much cheaper to operate. Now, (74) supersonic passenger travel will be available not only to the rich

74. F. NO CHANGE
G. Nearby,
H. Soon,
J. Upcoming,

and famous, but also be for (75) the masses so they, too, can experience life at supersonic speeds.

75. A. NO CHANGE
B. but also be available to
C. but also to
D. but for

IF YOU FINISH BEFORE TIME IS CALLED, YOU MAY CHECK YOUR WORK ON THIS SECTION ONLY. DO NOT TURN TO ANY OTHER SECTION IN THE TEST. STOP

MATHEMATICS TEST

60 Minutes—60 Questions

Directions: Solve each problem, choose the correct answer, and then fill in the corresponding oval on your answer document.

Do not linger over problems that take too much time. Solve as many as you can, then return to the others in the time you have left for this test.

You are permitted to use a calculator on this test. You may use your calculator for any problems you choose, but some of the problems may best be done without using a calculator.

Note: Unless otherwise stated, all of the following should be assumed.

1. Illustrative figures are *not* necessarily drawn to scale.
2. All geometric figures lie in a plane.
3. The term *line* indicates a straight line.
4. The term *average* indicates arithmetic mean.

1. The eighth grade girls' basketball team played a total of 13 games this season. If they scored a total of 364 points, what was the mean (average) score per game?

A. 13
B. 16
C. 20
D. 28
E. 32

2. When $4\frac{3}{7}$ is written as an improper fraction in simplest form, what is the numerator of the fraction?

F. 12
G. 21
H. 27
J. 28
K. 31

3. If $4x + 18 = 38$, then $x = ?$

A. 3
B. 4.5
C. 5
D. 14
E. 20

4. John weighs 1.5 times as much as Ellen. If John weighs 144 pounds, how many pounds does Ellen weigh?

F. 84
G. 96
H. 104
J. 164
K. 216

GO ON TO THE NEXT PAGE

5. What positive number when divided by its reciprocal gives a result of $\frac{9}{16}$?

   A. $\frac{3}{16}$

   B. $\frac{3}{4}$

   C. $\frac{4}{3}$

   D. $\frac{16}{9}$

   E. $\frac{16}{3}$

6. If $\sqrt[3]{x} = \frac{1}{4}$, then $x = ?$

   F. $\frac{1}{256}$

   G. $\frac{1}{64}$

   H. $\frac{1}{12}$

   J. $\frac{1}{\sqrt[3]{4}}$

   K. 64

7. If $x^2 + 14 = 63$, then x could be which of the following?

   A. 4.5

   B. 7

   C. 14

   D. 24.5

   E. 49

8. Two vectors are given by $\mathbf{v}_1 = \langle 7, -3 \rangle$ and $\mathbf{v}_2 = \langle a, b \rangle$. If $\mathbf{v}_1 + \mathbf{v}_2 = \langle 5, 5 \rangle$, then what is the value of a ?

   F. -2

   G. 2

   H. 5

   J. 8

   K. 12

9. Based on past graduations, a university estimates that 6% of the graduating class will not attend the graduation ceremony. Based on this estimate, if there are 1,250 graduates, how many will not attend the ceremony?

   A. 75

   B. 140

   C. 220

   D. 350

   E. 425

10. $5.2^3 + 6.8^2 = ?$

    F. 46.24

    G. 94.872

    H. 120.534

    J. 140.608

    K. 186.848

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11. Lexi uses her debit card to make a purchase totaling $40. When she records the debit in her checkbook register, she accidentally adds $40 to her balance rather than subtracting it, which results in an inaccurate total. Because of her error, Lexi's checkbook register shows:

A. $80 less than it should.
B. $40 less than it should.
C. $20 more than it should.
D. $40 more than it should.
E. $80 more than it should.

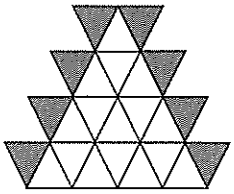
12. $3^3 \div 9 + (6^2 - 12) \div 4 = ?$

F. 3
G. 6.75
H. 9
J. 12
K. 15

13. If bananas cost $0.24 and oranges cost $0.38, what is the total cost of x bananas and y oranges?

A. $(x + y)(\$0.24 + \$0.38)$
B. $\$0.24x + \$0.38y$
C. $\$0.62(x + y)$
D. $\frac{\$0.24}{x} + \frac{\$0.38}{y}$
E. $\$0.38x + \$0.24y$

14. In the following figure, all of the small triangles are the same size. What percent of the entire figure is shaded?



F. 8
G. 24
H. $33\frac{1}{3}$
J. 50
K. $66\frac{2}{3}$

15. In a high school senior class, the ratio of girls to boys is 5:3. If there are a total of 168 students in the senior class, how many girls are there?

A. 63
B. 100
C. 105
D. 147
E. 152

16. On her first three geometry tests, Sarah scored an 89, a 93, and an 84. If there are four tests total and Sarah needs at least a 90 average for the four, what is the lowest score she can receive on the final test?

F. 86
G. 90
H. 92
J. 94
K. 96

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17. What is the solution set of $3x - 11 \geq 22$?

A. $x \geq -11$

B. $x < -3$

C. $x \geq 0$

D. $x > 3$

E. $x \geq 11$

18. Dillon is going to randomly pick a domino from a pile of dominos that are all facing downward. Of the dominos in the pile, 48 have an even number of dots on them. He randomly picks a single domino. If the probability that he picks a domino with an even number of dots is $\frac{3}{4}$, how many dominos are in the pile?

F. 36

G. 48

H. 56

J. 64

K. 72

19. What is the value of $3x - 8y$ when $x = 4$ and $y = -\frac{1}{2}$?

A. -4

B. 8

C. 12

D. 16

E. 28

20. Court reporters type every word spoken during trials and hearings so that there is a written record of what transpired. Suppose a certain court reporter can type 3.75 words per second, and a trial transcript contains 25 pages with an average of 675 words per page. If this court reporter typed the transcript at his typical rate, how long was he actively typing?

F. 1 hour, 15 minutes

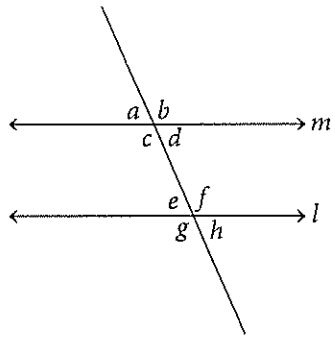
G. 1 hour, 40 minutes

H. 2 hours, 10 minutes

J. 2 hours, 30 minutes

K. 3 hours

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°

E. 292°

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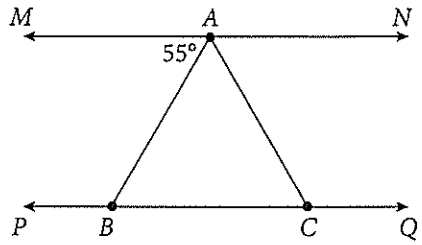
22. On a map, the scale is the ratio of the distance shown on the map to the actual distance. A geography teacher has a map on her wall with a scale of 1 inch:100 miles. She uses the school's copier to shrink the large wall map down to the size of a piece of paper to hand out to each of her students. To do this, she makes the map $\frac{1}{4}$ of its original size. Suppose on the students' maps, the distance between two cities is 2.5 inches. How many actual miles apart are those cities?

F. 25
G. 250
H. 800
J. 1,000
K. 1,200

23. A piece of letter-sized paper is $8\frac{1}{2}$ inches wide and 11 inches long. Suppose you want to cut strips of paper that are $\frac{5}{8}$ of an inch wide and 11 inches long. What is the maximum number of strips of paper you could make from 1 piece of letter-sized paper?

A. 5
B. 6
C. 12
D. 13
E. 14

24. In the following figure, $\overline{MN}$ and $\overline{PQ}$ are parallel. Point A lies on $\overline{MN}$, and points B and C lie on $\overline{PQ}$. If $AB = AC$ and $\angle MAB$ has a measure of 55°, what is the measure of $\angle ACB$?



F. 35°
G. 55°
H. 65°
J. 80°
K. 125°

25. What is the slope of the line that passes through the points $(-10,0)$ and $(0,-6)$?

A. $-\frac{5}{3}$
B. $-\frac{3}{5}$
C. $\frac{3}{5}$
D. $\frac{5}{3}$
E. 0

26. For all x, $(x+4)(x-4)+(2x+2)(x-2) = ?$

F. $x^2 - 2x - 20$
G. $3x^2 - 12$
H. $3x^2 - 2x - 20$
J. $3x^2 + 2x - 20$
K. $3x^2 + 2x + 20$

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27. What is the length of a line segment with endpoints (3,−6) and (−2,6) ?

A. 1
B. 5
C. 10
D. 13
E. 15

28. If 60 percent of h is 80, what is 30 percent of h ?

F. 30
G. 40
H. 50
J. 60
K. 70

29. Set A contains 7 consecutive even integers. If the average of Set A's integers is 46, which of the following is the smallest integer of Set A ?

A. 36
B. 38
C. 40
D. 42
E. 44

30. Which of the following statements describes the total of the first n terms of the arithmetic sequence below?

1, 3, 5, 7, 9, ...

F. The total is always equal to 25 regardless of n.
G. The total is always equal to $2n$.
H. The total is always equal to $3n$.
J. The total is always equal to n^2.
K. There is no consistent pattern for the total.

31. Which of the following matrices is equal to the matrix product $\begin{bmatrix} -2 & 0 \\ 1 & -3 \end{bmatrix} \cdot \begin{bmatrix} 2 \\ 2 \end{bmatrix}$?

A. $\begin{bmatrix} -4 & 0 \\ 2 & -6 \end{bmatrix}$
B. $\begin{bmatrix} -4 & 2 \\ 2 & -6 \end{bmatrix}$
C. $\begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$
D. $\begin{bmatrix} -4 \\ -4 \end{bmatrix}$
E. $\begin{bmatrix} -4 \\ -6 \end{bmatrix}$

32. A playground is $(x + 7)$ units long and $(x + 3)$ units wide. If a square of side length x is sectioned off from the playground to make a sandpit, which of the following could be the remaining area of the playground?

F. $x^2 + 10x + 21$
G. $10x + 21$
H. $2x + 10$
J. $21x$
K. 21

33. Assume m and n are nonzero integers such that $m > 0$ and $n < 0$. Which of the following *must* be negative?

A. $-n^m$
B. $-mn$
C. m^n
D. $-n - m$
E. $n - m$

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34. The point $(-3,-2)$ is the midpoint of the line segment in the standard (x,y) coordinate plane with endpoints $(1,9)$ and (m,n). Which of the following is (m,n) ?

F. $(-7,-13)$

G. $(-2,7)$

H. $(-1,3.5)$

J. $(2,5.5)$

K. $(5,20)$

35. If $f(x) = 16x^2 - 20x$, what is the value of $f(3)$?

A. -12

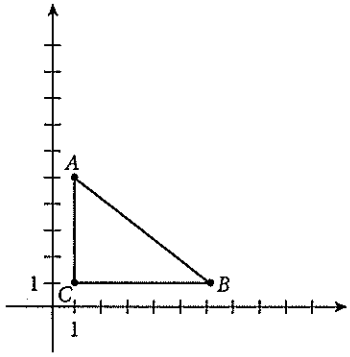
B. 36

C. 84

D. 144

E. 372

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

K. 7

37. If $f(x) = \frac{1}{3}x + 13$ and $g(x) = 3x^2 + 6x + 12$, which expression represents $f(g(x))$?

A. $x^2 + 12x + 4$

B. $\frac{x^2}{3} + 2x + 194$

C. $x^2 + 2x + 17$

D. $x^2 + 2x + 25$

E. $x^2 + 2x + 54$

38. What is the equation of a line that is perpendicular to the line $y = \frac{2}{3}x + 5$ and contains the point $(4,-3)$?

F. $y = \frac{2}{3}x + 4$

G. $y = -\frac{2}{3}x + 3$

H. $y = -\frac{3}{2}x + 3$

J. $y = -\frac{3}{2}x - 9$

K. $y = -\frac{3}{2}x + 9$

39. The formula for converting a Fahrenheit temperature reading to Celsius is $C = \frac{5}{9}(F - 32)$, where C is the reading in degrees Celsius and F is the reading in degrees Fahrenheit. Which of the following is the Fahrenheit equivalent to a reading of 95° Celsius?

A. 35°F

B. 53°F

C. 63°F

D. 203°F

E. 207°F

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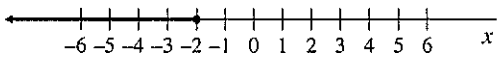
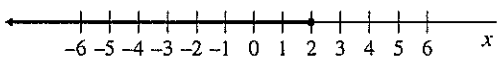
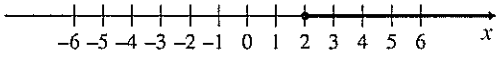
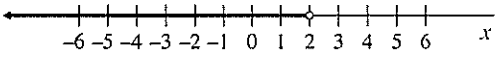
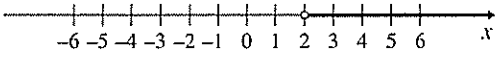
40. When 3 times x is increased by 5, the result is less than 11. Which of the following is a graph of the real numbers x for which the previous statement is true?

F.


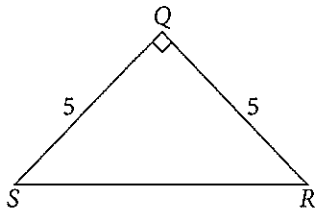
G.


H.


J.


K.


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



A. $\frac{\sqrt{2}}{6}$

B. $\frac{\sqrt{2}}{5}$

C. $\frac{\sqrt{2}}{2}$

D. $2\sqrt{2}$

E. $5\sqrt{2}$

42. Marvin has two saltwater fish tanks in his home. One has tangs and angelfish in a ratio of 5 to 2. The second tank has tangs and puffers in a ratio of 2 to 3. Marvin wants to put a tank in his office with angelfish and puffers using the same ratio he has at home to make it easier to buy food for them in bulk. What ratio of angelfish to puffers should he use?

F. 2:3

G. 2:5

H. 5:2

J. 5:7

K. 4:15

43. The volume of a sphere is given by the formula $V = \frac{4}{3}\pi r^3$, where r is the radius of the sphere. What is the volume, in cubic inches, of a sphere that has a diameter of 6 inches?

A. 3π

B. 9π

C. 27π

D. 36π

E. 288π

44. For all $x \neq -1$, which of the following is equivalent to $\frac{x^2 - 5x - 6}{x + 1} + x + 1$?

F. $x - 5$

G. $2x - 5$

H. $x^2 - 5x - 6$

J. $\frac{2x - 5}{x + 1}$

K. $\frac{x^2 - 4x - 5}{x + 1}$

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45. Which of the following expressions is the greatest monomial factor of $60a^3b + 45a^2b^2$?

A. $15a^2b$

B. $15a^3b^2$

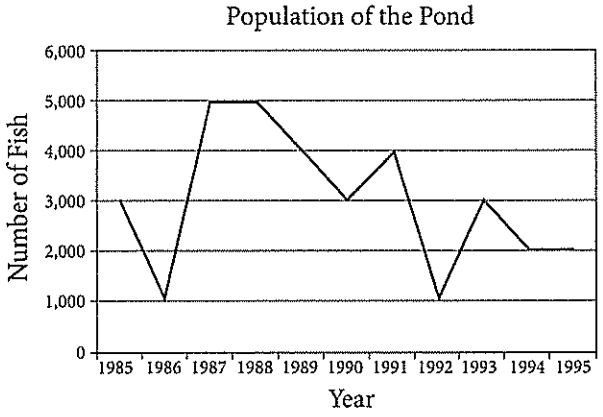
C. $15a^5b^3$

D. $180a^3b^2$

E. $180a^5b^3$

Use the following information to answer questions 46–47.

The population of fish in a certain pond from 1985 to 1995 is shown in the graph below.



46. Which of the following best describes the percent change in the population from 1985 to 1995 ?

F. 33.33% increase

G. 33.33% decrease

H. 50% decrease

J. 333.33% increase

K. 333.33% decrease

47. Which of the following years contains the median population for the data?

A. 1986

B. 1989

C. 1990

D. 1991

E. 1995

48. The table below shows the results of a study identifying the number of males and females with and without college degrees who were unemployed or employed at the time of the study. If one person from the study is chosen at random, what is the probability that that person is an employed person with a college degree?

	Unemployed	Employed	Totals
Female Degree	12	188	200
Female No Degree	44	156	200
Male Degree	23	177	200
Male No Degree	41	159	200
Totals	120	680	800

F. $\frac{73}{160}$

G. $\frac{10}{17}$

H. $\frac{73}{136}$

J. $\frac{17}{20}$

K. $\frac{73}{80}$

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49. Which of the following expressions gives the number of distinct permutations of the letters in GEOMETRY ?

A. $8!(2!)$

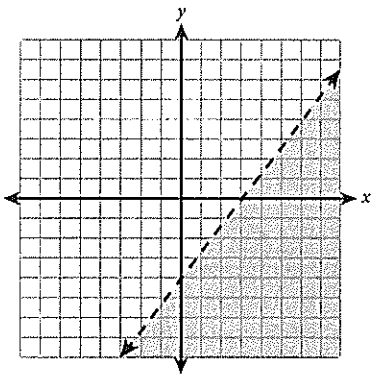
B. $8!$

C. $\frac{8!}{2!}$

D. $\frac{8!}{6!}$

E. $\frac{8!}{(6!)(2!)}$

50. The graph below represents the solution set to which inequality, assuming each grid line represents 1 unit?



F. $y < -\frac{4}{3}x - 4$

G. $y > -\frac{3}{4}x - 4$

H. $y < \frac{3}{4}x - 4$

J. $y < \frac{4}{3}x - 4$

K. $y > \frac{4}{3}x - 4$

51. A function h is defined by $h(x,y,z) = 4xy^2 - yz^3$. What is the value of $h(2,-1,3)$?

A. -35

B. -19

C. -1

D. 19

E. 35

52. The radius of a circle is increased so that the radius of the new circle is triple that of the original circle. How many times larger is the area of the new circle than that of the original circle?

F. $\frac{1}{3}$

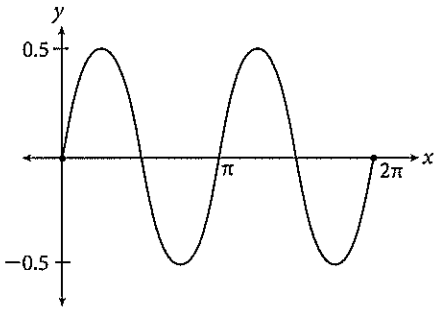
G. 3

H. 6

J. 6π

K. 9

53. The function $f(x) = 0.5 \sin(2x)$ is graphed below over the domain $[0,2\pi]$. What is the period of the function?



A. $\frac{\pi}{4}$

B. $\frac{\pi}{2}$

C. π

D. 2π

E. 4π

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54. For what value of x is the equation $\sqrt[3]{4x - 12} + 25 = 27$ true?

F. -5

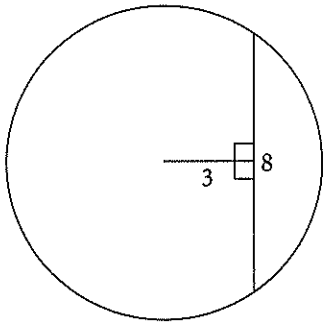
G. -1

H. -2.5

J. 5

K. 6.5

55. 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

E. 28π

56. If $f(x) = 3^{3x + 3}$ and $g(x) = 27^{\left(\frac{2}{3}x - \frac{1}{3}\right)}$, for what value of x, if any, does the graph of $f(x)$ intersect the graph of $g(x)$?

F. -4

G. $-\frac{7}{4}$

H. $-\frac{10}{7}$

J. 2

K. The graphs do not intersect.

57. What value of x satisfies the equation $\log_3 (5x - 40) - \log_3 5 = 2$?

A. 17

B. 9

C. 1

D. -9

E. -17

58. A finite arithmetic sequence has five terms. The first term is 4. What is the difference between the mean and the median of the five terms?

F. 0

G. 1

H. 2

J. 4

K. 5

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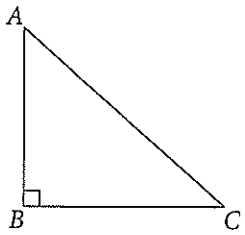
59. In the following triangle, if $\cos \angle BAC = 0.6$ and the hypotenuse of the triangle is 15, what is the length of side BC?



A. 3
B. 5
C. 10
D. 12
E. 15

60. The table below shows several points that lie on the graph of a parabola. Based on the data in the table, what is the value of y when $x = -4$?

x	y
−2	3
0	−3
2	−5
4	−3
6	3
8	13

F. −13
G. −5
H. 5
J. 13
K. Cannot be determined from the given information

IF YOU FINISH BEFORE TIME IS CALLED, YOU MAY CHECK YOUR WORK ON THIS SECTION ONLY. DO NOT TURN TO ANY OTHER SECTION IN THE TEST. STOP

READING TEST

35 Minutes—40 Questions

Directions: There are four passages in this test. Each passage is followed by several questions. After reading a passage, choose the best answer to each question and fill in the corresponding oval on your Answer Grid. You may refer to 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 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 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 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 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 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 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 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 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 as dancing a Spanish shawl dance and singing Neapolitan lovesongs 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 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 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 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

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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 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 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 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 (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 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.

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.

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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. Nonconformity
   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.

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Passage II

SOCIAL SCIENCE: The following passage is excerpted from a magazine article discussing scientific research on traditional methods of predicting the timing and character of the Indian monsoon.

Can traditional rules of thumb provide accurate weather forecasts? Researchers in Junagadh, India, are trying to find out. Most farmers in the region grow one crop of peanuts or castor per year. In a wet year, peanuts give the best returns, but if the rains are poor, the more drought-tolerant castor is a better bet. In April and May, before the monsoon comes, farmers decide what to plant, buy the seed, prepare the soil and hope for the best. An accurate forecast would be extremely helpful.

Little wonder, then, that observant farmers have devised traditional ways to predict the monsoon's timing and character. One such rule of thumb involves the blooming of the *Cassia fistula* tree, which is common on roadsides in southern Gujarat. According to an old saying which has been documented as far back as the 8th century, the monsoon begins 45 days after *C. fistula's* flowering peak. Since 1996, Purshottambhai Kanani, an agronomist at Gujarat Agricultural University, has been collecting data to test this rule. He records the flowering dates of trees all over the university's campus and plots a distribution to work out when the flowering peak occurs. While not perfect, *C. fistula* has so far done an admirable job of predicting whether the monsoon will come early or late.

Similarly, with help from local farmers, Dr. Kanani has been investigating a local belief regarding the direction of the wind on the day of Holi, a Hindu festival in spring. The wind direction at certain times on Holi is supposed to indicate the strength of the monsoon that year. Wind from the north or west suggests a good monsoon, whereas wind from the east indicates drought. Each year before Holi, Dr. Kanani sends out postcards to more than 400 farmers in Junagadh and neighbouring districts. The farmers note the wind direction at the specified times, and then send the postcards back.

In years of average and above-average monsoons (1994, 1997, 1998, and 2001), the wind on Holi tended to come from the north and west. In the drier years of 1995 and 1996 the majority of farmers reported wind from the east (Dr. Kanani did not conduct the study in 1999 and 2000). As with the *C. fistula* results, the predictions are not especially precise, but the trend is right.

Dr. Kanani first became interested in traditional methods in 1990, when an old saying attributed to a tenth-century sage named Bhadli—that a storm on a particular day meant the monsoon would come 72 days later—proved strikingly correct. This prompted Dr. Kanani to collect other rules from old texts in Gujarati and Sanskrit.

Not all of his colleagues approve. Damaru Sahu, a meteorologist at Gujarat Agricultural University and a researcher for India's director-general of meteorology, says that traditional methods are "OK as a hobby." But, he goes on, they cannot be relied upon, and "may not be applicable to this modern age." Yet Dr. Sahu concedes that meteorological science has failed to provide a useful alternative to traditional methods. For the past 13 years, he notes, the director-general for meteorology has predicted "normal monsoon" for the country. Every year, the average rainfall over the whole country is calculated, and this prediction is proved correct. But it is no use at all to farmers who want to know what will happen in their region.

Dr. Kanani hopes that his research will put traditional methods on a proper scientific footing. He and his colleagues have even set up a sort of peer-review forum for traditional meteorology. Each spring, he hosts a conference for 100 local traditional forecasters, each of whom presents a monsoon prediction with supporting evidence—the behaviour of a species of bird, strong flowering in a certain plant, or the prevailing wind direction that season. Dr. Kanani records these predictions and publishes them in the local press.

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He has also started a non-governmental organisation, the Varsha Vigyan Mandal, or Rain Science Association, which has more than 400 members. Its vice-president, Dhansukh Shah, is a scientist at the National Directorate of Meteorology in Pune. By involving such mainstream meteorologists as Dr. Shah in his work, Dr. Kanani hopes to bring his unusual research to the attention of national institutions. They could provide the funding for larger studies that could generate results sufficiently robust to be published in peer-reviewed science journals.

11. According to the passage, all of the following traditional methods of weather prediction have been scientifically tested EXCEPT:

    A. wind direction during the Hindi festival of Holi.
    B. the behavior of certain bird species.
    C. the flowering *Cassia fistula* trees.
    D. a tenth-century prediction connecting storm activity to later monsoons.

12. The author uses the phrase "useful alternative" (line 62) in order to show that:

    F. modern meteorology rarely provides an accurate forecast.
    G. equipment needed for accurate forecasting is too expensive for many in India.
    H. modern meteorology doesn't give as reliable predictions as traditional methods do.
    J. today's science is not yet able to provide specific meteorological forecasts needed by farmers.

13. According to the passage, a good monsoon is associated with winds from the:

    A. north.
    B. south.
    C. east.
    D. southwest.

14. The author's attitude toward traditional methods of weather forecasting may reasonably be described as:

    F. curious as to their development.
    G. cautious hopefulness that they are useful.
    H. skeptical regarding their real scientific value.
    J. regretful of the fad of interest in these methods.

15. According to the passage, which of the discussed methods gives the most advanced prediction of monsoon arrival?

    A. The behavior of the birds
    B. The flowering of the *C. fistula* tree
    C. The wind direction on Holi
    D. Bhadli's prediction based on storms

16. The function of the second paragraph in relation to the passage as a whole is most likely to provide:

    F. a reason that farmers need techniques to predict monsoons earlier.
    G. examples of the inexact nature of predictions made from traditional methods.
    H. an explanation of the ancient saying that the rest of the passage will examine.
    J. an introduction to the modern research of traditional methods.

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17. According to the passage, the purpose of Dr. Kanani's springtime conferences is to:

    A. record the traditional methods of weather prediction before they disappear.
    B. help gain acceptance for traditional methods in the academic community.
    C. publish the methods in the local press.
    D. facilitate the exchange of ideas between farmers from far-flung regions of India.

18. According to the passage, the reason farmers use traditional methods to predict the weather is that:

    F. traditional methods are more accessible to rural populations.
    G. "normal" monsoons can still be very different from each other.
    H. they need to anticipate the local conditions for the coming growing season.
    J. traditional methods get the basic trends right.

19. The author uses the term "admirable job" (line 25) to indicate that:

    A. the flowering of the *C. fistula* tree provides remarkably predictive data on the coming monsoon.
    B. precision isn't everything.
    C. predictions based on the peak of *C. fistula's* flowering do provide some reliable answers.
    D. sometimes rules of thumb are better than complex formulas.

20. According to Damaru Sahu, traditional weather prediction:

    F. can be curiously accurate.
    G. has a defined place in meteorology.
    H. is useful in some ways despite its lack of scientific foundation.
    J. appeals to an instinct different than the rational brain.

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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

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 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 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, 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 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, 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 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 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 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 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 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 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 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 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 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,

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and English melodic forms, infused, over time, with African-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 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 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. 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 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 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 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 three-finger banjo picking style, are widely considered the 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 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, 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 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.

Questions 21–23 ask about Passage A.

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.

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Questions 24–26 ask about Passage B.

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 because 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.

Questions 27–30 ask about both passages.

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" (lines 59–60) 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.

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Passage IV

NATURAL SCIENCE: The following passage appeared in *Science* magazine as "Pluto: The Planet That Never Was" by Govert Schilling. (© *Science*, Inc., 1999)

Nearly 70 years ago, Pluto became the ninth member of the sun's family of planets, but now it's on the verge of being cast out of that exclusive clan. The International Astronomical Union (IAU) is collecting votes on how to reclassify the icy body: as the first (and largest) of the so-called trans-Neptunian objects, or as the 10,000th entry in the growing list of minor bodies orbiting the sun. In either case, Pluto may officially lose its planetary status, leaving the solar system with only eight planets.

Children's books and planetariums may not acknowledge the loss. And Brian Marsden of the Harvard-Smithsonian Center for Astrophysics in Cambridge, Massachusetts, who launched the discussion six years ago, says no one is trying to demote Pluto. "If anything, we're going to add to Pluto's status," he says, "by giving it the honor of a very special designation."

Cold comfort for Pluto, maybe, but its reclassification will at least end a long identity crisis, which began soon after its 1930 discovery at Lowell Observatory in Flagstaff, Arizona, by Clyde Tombaugh, who died in 1997. Pluto turned out to be much smaller than all the other planets (according to recent estimates, its diameter is only 2200 kilometers), and its orbit is strangely elongated. It didn't belong with either the Earth-like rocky planets or the gas giants.

A clue to its true nature came in 1992, when David Jewitt of the University of Hawaii, Honolulu, and Jane Luu, then at the University of California, Berkeley, discovered a small, icy object beyond the orbit of Neptune. Provisionally cataloged as 1992 QB1, this ice dwarf measures a mere 200 kilometers in diameter. Since then many more trans-Neptunian objects (TNOs) have been detected, some of which move in very Pluto-like orbits around the sun.

These "supercomets" populate the Kuiper Belt, named after Dutch-American astronomer Gerard Kuiper, who predicted its existence in the early 1950s. "Pluto fits the picture [of the solar system] much better if it's viewed as a TNO," says Luu, who is now at Leiden University in the Netherlands.

At present, more than 70 TNOs are known, and apparently, Pluto is just the largest member of this new family, which explains why it was found more than 60 years before number two. If astronomers had known about the other TNOs back in the 1930s, Pluto would never have attained the status of a planet, Luu says: "Pluto was lucky."

A couple of months ago, the kinship between Pluto and the TNOs led Richard Binzel of the Massachusetts Institute of Technology to propose that Pluto be made the first entry in a new catalog of TNOs for which precise orbits have been determined. It would then enter the textbooks as something like TN-1 (or TN-0, as some astronomers have suggested).

Marsden agrees that Pluto is a TNO, but he doesn't like the idea of establishing a new catalog of solar system objects, arguing that astronomers already have a perfectly serviceable list of numbered minor bodies (mostly asteroids). "The question is: Do we want to recognize [trans-Neptunian objects] with a different designation?" he asks. He points out that the Centaurs—TNOs that have been nudged well inside Neptune's orbit—have been classified as asteroids and says he sees "no reason for introducing a new designation system for objects of which we have representations in the current [catalog of minor bodies]."

Instead of making Pluto the founding member of a new catalog, Marsden wants to add it to the existing list. "The current number is 9826," he says. "With the current detection rate, we should arrive at number 10,000 somewhere in January or February." He notes that asteroids 1000, 2000, 3000, and so on have all been honored by the IAU

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with special names, including Leonardo and Isaac Newton. "What better way to honor Pluto than to give it this very special number?"

But the prospect of lumping Pluto with the solar system's riffraff outrages supporters of a new TNO category. "It's the most idiotic thing" she's ever heard, says Luu. "Pluto is certainly not an asteroid," she says.

To try to settle the issue, Mike A'Hearn of the University of Maryland, College Park, is collecting e-mail votes from 500 or so members of IAU divisions on the solar system, comets and asteroids, and other relevant topics. "I wanted to arrive at a consensus before Christmas [1998]," he says, "but it may take a while, since the community as a whole doesn't seem to have a consensus." Neither proposal has attracted a majority. Although many people opposed Marsden's proposal, a comparable number were unhappy with Binzel's idea, A'Hearn says, because Pluto would still be an anomaly, being much larger than the other trans-Neptunian objects. A'Hearn says that if no consensus can be reached, Pluto will probably not end up in any catalog at all, making it the ultimate outcast of the solar system.

However the debate settles out, Pluto's career as a planet seems to be ending, and even astronomers are wistful at the prospect. "No one likes to lose a planet," says Luu. A'Hearn agrees. "It will probably always be called the ninth planet" by the general public, he says.

31. According to the passage, regarding the view that Pluto should be categorized as an asteroid, Jane Luu expressed which of the following?

A. Shock
B. Excitement
C. Confusion
D. Forceful opposition

32. It can be inferred that Pluto's original designation as a planet would have never happened if scientists had:

F. understood its size from the beginning.
G. seen the icy core of Pluto sooner.
H. been able to detect the many smaller TNOs when Pluto was discovered.
J. understood the popular misconceptions about Pluto's planethood that would follow.

33. With which of the following statements would the author agree in regard to reclassifying Pluto?

A. It should be classified as a TNO.
B. It should be classified as an IAU.
C. It should remain a planet.
D. Its future classification is unclear.

34. According to the passage, large objects similar to the makeup and orbit of Pluto found nearer to the sun than Neptune are called:

F. Centaurs.
G. IAUs.
H. TNOs.
J. ice dwarves.

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35. According to lines 66–73, the central issue in the debate over Pluto is:

    A. whether Pluto is more similar to the rocky planets or the gas giants.
    B. the distance of Pluto from the sun.
    C. whether or not the unique qualities of Pluto warrant the creation of a new classification category for all TNOs.
    D. scientists' conception of Pluto versus the view of the general public.

36. As used in line 64, the term *serviceable* most nearly means:

    F. able to be fixed.
    G. adequate.
    H. beneficial.
    J. durable.

37. One slightly less scientific concern expressed by most of the scientists in the passage is:

    A. the role of the IAU in making classification decisions.
    B. respect for the views of the public.
    C. who gets the credit for Pluto's reclassification.
    D. the preservation of Pluto's fame and importance.

38. According to the passage, what is the major reason for lack of consensus regarding the status of Pluto?

    F. The general population resists the scientific community's belief that Pluto is not a planet.
    G. Pluto seems very different than the other members of any classification.
    H. Pluto's strange orbit makes it asteroid-like, but its surface more closely resembles a planet.
    J. There have been numerous discoveries of other Pluto-like objects nearer to the sun than to Neptune.

39. Details in the passage suggest that Pluto is much different from other planets in:

    A. its distance from the sun and the shape of its orbit.
    B. its size and the shape of its orbit.
    C. the year of its discovery and its size.
    D. its shape and surface composition.

40. Pluto's size accounts for:

    F. its classification as a TNO.
    G. its dissimilarity to asteroids.
    H. its early discovery relative to other TNOs.
    J. its bizarre orbit.

IF YOU FINISH BEFORE TIME IS CALLED, YOU MAY CHECK YOUR WORK ON THIS SECTION ONLY. DO NOT TURN TO ANY OTHER SECTION IN THE TEST. STOP

SCIENCE TEST

35 Minutes—40 Questions

Directions: There are six passages in this test. Each passage is followed by several questions. After reading a passage, choose the correct answer to each question and fill in the corresponding oval on your Answer Grid. You may refer to the passages as often as necessary. You are NOT permitted to 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 Diagram 1. Diagram 1 also shows the depth of each horizon and the overall density of the soil.

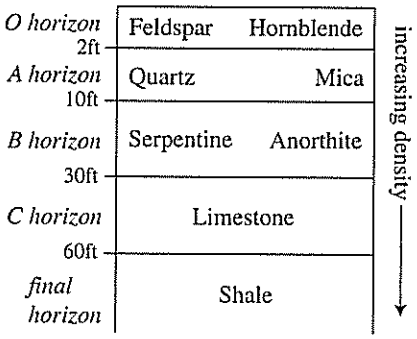

Diagram 1

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

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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 Diagram 1 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.

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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 = $0.512 \frac{°C \times kg}{mol}$

m = 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 H_2O 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_2O (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
5	100.00	0.342	103.50

Study 2

In order to prepare various solutions of calcium chloride ($CaCl_2$), 100.00 g of H_2O were added to a beaker. A known quantity of $CaCl_2$ was dissolved into the water and the resulting boiling point of the solution was recorded. This procedure was repeated with different amounts of $CaCl_2$ as shown in Table 2.

Table 2

Solution	Mass of H_2O (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

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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 mol of NaCl ?

   F. 100.00°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 H_2O 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.

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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' 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_2O)					
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
Phosphorus Oxide (P_2O_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.

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14. The hypothesis that increasing humidity increases the concentration of a compound is supported by the results for each 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.

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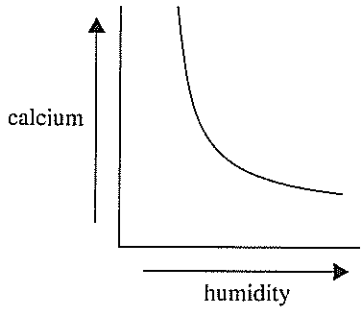
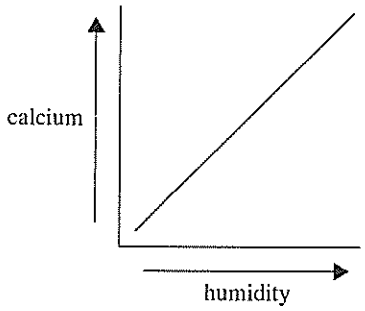
18. The relationship between humidity level and calcium concentration, as measured by System B, is best represented by which of the following graphs?

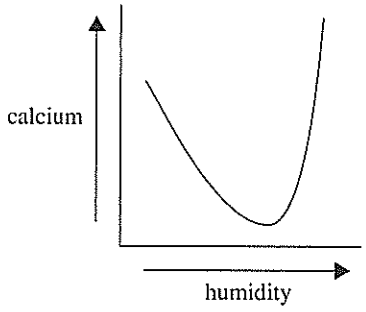
F.



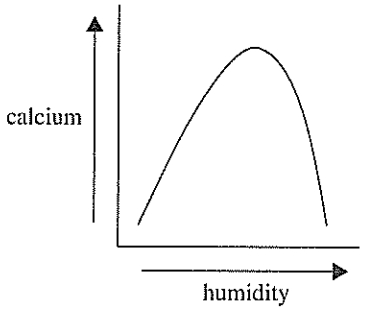
G.



H.



J.



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%.

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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.

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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.

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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.

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.

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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 reasonable to conclude 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.

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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 Diagram 1. The circuit contains a battery and an ammeter, which measures current in milliamperes (mA). The results are presented in Table 1.

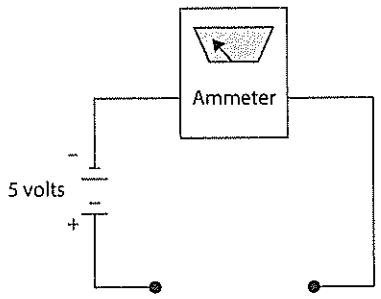

Diagram 1

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
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

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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. $\sigma = \Omega \times \text{m}$

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

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

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

IF YOU FINISH BEFORE TIME IS CALLED, YOU MAY CHECK YOUR WORK ON THIS SECTION ONLY. DO NOT TURN TO ANY OTHER SECTION IN THE TEST. STOP

WRITING TEST

40 Minutes

Directions: This is a test of your writing skills. You will have **forty** (40) minutes to read the prompt, plan your response, and write an essay in English. Before you begin working, read all material in this test booklet carefully to understand exactly what you are being asked to do.

You will write your essay on the lined pages in the answer document provided. Your writing on those pages will be scored. You may use the unlined pages in this test booklet to plan your essay. Your work on these pages will not be scored.

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

- Clearly state your own perspective on a complex issue, and analyze the relationship between your perspective and at least one other perspective
- Develop and support your ideas with reasoning and examples
- Organize your ideas clearly and logically
- Communicate your ideas effectively in standard written English

Lay your pencil down immediately when time is called.

DO NOT OPEN THIS BOOKLET UNTIL TOLD TO DO SO.

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Scientific Research

A great deal of pure research, undertaken without specific goals but generally to further humankind's understanding of itself and its 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

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

Perspective Two

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

Perspective Three

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 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.

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Essay Task

Write a unified, coherent essay about government funding of scientific research. In your essay, be sure to:

- analyze and evaluate the perspectives given
- state and develop your own perspective on the issue
- explain the relationship between your perspective and those given

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

Planning Your Essay

You may wish to consider the following as you think critically about the task:

Strengths and weaknesses of the three given perspectives

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

Your own knowledge, experience, and values

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

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