

1



1

ENGLISH TEST

45 Minutes—75 Questions

DIRECTIONS: In the passages that follow, some words and phrases are underlined and numbered. In the answer column, you will find alternatives for the words and phrases that are underlined. Choose the alternative that you think is best, and fill in the corresponding bubble on your answer sheet. If you think that the original version is best, choose “NO CHANGE,” which will always be either answer choice A or F. You will also find questions about a particular section of the

passage, or about the entire passage. These questions will be identified either by an underlined portion or by a number in a box. Look for the answer that clearly expresses the idea, is consistent with the style and tone of the passage, and makes the correct use of standard written English. Read the passage through once before answering the questions. For some questions, you should read beyond the indicated portion before you answer.

PASSAGE I

An Island Speaks

For some, backpacking is the ultimate vacation. The wilderness has a way of cleansing the spirit. What was once a tedious, tiring activity, for me, is now an essential part of my summer recreation. My passion for backpacking took hold many years ago when I crossed paths with a hiker in the backcountry of Isle Royale National Park.

The excitement in his eyes needless to say was infectious as he gazed out over Lake Superior. “By the shores of Gitche Gumee,/By the shining Big-Sea-Water,/Stood the wigwam of Nokomis,/Daughter of the Moon, Nokomis.” He continued with more verses. “Have you read Longfellow’s *Song of Hiawatha*?” he asked, inquiring me.

I had not. “Read it,” he replied, “and you have felt the passion that the native people had for this lake, this land. It was their lifeblood.” I understood what he meant. In the wilderness both physical and spiritual sustenance can be

1. A. NO CHANGE
B. for me, a tedious and tiring activity is
C. a tedious, tiring activity for me is
D. a tedious and tiring activity for me, is
2. F. NO CHANGE
G. in the backcountry, with a hiker, of Isle Royale National Park
H. with the backcountry of Isle Royale National Park, with a hiker
J. in Isle Royale National Park (the backcountry) with a hiker
3. A. NO CHANGE
B. excitement in his eyes was
C. excitement in his eyes—needless to say—was
D. excitement in his eyes, I considered to be
4. F. NO CHANGE
G. he asked inquiring me
H. he asked
J. he asked of me
5. A. NO CHANGE
B. you would feel
C. you felt
D. you will feel

GO ON TO THE NEXT PAGE.

1



1

found, so every step along the trail brings you, closer to
peace. My goal in backpacking is no longer the destination.
 6

However, like the people in Longfellow's epic, I now seek
 7
 harmony with the Earth through immersion in its scenic
 riches.

After many summers on the trail, I've established my
preferred routine. I rise and retire with the sun. Sunrises
 8

and sunsets are time with calm reflection. After breakfast
 9
 and before dinner, I slowly walk around the area near my
 tent, taking note of the plants, animals, and minerals that
 surround me. If I'm lucky, there is a creek, or a pond, to
 10
 discover. Sometimes I find a fallen log or a huge boulder
 perfect for sitting upon and reflecting. In these times I
 surrender myself to the wilderness, allowing the sights,
 sounds, and smells to pass through me. [11]

Sometimes what I write in the wilderness is poetry,
 other time's it's prose. Years later I can look at my
 12
 notepads to stir up vivid memories of my travels. This

creative process has made backpacking more than
 13
immeasurably rewarding. The backcountry stimulates both
 13
 my primal instincts and high levels of creativity.

6. F. NO CHANGE
 G. brings you closer, to peace.
 H. brings you closer to peace.
 J. brings, you closer, to peace.

7. A. NO CHANGE
 B. Now, like
 C. Occasionally, like
 D. Like

8. F. NO CHANGE
 G. preference
 H. preferential
 J. preferring

9. A. NO CHANGE
 B. are times for
 C. times are for
 D. are for time of

10. F. NO CHANGE
 G. lucky, there is a creek or a pond
 H. lucky, there is a creek, or a pond
 J. lucky there is a creek, or a pond,

11. Which of the following sentences, if added here, would best strengthen the tone of the essay while providing a transition into the next paragraph?
- A. I once sat on the bank of a small creek for nearly an entire day; I became so absorbed in my own musings that I completely lost all track of time.
- B. I sometimes speculate about how much my surroundings have changed over time. Did a native person sit on this same boulder watching the sunrise, much like I am today?
- C. I often find the sights around me to be the most thought provoking. A single autumn leaf changing from green to crimson inspires awe and wonder in me.
- D. In silence, I ponder the natural system at play, and in occasional moments of lucidity, words pour from my brain to my hand to my notepad.

12. F. NO CHANGE
 G. times'
 H. times
 J. time

13. A. NO CHANGE
 B. immeasurable
 C. immeasurably more
 D. highly immeasurably

1



1

Nowhere else do I feel as rawly human. When others snap
14

photographs, I write. Therefore, a picture isn't worth a
15
thousand words. A journal of reflections imbued with
nature's spectacle is far more valuable.

- 14. F. NO CHANGE
- G. others snapped
- H. other's snap
- J. other's are snapping
- 15. A. NO CHANGE
- B. (Do NOT begin a new paragraph) For me,
- C. (Begin a new paragraph) Finally,
- D. (Begin a new paragraph) Nevertheless,

PASSAGE II

African Dogs

When I was preparing for my two-week vacation to southern Africa, I realized that the continent would be like nothing ever that I'd seen, never having left
16

North America. I wanted to explore the urban's streets as well as the savannah; it's always been my goal to have
17
experiences while on vacation that most tourists fail to find. Upon my arrival in Africa, the amiable
18
people there welcomed me with open arms. Despite the warmth of these people, I discovered that our cultural differences were stunning and made for plenty of laughter and confusion. What's funny now, though, more than ever, is how ridiculous I must have seemed to the people of one village when I played with their dog. [19]

When I walk the streets of my hometown now, I often find myself staring at all the dogs and dog-owners on the sidewalk. The owner smiles and stares at the animal,

panting excitedly in anticipation of the next stimulus along
20

the path. Dog's owners love to believe their animal is
21
smart, while people who've never owned a dog tend to

- 16. F. NO CHANGE
- G. I'd ever seen
- H. I'd ever saw
- J. I'd seen ever
- 17. A. NO CHANGE
- B. urban streets'
- C. urbans streets
- D. urban streets
- 18. F. NO CHANGE
- G. tourist's fail finding
- H. failing tourists find
- J. tourists are failing to find
- 19. Which of the following sentences, if added here, would most effectively introduce the subject of the remainder of the essay?
- A. Like my dog at home, their dog was a German Shepherd and Golden Retriever mix.
- B. Apparently, the role of dogs in America is nothing like it is in the third world.
- C. Their dog had never played fetch before, so I tried to teach it how to play.
- D. Dog lovers like myself always stop and play with the dogs that they cross paths with.
- 20. F. NO CHANGE
- G. and pants
- H. which pants
- J. who panted
- 21. A. NO CHANGE
- B. Dog owner's
- C. Dogs owner
- D. Dog owners

1



1

believe the opposite. ²² Perhaps Americans enjoy dogs for

just that sort of ignorant bliss. ²³ With a little training, dogs won't bark, bite, or use the sofa as a toilet, but they will provide years of unconditional affection and loyalty, plus the occasional lame-brained escapade at which human onlookers can laugh.

If a dog ²⁴ happens to live on the urban streets of

southwest Africa, ²⁵ they soon learn to deal with a

²⁶ starkly different reality than that of the American pooch.

As I saw it, the relationship between a typical African and

his dog is one of mutualism. ²⁷ I say tangible because the African sees himself as the dominant creature not to be

bothered by the ²⁸ dog but nevertheless responsible for providing for it. Hence, attempts at behavior training are rare on African dogs. Instead, a villager seizes power with a chunk of scrap meat and a bowl of water. The dog soon learns to quit yapping and biting at the hand that feeds him. ²⁹ Never does the villager speak to the animal. I'm not even sure such dogs get names. Their behavior becomes interestingly balanced, however, much to the surprise of

22. The writer wants to add a quote here that would further exemplify what he believes are the attitudes of Americans who have never owned a pet. Which of the following would most effectively accomplish this?

- F. "Look John, your dog just fell asleep with his head on my leg."
- G. "John, I think your dog has fleas. He won't stop scratching and biting himself."
- H. "John, your dog is standing in front of the mirror and barking at himself again."
- J. "Where did your dog go John? I can't find him anywhere."

23. Which of the choices would NOT be acceptable here?

- A. With some training
- B. After minimal training
- C. If they are trained a little
- D. With less training

24. F. NO CHANGE

- G. happen
- H. happening
- J. happened

25. A. NO CHANGE

- B. it soon learns
- C. they soon learned
- D. it soon was learning

26. F. NO CHANGE

- G. reality that is differently stark
- H. differently stark reality
- J. different reality that is stark

27. In order to emphasize the visibility of the typical African's relationship with his dog, the author intends to add the word "tangible" to the preceding sentence. The word would most effectively serve the above-stated purpose if added:

- A. before the word *typical*.
- B. before the word *African*.
- C. before the word *dog*.
- D. before the word *mutualism*.

28. F. NO CHANGE

- G. dog; but
- H. dog, but
- J. dog—but

29. A. NO CHANGE

- B. It never occurs that the villager speaks to the animal.
- C. By the villager, the animal is never spoken to.
- D. The villager speaks never to the animal.

GO ON TO THE NEXT PAGE.

1



1

the compassionate American dog lover. I believe that the secret to the villager's success after so little effort is providing for the dog's physical needs.

Without the man the dog eats no meat so the dog reverts the man. Perhaps tomorrow the dog will eat another's scraps. Soon, the animal becomes tame, well-mannered community property that keeps the rodent population down and the children company.

- 30. F. NO CHANGE
- G. Without the man, the dog eats no meat, so
- H. Without the man, the dog eats no meat, so,
- J. Without the man the dog, eats no meat, so,

PASSAGE III

Need for Speed

As an avid skier and inline skater, I thought I had already achieved some incredible downhill speeds. On a recent trip to Quebec City, nevertheless, my concept of how fast humans can move was radically altered. It was Carnival season, the time when people from across the province and the world flocking to the old walled city for two weeks of food, drink, revelry, and winter sports. Normally, I go to Carnival looking for the rare thrill, all the better if it requires a helmet and my signature on a release of liability.

- 31. A. NO CHANGE
- B. thus
- C. therefore
- D. though

- 32. F. NO CHANGE
- G. flock
- H. flocked by
- J. are flocking

This time for me, it was full-contact downhill

- 33. A. NO CHANGE
- B. It was full-contact for me this time, I was ice-skating downhill.
- C. Ice-skating downhill this time for me, it was full-contact.
- D. This time, I was full-contact ice-skating downhill.

ice-skating. [34]

- 34. At this point, the author wants to add a sentence to the paragraph that further illustrates his adventurous nature. Which of the options does this best?
 - F. I certainly didn't know what I had signed up for!
 - G. Downhill ice-skating sounded much more exciting than normal ice-skating!
 - H. I could easily have been injured, but the thrill I got was worth the risk!
 - J. I normally wouldn't sign up for such a thing, but anything goes at Carnival!

The course looked a lot like a bobsled run. From the top of the mountain a sturdy metal chute descended that wound left and right on its way down. About eight inches of icepack covered the metal surface, which was wetted twice daily to maintain an ideal slickness. If by the time you reach the end of the chute you still haven't regained your footing, there's a line of meter-thick foam padding to absorb your crash.

- 35. A. NO CHANGE
- B. footing; there's a line of meter-thick foam padding
- C. footing there's a line of meter-thick foam padding,
- D. footing; there's a line of meter-thick foam padding,

1



1

The thrill seeker in me was chomping at the bit to try out this new sport. I signed up and put on my helmet. The organizer quickly looked me over shooting me a sarcastic

36

grin. Smiling back and giving him a brief nod, I mounted the chair lift for the top of the mountain and prepared to watch the few heats that came before mine.

37

The first heat of the day went smooth and gave me a good idea of what was permitted and what was against the rules, as well as good and bad technique on the chute.

38

Professionals were what the first five racers looked like.

39

They calmly and silently approached the starting line, which was at the head of a 20-meter flat strip of ice that racers use to gain speed before entering the downhill section. The starting gun rang out and a few men began with powerful strides, landing them at the head of the pack. When they all entered the chute, their striding stopped and the physical contact began. This is the time I learned that full hockey-style body checks are perfectly legal, as one competitor veered sharply to his left, knocking the smallest racer up and over the wall of the chute and into the meters-deep powdery snow that lined the outside of the chute. Racing continued with countless rounds of hip checks and slippery maneuvers. By the end of the race, only three men were on their feet—it was a photo finish. As the large digital-display on both ends of the run showed that the men had approached speeds of sixty miles per hour.

40

42

41

Luckily, they seeded me in a heat with four other first-timers. When the starting gun sounded, I was quickly off to the pack's head. I shot down the track surprisingly smoothly when I suddenly realized I had no competition.

43

36. F. NO CHANGE

G. and shoots

H. and shooting

J. and shot

37. Which of the following choices most appropriately characterizes the attitude of the organizer of the race?

A. NO CHANGE

B. His lack of confidence notwithstanding

C. Assured by his enthusiasm

D. With his exuberance empowering me

38. F. NO CHANGE

G. went smoother

H. went smoothly

J. went smoothing

39. A. NO CHANGE

B. The first five racers looked like professionals.

C. Looking like professionals, the first five racers.

D. They looked like professionals, the first five racers.

40. F. NO CHANGE

G. Now is when

H. When

J. OMIT the underlined portion.

41. A. NO CHANGE

B. Racing continuing

C. Continuing racing

D. Racing continues

42. F. NO CHANGE

G. finish and so the

H. finish, therefore the

J. finish! The

43. A. NO CHANGE

B. packs head

C. head of the pack

D. head pack

GO ON TO THE NEXT PAGE.

1



1

I looked back and saw the other four skaters splayed out on the ice sliding helplessly toward the finish line. [44]

- 44. Which of the following statements, if added here, would best conclude the essay?
 - F. The next person to cross the finish line did so nearly forty seconds after I did.
 - G. I was much better at downhill ice-skating than I thought I would be.
 - H. I would be the clear winner of that heat and planned to celebrate my victory on the town that night.
 - J. I would have lost if I hadn't been placed in a heat of inexperienced racers!

Question 45 asks about the preceding passage as a whole.

- 45. Suppose the writer had been asked to write a brief essay discussing extreme sports. Would this essay successfully fulfill the requirements?
 - A. No, because the author simply gives a description of a single extreme sport that he personally has participated in.
 - B. No, because the author does not discuss extreme sports, but rather his desire for speed.
 - C. Yes, because the author gives an in-depth description of the extreme sport of downhill ice-skating.
 - D. Yes, because the writer details his own personal experiences in extreme sports.

PASSAGE IV

The Joy of Sailing

Pictures and postcards of the Caribbean do not lie; the shining water with every shade of aquamarine, from pale ⁴⁶ pastel green to deep emerald and navy. The ocean

hypnotizes with it's ⁴⁷ glassy vastness. A spell is set upon the

soul and a euphoric swell rises to the corners of the mouth ⁴⁸ pushing up. One sailing trip in particular brings back fond ⁴⁸ memories.

On this beautiful day, my good friends and I joined a more experienced crew and sailed blissfully from one cay to another. We were incredibly happy to be sailing ⁴⁹ through the cays. As boating novices, my friends and I ⁴⁹ were in charge of spotting the light areas of the seafloor

- 46. F. NO CHANGE
 - G. water there shone
 - H. water shining
 - J. water there shines
- 47. A. NO CHANGE
 - B. its
 - C. the
 - D. its'
- 48. F. NO CHANGE
 - G. to push up the corners of the mouth
 - H. pushing the corners of the mouth up
 - J. to the mouth to push up the corners
- 49. A. NO CHANGE
 - B. Because we were sailing through the cays, we were content.
 - C. Sailing through the cays brought us much delight.
 - D. OMIT the underlined portion.

GO ON TO THE NEXT PAGE.

1



1

that signaled dangerous reefs. Ocean reefs have the potential to rupture the hull of any sailboat that passes over them, so while the electronic depth sounder is an indispensable tool, it is always helpful to find a reef ahead of time so that it can be more easily avoided. ⁵⁰ All at once, a smooth sail can turn into complete pandemonium

as the captain at the wheel begins yell directions to the first mate, who quickly begins struggling with the sails and

rigging. Generally, the wind continues offers of resistance. This makes the first mate's struggle more demanding and outright frightening to the less experienced boaters on

board. This mad yelling and steering, along with the raucous flapping of the sails go on for several minutes before all is right again and the boat settles into its new

course. With congratulatory smiles, once this has occurred, the captain and first mate acknowledge each other. We novices, however, are still recovering from

our terror and wondering to ourselves. "Was all that supposed to happen? And they think this is fun?"

The marina we were heading back toward, the unpredictable wind not only slowed but stopped, and soon the boat did too. After several minutes, the ship's patient crew grudgingly turned on the trolling motor.

50. Given that all are true, which of the following sentences, if added here, would most effectively introduce the new topic of this paragraph?

- F. One aspect of boating that is reserved for the experts is tacking, the nautical term for changing direction.
- G. The more experienced crew played a larger role in maneuvering the boat.
- H. The captain and his first mate served as role models for those of us who were inexperienced boaters.
- J. Sailing through the Caribbean is always a nice break from the realities of everyday life.

51. A. NO CHANGE

- B. yelling
- C. to start yelling
- D. OMIT the underlined portion.

52. F. NO CHANGE

- G. offered
- H. to offer
- J. by offering

53. A. NO CHANGE

- B. flapping of the sails, can go on
- C. flapping of the sails, went on
- D. flapping of the sails goes on

54. F. NO CHANGE

- G. The captain and first mate acknowledge each other once this has occurred, with congratulatory smiles.
- H. Once this has occurred, the captain and first mate acknowledge each other with congratulatory smiles.
- J. The captain and first mate, with congratulatory smiles once this has occurred, acknowledge each other.

55. A. NO CHANGE

- B. to ourselves; "was
- C. to ourselves, "Was
- D. to ourselves "was

56. F. NO CHANGE

- G. As we, heading, back towards the marina
- H. The marina was what we were headed toward
- J. As we headed back toward the marina

57. A. NO CHANGE

- B. turns on
- C. is turning on
- D. will turn on

GO ON TO THE NEXT PAGE.

1



1

Unfortunately, the motor wouldn't start and so we lay adrift at sea, no land in sight, just waiting. It was late afternoon when I began to recognize the panic that was rising in my throat. Eventually, the ship's captain got the engine running and we slowly trolled back to our cozy slip. The sails were up and the little motor hummed along.

From the shore, we may have looks like we were

actually sailing. [60]

- 58. F. NO CHANGE
- G. Therefore
- H. Since then
- J. Because of this

- 59. A. NO CHANGE
- B. looked
- C. been looking
- D. had looks

- 60. The writer is considering adding the following sentence:

Of course we weren't, and I admit that I was thrilled to see that the beautiful wind-powered craft could take on a motor in a pinch.

Would this sentence be a relevant addition at this point in the essay, and why?

- F. Yes, because it illustrates another emotion the author felt while aboard the sailboat.
- G. No, because it contains information that detracts from the focus of this paragraph.
- H. Yes, because it effectively provides a conclusion to the paragraph that would otherwise be absent.
- J. No, because it is unclear what the author means by the phrase "I know better."

PASSAGE V

The following paragraphs may or may not be in the most logical order. You may be asked questions about the logical order of the paragraphs, as well as where to place sentences logically within any given paragraph.

History of the Louvre

[1]

The Louvre, in Paris, France, is one of the largest museums in the world. It has almost 275,000 works of art, which are displayed in over 140 exhibition rooms. The Louvre contains some of the most famous works of art in the history of the world including the *Mona Lisa* by Leonardo DaVinci and the *Venus de Milo* by Michelangelo.

- 61. A. NO CHANGE
- B. world, including
- C. world; including
- D. world: including

1



1

[2]

The Louvre is ordinarily celebrated for its vast collection of artwork, and also it has a long and interesting history as a building. It was originally a fort built by King Phillip sometime around 1200 A.D. In the 1300s, it became a royal residence for Charles V, who had it renovated to accommodate his lavish taste. While he did have his own collection of art there, everything was dispersed when he died.

[3]

This majestic building remained empty until 1527, when Francois I decided then he wanted it for his private residence. Francois I was a collector of early Italian Renaissance art when he moved into the Louvre, and already owned the Mona Lisa, as well as paintings by Titian and Raphael. However, he would not move into the Louvre until it was completely renovated and made even more efficient

than being during the reign of Charles V.

[4]

[1] Unfortunately, Francois I died before the work was completed, but they continued until the death of the head architect. [2] After the passing of both the King and his architect, several generations of French royalty lived in the sprawling palace until Louis XIV, the last of the monarchs to call the Louvre home, left in 1682. [3] The art collection grew from about 200 paintings to about 2,500 works of art from 1643 to 1715.

62. F. NO CHANGE
G. artwork it also
H. artwork but also it
J. artwork, but it also

63. A. NO CHANGE
B. taste: while
C. taste. Thus
D. taste, thus

64. F. NO CHANGE
G. which
H. than
J. that

65. A. NO CHANGE
B. *Mona Lisa*, paintings by Titian, and paintings by Raphael.
C. *Mona Lisa*, paintings by Titian, and Raphael.
D. *Mona Lisa*, Titian, and Raphael.

66. Which of these choices would be most consistent with the way the Louvre is portrayed in the essay, while reflecting the fact that it was being renovated for a king?
F. NO CHANGE
G. grandiose
H. unpretentious
J. monotonous

67. A. NO CHANGE
B. than it had been
C. then it would have been
D. then it will be

68. F. NO CHANGE
G. he
H. it had
J. the work

69. A. NO CHANGE
B. From about 200 paintings in 1643 to about 2,500 works of art in 1715 grew its art collection.
C. Its art collection grew from about 200 paintings in 1643 to about 2,500 works of art in 1715.
D. Starting in 1643, its art collection grew from about 200 paintings to about 2,500 works of art over the course of seventy-two years.

GO ON TO THE NEXT PAGE.

1



1

[4] It was a hub of creativity and elites, until the public ⁷⁰ began to be admitted in 1749. [5] The Louvre, however, was far from abandoned. [6] For about 30 years after Louis XIV's death in 1715, the Louvre became the home of assorted artists and intellectuals. [71]

[5]

[72] Napoleon plundered art from all over the world and added it to the Louvre's collection. He also hired laborers to construct several wings to accommodate his ballooning collection. After Napoleon's demise, the original owners reclaimed much of the plundered artwork.

[6]

During the last 100 years, art academies have been established at the Louvre, and some of the artwork has

been moved by specialized museums. Changes are ⁷³

continually being made to the Louvre, although it remains ⁷⁴

a marvelous place to visit and viewing some of the most ⁷⁵ glorious works of art of all time.

70. F. NO CHANGE

G. elitists

H. elitism

J. elite

71. Which of the following sentence sequences will make Paragraph 4 most logical?

A. NO CHANGE

B. 1, 2, 5, 6, 3, 4

C. 1, 2, 4, 5, 3, 6

D. 2, 1, 6, 3, 5, 4

72. Which of the following would best introduce the information in the paragraph that follows?

F. Throughout the French Revolution and the years dominated by Napoleon, the art collection in the Louvre grew immensely.

G. In 1799, Napoleon Bonaparte staged a coup, which installed the French Consulate, successfully setting the stage for his dictatorship.

H. Many leaders of France during the seventeenth and eighteenth centuries had a vested interest in the Louvre, and therefore made sure to contribute to its collection.

J. In 1805, Napoleon constructed the *Arc de Triomphe du Carrousel* at the entrance of the Louvre to commemorate his victories and provide an entrance to the palatial gardens.

73. A. NO CHANGE

B. moved to

C. moved where

D. moved for

74. Which of the following choices would NOT be acceptable?

F. NO CHANGE

G. Louvre; it

H. Louvre, yet it

J. Louvre. While it

75. A. NO CHANGE

B. view of some of

C. view some of

D. OMIT the underlined portion.

END OF THE ENGLISH TEST.**STOP! IF YOU HAVE TIME LEFT OVER, CHECK YOUR WORK ON THIS SECTION ONLY.**

2



2

MATHEMATICS TEST

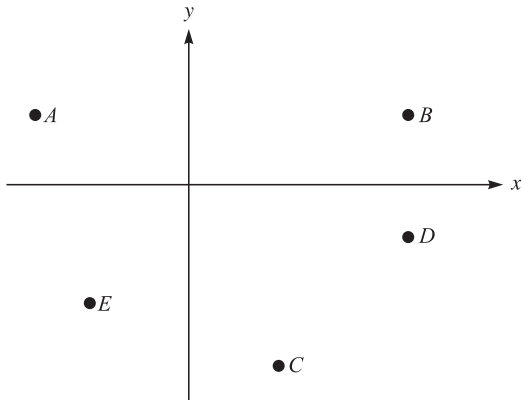
60 Minutes—60 Questions

DIRECTIONS: Solve each of the problems in the time allowed, then fill in the corresponding bubble on your answer sheet. Do not spend too much time on any one problem; skip the more difficult problems and go back to them later.

You may use a calculator on this test. For this test you should assume that figures are NOT necessarily drawn to scale, that all geometric figures lie in a plane, and that the word *line* is used to indicate a straight line.

1. Which point in the standard (x,y) coordinate plane below has the coordinates $(2,-5)$?

DO YOUR FIGURING HERE.



- A. A
 B. B
 C. C
 D. D
 E. E
2. Assume that the statements in the box below are true.

All students who attend Tarrytown High School have a student ID.
 Amelia does not attend Tarrytown High School.
 Carrie has a student ID.
 Traci has a student ID.
 Joseph attends Grayson High School.
 Michael is a high school student who attends Tarrytown High School.

Considering only the statements in the box, which of the following statements must be true?

- F. Michael has a student ID.
 G. Amelia is not a high school student.
 H. Carrie attends Tarrytown High School.
 J. Traci attends Tarrytown High School.
 K. Joseph does not have a student ID.

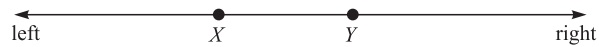
GO ON TO THE NEXT PAGE.

2

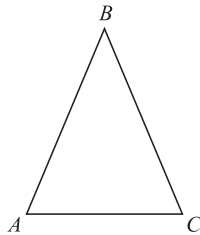


2

3. The balance of Juan's savings account quadrupled during the year. At the end of the year, Juan withdrew \$300, and the resulting balance was \$400. What was the balance in the account before it quadrupled?
- A. \$100
B. \$175
C. \$300
D. \$350
E. \$700
4. For what value of a is the equation $3(a + 5) - a = 23$ true?
- F. 9
G. 8
H. 5
J. 4
K. 2
5. On the real number line below, numbers decrease in value from right to left, and Y is positive. The value of X must be:



- A. positive.
B. negative.
C. greater than Y .
D. less than Y .
E. between 0 and Y .
6. In $\triangle ABC$ below, $AB \cong BC$, and the measure of $\angle B$ is 55° . What is the measure of $\angle C$?



- F. 27.5°
G. 55°
H. 62.5°
J. 125°
K. Cannot be determined from the given information
7. If $3(x - 2) = -7$, then $x =$?
- A. 3
B. 1
C. $\frac{1}{3}$
D. $-\frac{1}{3}$
E. $-\frac{5}{3}$

DO YOUR FIGURING HERE.

GO ON TO THE NEXT PAGE.

2**2**

8. Which of the following is a factor of the polynomial $x^2 + 3x - 18$?

F. $x - 6$
G. $x - 12$
H. $x - 18$
J. $x + 3$
K. $x + 6$

DO YOUR FIGURING HERE.

9. A line in the standard (x, y) coordinate plane is parallel to the x -axis and 5 units below it. Which of the following is an equation of this line?

A. $y = -5$
B. $x = -5$
C. $y = -5x$
D. $y = x - 5$
E. $x = y - 5$

10. $\frac{2r}{3} + \frac{4s}{5}$ is equivalent to:

F. $\frac{2r + 4s}{8}$
G. $\frac{2r + 4s}{15}$
H. $\frac{2(r + 2s)}{15}$
J. $\frac{(10r + 12s)}{15}$
K. $\frac{2(10r + 12s)}{15}$

11. A pie recipe calls for $\frac{1}{3}$ cup sugar to make one 9-inch pie. According to this recipe, how many cups of sugar should be used to make three 9-inch pies?

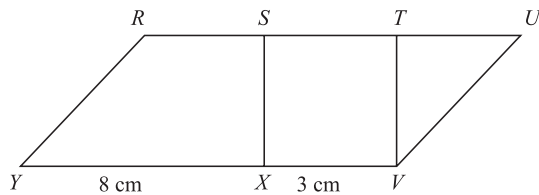
A. $\frac{1}{9}$
B. $\frac{2}{3}$
C. 1
D. $1\frac{1}{9}$
E. 3

12. $|5 - 3| - |2 - 6| = ?$

F. -4
G. -2
H. 2
J. 4
K. 6

2**2**

13. If Ryan traveled 20 miles in 4 hours and Jeff traveled twice as far in half the time, what was Jeff's average speed, in miles per hour?
- A. 80
B. 40
C. 20
D. 10
E. 5
14. If $x = -5$, what is the value of $2x^2 + 6x$?
- F. -80
G. -20
H. 5
J. 20
K. 50
15. For what value of a is $b = 4$ a solution to the equation $b - 2 = ab + 16$?
- A. -3.5
B. -1.5
C. 0
D. 3.5
E. 7
16. In the figure below, S and T are points on RU . What is the ratio of the area of square $STVX$ to the area of parallelogram $RUVY$?



- F. 3:8
G. 1:11
H. 3:11
J. 9:11
K. 3:24

DO YOUR FIGURING HERE.

2



2

17. If $f(x) = 2x^2 - 6x + 7$, then $f(-3) = ?$

A. 7
 B. 18
 C. 25
 D. 36
 E. 43

DO YOUR FIGURING HERE.

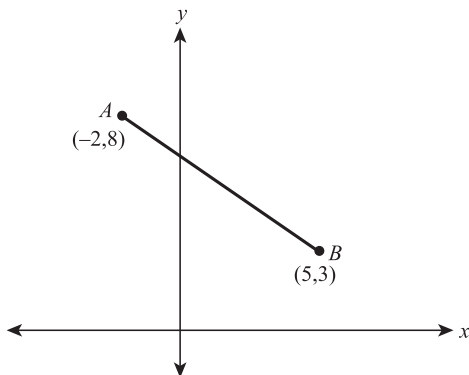
18. A map is drawn so that 1.2 inches represents 50 miles. About how many miles do 1.4 inches represent?

F. 54
 G. 58
 H. 65
 J. 70
 K. 100

19. $(5x^3 + 3xz^2 - 17z) - (4xz^2 + 5z - 2x^3) = ?$

A. $7x^3 - xz^2 - 22z$
 B. $7x^3 - xz^2 - 12z$
 C. $3x^3 - xz^2 - 12z$
 D. $3x^3 + 7xz^2 - 22z$
 E. $3x^3 + 7xz^2 - 12z$

20. In the standard (x,y) coordinate plane shown below, what is the distance on the y -axis, in units, from point A to point B ?



F. -3
 G. -5
 H. 3
 J. 5
 K. 11

21. Which of the following is NOT a solution of $(x - 5)(x - 3)(x + 3)(x + 9) = 0$?

A. 5
 B. 3
 C. -3
 D. -5
 E. -9

22. If $0 < pr < 1$, then which of the following CANNOT be true?

F. $p < 0$ and $r < 0$
 G. $p < -1$ and $r < 0$
 H. $p < -1$ and $r < -1$
 J. $p < 1$ and $r < 1$
 K. $p < 1$ and $r > 0$

GO ON TO THE NEXT PAGE.



23. If $n = 10$, then which of the following represents 552?

A. $5n + 2$
B. $5n^2 + 2$
C. $5n^2 + 5n + 2$
D. $5n^3 + 5n + 2$
E. $5n^4 + 5n + 2$

DO YOUR FIGURING HERE.

24. What is the value of b in the solution to the system of equations below?

$$3a - b = 18$$
$$a + 3b = -4$$

- F. -10
G. -3
H. 3
J. 6
K. cannot be determined with the given information
25. Which of the following is an equivalent form of $x + x(x + x + x)$?
- A. $5x$
B. $x^2 + 3x$
C. $3x^2 + x$
D. $5x^2$
E. $x^3 + x$
26. Due to inflation, a refrigerator that formerly sold for \$450 now sells for 7% more. Which of the following calculations gives the current cost, in dollars, of the refrigerator?
- F. $450 + 7$
G. $450 + 450(0.07)$
H. $450 + 450(0.7)$
J. $450 + 450(7)$
K. $450(0.07)$
27. In a 3-dimensional (x, y, z) space, the set of all points 5 units from the x -axis is:
- A. a line.
B. 2 parallel lines.
C. a circle.
D. a sphere.
E. a cylinder.
28. An overlay of an accessibility ramp of a building is placed on the standard (x, y) coordinate plane so that the x -axis aligns with the horizontal. The line segment representing the side view of the ramp goes through the points $(-2, -1)$ and $(16, 2)$. What is the slope of the accessibility ramp?
- F. -3
G. $-\frac{1}{3}$
H. $-\frac{1}{6}$
J. $\frac{1}{6}$
K. $\frac{1}{14}$

2**2**

29. The number 0.002 is 100 times as large as which of the following numbers?

A. 0.000002
 B. 0.00002
 C. 0.0002
 D. 0.02
 E. 0.2

DO YOUR FIGURING HERE.

30. The volume, V , of a sphere is determined by the formula

$V = \frac{4\pi r^3}{3}$, where r is the radius of the sphere. What is the volume, in cubic inches, of a sphere with a diameter 12 inches long?

F. 48π
 G. 72π
 H. 288π
 J. 864π
 K. 2304π

31. Which of the following is equal to $\frac{\left(\frac{1}{3} - \frac{1}{4}\right)}{\left(\frac{1}{3} + \frac{1}{4}\right)}$?

A. $-\frac{1}{7}$
 B. $\frac{1}{7}$
 C. $\frac{1}{12}$
 D. $\frac{7}{12}$
 E. $\frac{12}{7}$

32. One traffic light flashes every 6 seconds. Another traffic light flashes every 9 seconds. If they flash together and you begin counting seconds, how many seconds after they flash together will they next flash together?

F. 6
 G. 9
 H. 18
 J. 36
 K. 54

33. If $\sqrt{2x} + 5 = 9$, then $x = ?$

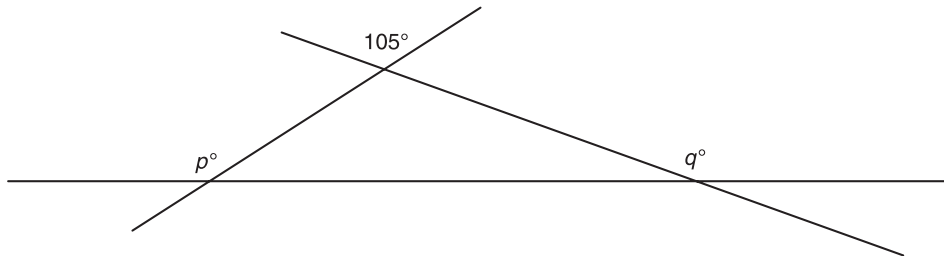
A. -4
 B. 2
 C. 4
 D. 8
 E. 16

GO ON TO THE NEXT PAGE.

2**2**

34. In the figure below, what is the sum of p and q ?

DO YOUR FIGURING HERE.



- F. 75°
G. 150°
H. 180°
J. 285°
K. 360°
35. How many ordered pairs (x, y) of real numbers will satisfy the equation $5x - 7y = 13$?
- A. 0
B. 1
C. 2
D. 3
E. Infinitely many
36. How many different positive 3-digit integers can be formed if the three digits 3, 4, and 5 must be used in each of the integers?
- F. 6
G. 7
H. 8
J. 9
K. 12

GO ON TO THE NEXT PAGE.

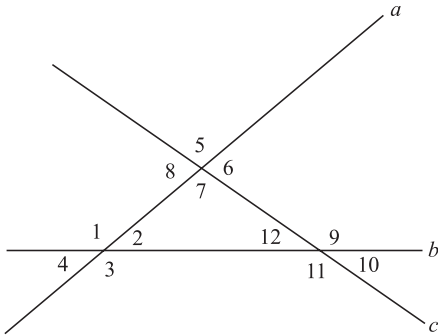
2



2

37. Each of the 3 lines crosses the other 2 lines as shown below. Which of the following relationships, involving angle measures (in degrees) *must* be true?

DO YOUR FIGURING HERE.



- I. $m\angle 2 + m\angle 7 + m\angle 12 = 180^\circ$
 II. $m\angle 4 + m\angle 5 + m\angle 10 = 180^\circ$
 III. $m\angle 3 + m\angle 8 + m\angle 11 = 180^\circ$
- A. I only
 B. II only
 C. III only
 D. I and II only
 E. I, II, and III
38. If $x^2 - y^2 = 49$ and $x - y = 7$, then $x =$?
- F. 14
 G. 7
 H. 4
 J. -4
 K. -7

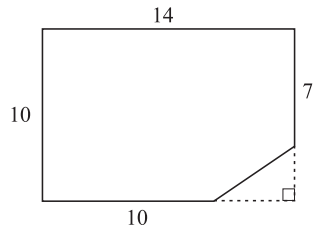
39. For $a \neq 0$, $\frac{a^9}{a^3}$ is equivalent to:
- A. 1
 B. 3
 C. a^3
 D. a^4
 E. a^6

2



2

40. The polygon below was once a rectangle with sides 10 and 14 before a triangle was cut off. What is the perimeter, in inches, of this polygon?

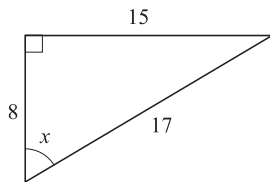


- F. 54
- G. 48
- H. 46
- J. 41
- K. 36

DO YOUR FIGURING HERE.

41. A circle in the standard (x,y) coordinate plane has center $(-4,5)$ and radius 5 units. Which of the following equations represents this circle?
- A. $(x - 4)^2 - (y + 5)^2 = 5$
 - B. $(x - 4)^2 + (y + 5)^2 = 5$
 - C. $(x - 4)^2 - (y + 5)^2 = 25$
 - D. $(x + 4)^2 + (y - 5)^2 = 25$
 - E. $(x + 4)^2 - (y - 5)^2 = 25$

42. For the triangle shown below, what is the value of $\tan x$?



- F. $\frac{8}{15}$
- G. $\frac{8}{17}$
- H. $\frac{15}{8}$
- J. $\frac{15}{17}$
- K. $\frac{17}{8}$

43. You have enough material to build a fence 120-feet long. If you use it all to enclose a square region, how many square feet will you enclose?
- A. 900
 - B. 480
 - C. 240
 - D. 120
 - E. 60

2

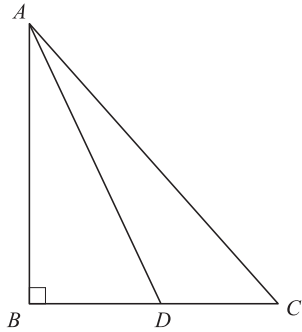


2

44. For what nonzero whole number k does the quadratic equation $y^2 + 2ky + 4k = 0$ have exactly one real solution for y ?
- F. 8
G. 4
H. 2
J. -4
K. -8

DO YOUR FIGURING HERE.

45. In $\triangle ABC$ below, points B , D , and C are collinear. Segment AB is perpendicular to segment BC , and segment AD bisects angle BAC . If the measure of angle DCA is 60° , what is the measure of angle ADB ?



- A. 15°
B. 45°
C. 60°
D. 75°
E. 105°
46. For all $x > 4$, $\frac{4x - x^2}{x^2 - 2x - 8} = ?$
- F. $-\frac{x}{x+2}$
G. $\frac{x}{x-2}$
H. $\frac{1}{x+2}$
J. $-\frac{1}{8}$
K. $\frac{1}{8}$

GO ON TO THE NEXT PAGE.

2**2**

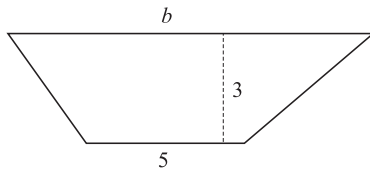
47. If the circumference of a circle is $\frac{4}{3}\pi$ inches, how many inches long is its radius?

- A. $\frac{3}{4}$
B. $\frac{3}{2}$
C. $\frac{2}{3}$
D. $\sqrt{\frac{4}{3}}$
E. $\frac{4\sqrt{3}}{3}$

48. If the function f satisfies the equation $f(x+y) = f(x) + f(y)$ for every pair of real numbers x and y , what is (are) the possible value(s) of $f(1)$?

- F. Any real number
G. Any positive real number
H. 0 and 1 only
J. 0 only
K. 1 only

49. The area of the trapezoid below is 24 square inches, the altitude is 3 inches, and the length of one base is 5 inches. What is the length, b , of the other base, in inches?



- A. 3
B. 8
C. 11
D. 13
E. 16
50. If a , b , and c are consecutive positive integers and $2^a \times 2^b \times 2^c = 512$, then $2^a + 2^b + 2^c = ?$
- F. 6
G. 9
H. 14
J. 16
K. 28

2



2

51. If 30% of x equals 60% of y , which of the following expresses y in terms of x ?

A. $y = 33\%$ of x
 B. $y = 50\%$ of x
 C. $y = 66\%$ of x
 D. $y = 150\%$ of x
 E. $y = 200\%$ of x

DO YOUR FIGURING HERE.

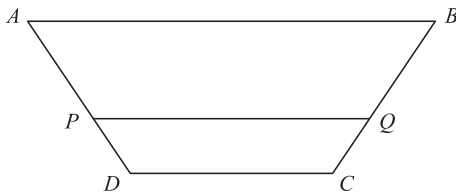
52. For which values of x will $3(x + 4) \geq 9(4 + x)$?

F. $x \leq -4$
 G. $x \geq -4$
 H. $x \geq -16$
 J. $x \leq 4$
 K. $x \leq -16$

53. If $x = 6a + 3$ and $y = 9 + a$, which of the following expresses y in terms of x ?

A. $y = x + 51$
 B. $y = 7x + 12$
 C. $y = 9 + x$
 D. $y = \frac{57 + x}{6}$
 E. $y = \frac{51 + x}{6}$

54. ABCD is a trapezoid that is bisected by line PQ, which is parallel to lines AB and DC. If the length of line DP is 8 units, the length of line PA is 12 units, and the length of line AB is 36 units, what is the length of PQ?

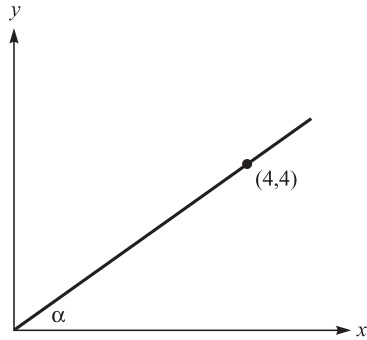


- F. 8
 G. 9
 H. 12
 J. 16
 K. 24
55. The total weekly profit p , in dollars, from producing and selling x units of a certain product is given by the function $p(x) = 225x - (165x + c)$, where c is a constant. If 75 units were produced and sold last week for a profit of \$3,365, what is the value of c ?
- A. -1,135
 B. -745
 C. 1,135
 D. 4,500
 E. 9,010

2**2**

56. In the figure below, $\sin \alpha = ?$

DO YOUR FIGURING HERE.



F. $\frac{1}{2}$

G. $\frac{\sqrt{3}}{2}$

H. 1

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

K. $\frac{\sqrt{2}}{4}$

57. For all real integers, which of the following is *always* an even number?

- I. $x^3 + 4$
- II. $2x + 4$
- III. $2x^2 + 4$

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

GO ON TO THE NEXT PAGE.

2**2**

58. Carol has an empty container and puts in 6 red chips. She now wants to put in enough white chips so that the probability of drawing a red chip at random from the container is $\frac{3}{8}$. How many white chips should she put in?
- F. 3
G. 6
H. 8
J. 10
K. 16

59. A wheel 27 inches in diameter rolls along a line. How many inches does the wheel roll along the line in 32 revolutions?
- A. 27π
B. 32π
C. 432π
D. 864π
E. $1,728\pi$

60. For any real number a , the equation $|x - 2a| = 5$. On a number line, how far apart are the 2 solutions for x ?
- F. $2a$
G. $5 + 2a$
H. $10a$
J. 5
K. 10

DO YOUR FIGURING HERE.

**END OF THE MATHEMATICS TEST.
STOP! IF YOU HAVE TIME LEFT OVER, CHECK YOUR WORK ON THIS SECTION ONLY.**

3

3

READING TEST

35 Minutes—40 Questions

DIRECTIONS: This test includes four passages, each followed by ten questions. Read the passages and choose the best answer to each question. After you have selected your answer, fill in the corresponding bubble on your answer sheet. You should refer to the passages as often as necessary when answering the questions.

PASSAGE I

PROSE FICTION: *This passage is adapted from Susan Coolidge's novel, What Katy Did © 1872.*

The September sun was glinting cheerfully into a pretty bedroom furnished with blue. It danced on the glossy hair and bright eyes of two girls, who sat together hemming ruffles for a white muslin dress. The half-finished skirt of the dress lay on the bed, and as each crisp ruffle was completed, the girls added it to the snowy heap, which looked like a drift of transparent clouds or a pile of foamy white of egg beaten stiff enough to stand alone.

These girls were Clover and Elsie Carr, and it was Clover's first evening dress for which they were hemming ruffles. It was nearly two years since a certain visit made by Johnnie to Inches Mills and more than three since Clover and Katy had returned home from the boarding school at Hillsover.

Clover was now eighteen. She was a very small Clover still, but it would have been hard to find anywhere a prettier little maiden than she had grown to be. Her skin was so exquisitely fair that her arms and wrists and shoulders, which were round and dimpled like an infant's, seemed cut out of daisies or white rose leaves. Her thick, brown hair waved and coiled gracefully about her head. Her smile was peculiarly sweet, and the eyes, always Clover's chief beauty, had still that pathetic look which made them quite irresistible to anyone with a tender or sympathetic heart.

Elsie, who adored Clover, considered her as beautiful as girls in books, and was proud to be permitted to hem ruffles for the dress in which she was to burst upon the world. Though, as for that, not much "bursting" was possible in the village of Burnet, where tea parties of a middle-aged description, and now and then a mild little dance, represented "gaiety" and "society." Girls "came out" very much as the sun comes out in the morning—by slow degrees and gradual approaches, with no particular one moment which could be fixed upon as having been the climax of the joyful event.

"There," said Elsie, adding another ruffle to the pile on the bed, "there's the fifth done. It's going to be ever so pretty, I think. I'm glad you had it all white; it's a great deal nicer."

"Cecy wanted me to have a blue bodice and sash," said Clover, "but I wouldn't. Then she tried to persuade me to get a long spray of pink roses for the skirt."

"I'm so glad you didn't! Cecy was always crazy about pink roses. I only wonder she didn't wear them when she was married!"

Yes, the excellent Cecy, who at thirteen had announced her intention to devote her whole life to teaching Sunday School, visiting the poor, and setting a good example to her more worldly contemporaries, had actually forgotten these fine resolutions, and before she was twenty had become the wife of Sylvester Slack, a young lawyer in a neighboring town! Cecy's wedding and wedding clothes, and Cecy's house furnishing, had been the great excitement of the preceding year in Burnet; and a fresh excitement had come since in the shape of Cecy's baby, now about two months old, and named 'Katherine Clover,' after her two friends. This made it natural that Cecy and her affairs should still be of interest in the Carr household, and Johnnie, at the time we write of, was paying her a week's visit.

"She *was* rather wedded to them," went on Clover, pursuing the subject of the pink roses. "She was almost vexed when I wouldn't buy the spray. But it cost lots, and I didn't want it at all, so I stood firm. Besides, I always said that my first party dress should be plain white. Girls in novels always wear white to their first balls and fresh flowers are a great deal prettier, anyway, than the artificial ones. Katy says she'll give me some violets to wear."

"Oh, will she? That will be lovely!" cried the adoring Elsie. "Violets look just like you, somehow. Oh, Clover, what sort of a dress do you think I shall have when I grow up and go to parties and things? Won't it be awfully interesting when you and I go out to choose it?" Clover's smile beamed.

- When Clover says "She *was* rather wedded to them," (line 65) she is expressing her belief that:
 - Cecy was married when she wore pink roses.
 - Cecy's husband presented her with pink roses on their wedding day.
 - Cecy seemed to have a sentimental attachment to pink roses.
 - Cecy believed that pink roses must only be worn at one's wedding.

GO ON TO THE NEXT PAGE.

3

3

2. It can be reasonably inferred from the context of the passage that Cecy is:
- F. a sister of Clover and Elsie.
 - G. a dear friend of Clover.
 - H. a middle-aged acquaintance of the Carr family.
 - J. approximately the same age as Elsie.
3. The fact that Clover is preparing to attend a milestone event can best be exemplified by which of the following quotations from the passage?
- A. "I always said my first party dress should be plain white."
 - B. "with no particular one moment which could be fixed upon as having been the climax of the joyful event."
 - C. "Oh, Clover, what sort of dress do you think I shall have when I grow up and go to parties and things?"
 - D. "and was proud to be permitted to hem ruffles for the dress in which she was to burst upon the world."
4. As it is used in Paragraph 3, the phrase "the eyes, always Clover's chief beauty, had still that pathetic look" most nearly means that:
- F. Clover was beautiful with the exception of her pitiable eyes.
 - G. Clover's eyes aroused a feeling of compassion.
 - H. people often felt sorry for Clover when they looked into her eyes.
 - J. Clover had pretty eyes but very poor vision.
5. According to the passage, before Cecy became a lawyer's wife she had intended to devote her life to:
- A. making evening dresses.
 - B. designing furniture.
 - C. performing good deeds.
 - D. writing novels.
6. The passage makes it clear that Clover and Elsie:
- F. rarely have the chance to spend time together.
 - G. often avoid spending time with Cecy.
 - H. take pleasure in each other's company.
 - J. are completely independent of their parents.
7. In the third paragraph (lines 16–27) the appearance of Clover's arms is compared to:
- A. those of a pretty maiden.
 - B. those of a baby.
 - C. a wedding dress.
 - D. those of her sister Elsie.
8. Details in the passage suggest that Clover:
- F. is aware of how beautiful the townspeople perceive her to be.
 - G. is about to get married to Johnnie.
 - H. is jealous of her friend Cecy's wedding clothes.
 - J. did not want to use the flowers that Cecy was suggesting.
9. The passage indicates that Elsie's feelings towards Clover can best be described as:
- A. admiring.
 - B. objective.
 - C. malevolent.
 - D. predictable.
10. It can be reasonably inferred from the last paragraph of the passage that:
- F. Clover and Elsie are very close in age.
 - G. Elsie is more interested in the dress than Clover is.
 - H. Clover and Elsie needed to hurry to finish sewing the skirt.
 - J. Elsie values the opinions of her sister.

3

3

PASSAGE II

SOCIAL SCIENCE: Adam Smith and the "Invisible Hand" Doctrine

In *An Inquiry into the Nature and Causes of the Wealth of Nations*, Scottish economist Adam Smith asserts the power of the "invisible hand," the notion that a society benefits from people acting in their own self-interest, without regard to community service. Wrote Smith, "It is not from the benevolence of the butcher, the brewer, or the baker, that we can expect our dinner, but from their regard to their own interest." So, the butcher does not cut meat because the community desires it, but rather because it is a means to earn money. Smith points out that in the absence of fraud and deception, a mercantile transaction must benefit both parties. The buyer of a steak values the steak more than his money, while the butcher values the money more than the steak.

The "invisible hand" is harshly criticized by parties who argue that untempered self-interest is immoral and that charity is the superior vehicle for community improvement. Some of these people, though, fail to recognize several important aspects of Smith's concept. First, he was not declaring that people should adopt a pattern of overt self-interest, but rather that people already act in such a way. Second, Smith was not arguing that all self-interest is positive for society; he simply did not agree that it was necessarily bad. Standing as a testament to his benevolence, Smith bequeathed much of his wealth to charity.

Additionally, the "invisible hand" has come to stand for the resilience of the market after apparently ruinous circumstances. Smith posited that markets naturally recover without intervention on the part of government or similar regulatory bodies. For example, should a product be in excess production, its price in the market would fall, providing incentive for the public to purchase it, thus reducing the stock. This kind of reaction leads to the "natural price" of a good or service, which, Smith believed, was the production cost plus a reasonable profit. This idea would become central to the doctrine of the *laissez-faire* economists several generations later.

Adam Smith's *Wealth of Nations* was written for the masses and is generally accepted as the first treatise on economics. For these reasons, the book is thoroughly studied; for the theory within, Smith's magnum opus remains controversial. It stresses low government intervention and personal action as the roots of a prosperous market. As societies balance the question of whether and how to manipulate their markets, Smith presents a valuable warning, saying of man, "he intends only his own gain, and he is in this, as in many other cases, led by an invisible hand to promote an end which was no part of his intention."

11. As it is used in the passage (lines 44–45), the phrase *magnum opus* most nearly means:
- crowning achievement.
 - manuscript.
 - attitude.
 - community improvement.

12. According to the passage, the main focus of Smith's "invisible hand" theory is:
- community.
 - self-interest.
 - society.
 - benevolence.
13. According to the description of the "invisible hand" theory in the passage, what would happen in the market if there were a shortage of a product?
- Stock of the product would be reduced.
 - The price of the product would rise.
 - The product would become more profitable.
 - The public would have little incentive to purchase the product.
14. According to the information presented in the passage, which of the following best describes Adam Smith's view of the relationship between a baker and the community?
- The baker bakes bread to increase his wealth and also because the community desires bread.
 - The baker values his trade as a baker; the community members value their own personal wealth.
 - The baker and the community both see money as the key commodity in any mercantile transaction.
 - The baker bakes in order to increase his wealth; the community members value the baker's bread more than their money.
15. All of the following are assertions made in of Smith's *Wealth of Nations* EXCEPT:
- people naturally base their actions on what will be most beneficial to themselves.
 - markets adjust to change naturally, without assistance from the government.
 - the natural prices of objects should include profuse amounts of profit.
 - all transactions that occur have some benefit to each party involved in the transaction.
16. Which of the following is a basis upon which some criticize Smith's *Wealth of Nations*?
- Market prices should not include profit.
 - Commercial transactions need to benefit both participants.
 - Falling market prices reduce the stock of products that have excess production.
 - Exorbitant self-interest is unethical.

GO ON TO THE NEXT PAGE.

3

3

17. It can be inferred that the word *benevolence*, as it is used in line 6, primarily refers to:
- A. a penchant for performing generous acts.
 - B. formal or obligatory politeness.
 - C. having a stubborn disposition.
 - D. the requisite giving of payments or gifts.
18. It can be inferred from Smith's quotation at the end of the passage ("He intends ... intention.") that Smith believes that:
- F. people do not want an "invisible hand" controlling their actions.
 - G. the "invisible hand" deters people from following their selfish interests.
 - H. individuals acting selfishly can unwittingly create an outcome that is beneficial to others.
 - J. no single person intends to be selfish, but every person is.
19. As described in the passage, Smith's theory of "natural price" is vital to the theory of:
- A. charitable organizations.
 - B. self-interest, without regard to community service.
 - C. *laissez-faire* economics.
 - D. mercantile transactions absent of fraud.
20. Based on the passage as a whole, which of the following would most likely approximate Smith's views on competition in the marketplace?
- F. Competition is a good thing because it keeps prices for goods and services low for the consumer.
 - G. The government should try to eliminate competition because people make purchases based on self-interest.
 - H. Competition is positive, for it causes profit margins to increase and thereby increases market prices.
 - J. The government should foster competition in order to boost the country's economy in times of recession.

3

3

PASSAGE III

HUMANITIES: *Michael Nyman: Minimalist Composer*

Many people take classical music to be the realm of the symphony orchestra or smaller ensembles of orchestral instruments. Even more restrictive is the mainstream definition of “classical,” which only includes the music of generations past that has seemingly been pushed aside by such contemporary forms of music as jazz, rock, and rap. In spite of its waning limelight, however, classical music occupies an enduring niche in Western culture, always the subject of experimentation on the part of composers and performers.

Of the various schools of composition that emerged in the 20th century, Minimalism remains one of the most influential. English composer Michael Nyman has emerged as one of the great writers, conductors, and performers of experimental and often minimalist pieces of music. In fact, it was he who coined the term “Minimalism,” in a review of another composer’s work. Nyman’s compositions vary greatly in mood and orchestration, but generally reflect the characteristic tenets of minimalist fare; composer-author David Cope defines these as silence, conceptual forms, brevity, continuity, and strong patterns.

A 1976 commission led Nyman to form what he once called “the loudest unamplified street band” possible. Eventually coined the Michael Nyman Band, his group comprised several saxophonists and some players of ancient string and woodwind instruments of various medieval-sounding names. When Nyman set to developing material for his band, he implemented piano segments for himself, a rich string section, and eventually, amplification of all the instruments. In this setting, the composer honed his style of deliberate melodies, malleable rhythms, and precise ensemble playing. Nyman’s popularity grew within classical circles. He would often profit from it, accepting commissions from celebrated orchestras, choreographers, vocalists, and string groups. These works, though, would not reach his largest audience.

Nyman will be remembered by the masses for his stunning film scores. His most famous achievement was the music for *The Piano* (1993), winner of the Cannes Film Festival’s prestigious Palme d’Or award for best picture. In the U.S., the film was nominated for six Academy Awards, and won three. However, a nomination was not even granted to Nyman’s soundtrack for the Best Score award. Despite this oversight, the soundtrack remains among the bestselling film music recordings of all time. Its grace is achieved through skillful use of the piano to replace the female lead’s voice, which is absent throughout the film. Similarly emotive is Nyman’s composition for *Gattaca* (1997), a film that tells the tale of a world obsessed with highly sophisticated bioengineering, which creates a society woefully stratified according to genetic purity. Nyman layers repetitive melodies played on string instruments to create an atmosphere of soaring highs tempered with sorrow, but these melodies overcome hopeless melancholy to finish on an uplifting note. The austere blues and greens of the film’s cinematography blend

with Nyman’s round melodies to impose a trance on the audience, infusing a cold future reality with vivid romance.

Following Nyman’s snub by the Academy, the composer admitted the critics tend to look down their noses at his work. He concedes that giving a sold-out performance at a major concert hall does little to impress them. According to Nyman, there will always be some stuffed shirts anxious to cry foul at the new and different. Though rarely awarded for his many accomplishments, Nyman certainly remains an important figure in the innovation of classical music and represents a substantial reason for its persistent popularity.

21. One of the main arguments the author is trying to make in the passage is that:
- A. until recently, classical music had been fading in popularity among Western societies.
 - B. Michael Nyman has produced much important music, but remains underappreciated.
 - C. modern classical music is changing the way in which artists interpret the world.
 - D. *The Piano* gained widespread popularity because of Michael Nyman’s impressive soundtrack.
22. Considering the information given in the first two paragraphs (lines 1–23), which of the following is the most accurate description of modern classical music?
- F. It lacks the intellectual richness of classical music from earlier periods.
 - G. It has not progressed since the emergence of Minimalism.
 - H. It shares audiences with other forms of music, but has not stopped evolving.
 - J. It has become more of an artistic medium than it had been historically.
23. As it is used in the passage, “fare” (line 21) most nearly means:
- A. a fee paid to attend a minimalist concert.
 - B. Michael Nyman’s ability to write minimalist music.
 - C. the collection of minimalist music.
 - D. a feeling evoked by minimalist music.
24. Which of the following statements from the passage is an acknowledgment by the author that the Michael Nyman Band enjoys limited popularity?
- F. “English composer Michael Nyman has emerged as one of the great writers, conductors, and performers of experimental and often minimalist pieces of music” (lines 14–17).
 - G. “Nyman’s compositions vary greatly in mood and orchestration” (lines 19–20).
 - H. “These works, though, would not reach his largest audience” (lines 38–39).
 - J. “Despite this oversight, the music remains among the bestselling film music recordings of all time” (lines 47–49).

GO ON TO THE NEXT PAGE.

3

3

25. The author claims Michael Nyman used the music for *Gattaca* “to impose a trance on the audience” (lines 61–62) because:
- A. it reverberates with layers of emotional string melodies.
 - B. it features sorrowful melodies instead of uplifting ones.
 - C. it reflects the harsh reality of the world portrayed in the film.
 - D. it dulls the raw emotion caused by the futuristic crisis in the film.
26. When the author says that Michael Nyman is “rarely rewarded” (line 70), he most likely means that Nyman:
- F. lacks the musical merit to deserve critical acclaim.
 - G. produces obscure music that fails to appeal to a modern audience.
 - H. gives many long recitals throughout the year.
 - J. deserves praise, but does not receive enough of it.
27. The author implies by the phrase “snub by the Academy” (line 64) that Michael Nyman:
- A. did not deserve to win an Academy Award nomination.
 - B. prepared a superficial composition for *The Piano*.
 - C. considers the score for *The Piano* his crowning achievement.
 - D. deserved an Academy Award nomination, but was denied one.
28. According to the passage, by considering classical music only a historical form of music, many people lose the sense that:
- F. playing unamplified, traditional instruments remains an enriching enterprise.
 - G. classical music has never disappeared, but rather has evolved with the times.
 - H. Michael Nyman is a valuable contributor to Western music.
 - J. classical music is the highest form of recorded music.
29. The second paragraph (lines 12–23) states that, at the time of Michael Nyman’s emergence as a composer, Minimalism was:
- A. in a period of stylistic turmoil.
 - B. an ancient practice in classical music.
 - C. a young musical style.
 - D. invented by Michael Nyman.
30. When the author says that “austere blues and greens of the film’s cinematography blend with Nyman’s round melodies” (lines 59–61), he most likely means that the film:
- F. presents a conflicting viewpoint to the audience.
 - G. tempers its severe elements with appeals to human emotion.
 - H. juxtaposes ugliness with whimsy.
 - J. is really a tongue-in-cheek commentary on the progress of science.

3

3

PASSAGE IV

NATURAL SCIENCE: *The Great Pyramid at Giza: Its Composition and Structure*

The Great Pyramid at Giza is arguably one of the most fascinating and contentious piece of architecture in the world. In the 1980s, researchers began focusing on studying the mortar from the pyramid, hoping it would reveal important clues about the pyramid's age and construction. Instead of clarifying or expunging older theories about the Great Pyramid's age, the results of the study left the researchers mystified.

Robert J. Wenke from the University of Washington received authorization to collect mortar samples from some of the famous ancient construction sites. Among these sites was the Great Pyramid. The mortar that Wenke discovered was formed by particles of pollen, charcoal, and other organic matter. By using radiocarbon dating, scientists were able to make some disconcerting discoveries. After adjusting the data, the mortar revealed that the pyramid must have been built between 3100 BC and 2850 BC with an average date of 2977 BC. This discovery was controversial because these dates claimed that the structure was built over 400 years earlier than most archaeologists originally believed it had been constructed.

Furthermore, archaeologists discovered something even more anomalous. Most of the mortar samples collected appeared to be little more than processed gypsum with traces of sand and limestone. The sand and limestone found in the gypsum were not added but were actually contaminants of the processed gypsum. The mortar used to build the Great Pyramid is of an unknown origin. It has been analyzed repeatedly and its chemical composition has been established. However, even using modern techniques, scientists have been unable to reproduce it. The gypsum mortar is stronger than the stone on the pyramid and the mortar is still intact today, thousands of years after the pyramid was built. This mortar was not used to bond the heavy stone blocks together like cement mortar does with modern bricks. Instead, the gypsum mortar's role was to buffer the joints and to reduce friction as the enormous blocks were put into place.

Examining the mortar from the Great Pyramid assists scientists in making inferences about Egypt's past. Researchers questioned why the Egyptian builders would choose to use gypsum mortar over lime mortar. Egypt had numerous limestone mines that could have been used to create a more durable lime mortar. Despite the abundance of lime, there is no evidence of lime mortar being used in Egypt until 2500 years after the pyramids were built. Researchers then began to determine why the more water-soluble gypsum would have been preferred. They discovered that gypsum would have been easier to mine than limestone. In addition, the Egyptian builders discovered that when gypsum is heated to approximately 265 degrees Fahrenheit, some of the moisture is excluded. When the processed gypsum is mixed with water again, the resulting substance is used for the mortar.

Despite having significant mineral resources, Egypt has few natural fuels available. The 265 degree

60 Fahrenheit temperatures needed to process the gypsum and turn it into mortar can be achieved with the heat of an open fire. On the other hand, to make lime mortar, extremely high temperatures of around 1800 degrees Fahrenheit are needed. Most historians conjecture that the high heat needed to process limestone is the reason lime mortar was not used. The shortage of natural fuel sources would most likely have made the creation of lime mortar highly uneconomical.

31. From the author's reference to the Great Pyramid at Giza as both "fascinating and contentious," (line 2) it can be inferred that the Great Pyramid is seen as both:
- A. captivating and flawless.
 - B. placid and disputable.
 - C. intriguing and controversial.
 - D. monotonous and statuesque.
32. According to the passage, the mortar used to build the Great Pyramid included all of the following EXCEPT:
- F. charcoal.
 - G. processed limestone.
 - H. pollen.
 - J. processed gypsum.
33. The passage indicates that, unlike gypsum, limestone:
- A. needs extremely high temperatures to be transformed into mortar.
 - B. would have been very easy for ancient Egyptians to mine.
 - C. was not nearly as resilient as gypsum.
 - D. was very soluble when mixed with water.
34. Which of the following was NOT a use of the mortar used in constructing the Great Pyramid?
- F. Assisting in the placement of stone blocks
 - G. Shielding the joints of the heavy stone blocks
 - H. Adhering heavy stone blocks together
 - J. Diminishing friction between the stone blocks
35. It may be reasonably inferred from the passage that for those studying ancient pyramids:
- A. radiocarbon dating is a relatively simple method to find an exact date of construction.
 - B. analyzing the chemical composition of a building material allows scientists to recreate the material being evaluated.
 - C. there is typically a very large gap between the conclusions of scientific researchers and those of archaeologists.
 - D. when conclusive facts are not available, researchers must sometimes speculate about the nature of certain findings.

3

3

36. The passage indicates that the type of mortar used in the construction of ancient Egyptian pyramids was affected by:
- F. the durability of the mortar.
 - G. the amount of mineral resources available.
 - H. the inferences drawn by the researchers.
 - J. the natural fuel sources available.
37. As it is used in line 6, the word *expunging* most nearly means:
- A. eliminating.
 - B. restoring.
 - C. devising.
 - D. obscuring.
38. Previous to the research discussed in the passage, it was believed that the Great Pyramid was constructed in approximately what year?
- F. 3377 BC
 - G. 2977 BC
 - H. 2577 BC
 - J. 2177 BC
39. The passage indicates that researchers believed that examination of the mortar would reveal information regarding the Great Pyramid's:
- A. natural fuel sources.
 - B. construction.
 - C. durability.
 - D. constant temperature.
40. According to the passage, which of the following is a reason that gypsum was used to create mortar instead of limestone?
- F. Gypsum is more water-soluble than limestone.
 - G. Gypsum is less complicated to mine than limestone.
 - H. Gypsum is sturdier than limestone.
 - J. Gypsum is more costly to mine than limestone.

END OF THE READING TEST.

STOP! IF YOU HAVE TIME LEFT OVER, CHECK YOUR WORK ON THIS SECTION ONLY.

4



4

SCIENCE REASONING TEST

35 Minutes—40 Questions

DIRECTIONS: This test includes seven passages, each followed by several questions. Read the passages and choose the best answer to each question. After you have selected your answer, fill in the corresponding bubble on your answer sheet. You should refer to the passages as often as necessary when answering the questions. You may NOT use a calculator on this test.

PASSAGE 1

Friction is the resistance to the movement of one object past another object with which the first object is in contact. A group of students performed several experiments using rectangular blocks of various materials and a smooth inclined plane 2 meters in length. To compare how different materials are affected by friction, the blocks were placed at the top of the plane and released to travel the 2-meter distance. The time in seconds (s) that it took for each block to reach the end of the inclined plane was recorded.

Experiment 1

The group of students wanted to know which materials moved down the plane in the shortest amount of time. The students used blocks of wood, steel, aluminum, glass, plastic, and concrete. The dimensions of each block were the same, the volume of each block remained constant, and the mass of the blocks was varied. The incline of the plane was set at 45° for each trial. The students conducted 3 trials for each material, and recorded the results in Table 1.

Block material	Volume of block (cm ³)	Mass of block (g)	Time (s)			
			Trial 1	Trial 2	Trial 3	Average
Wood	750	412	1.65	1.67	1.60	1.64
Steel	750	5,850	1.34	1.30	1.35	1.33
Aluminum	750	2,025	1.36	1.32	1.37	1.35
Glass	750	1,875	1.27	1.31	1.29	1.29
Plastic	750	975	1.40	1.40	1.43	1.41
Concrete	750	1,725	2.47	2.51	2.65	2.54

Experiment 2

The students conducted a similar experiment as in Experiment 1 to test the effect of volume on the time that it took for the blocks to move down the inclined plane. The results are shown in Table 2.

Block material	Volume of block (cm ³)	Mass of block (g)	Time (s)			
			Trial 1	Trial 2	Trial 3	Average
Wood	2,725	1,500	1.70	1.72	1.65	1.69
Steel	190	1,500	1.32	1.28	1.33	1.31
Aluminum	550	1,500	1.36	1.38	1.37	1.37
Glass	750	1,500	1.30	1.32	1.29	1.30
Plastic	1,150	1,500	1.44	1.41	1.44	1.43
Concrete	650	1,500	2.47	2.41	2.53	2.47

Experiment 3

Objects can be rated according to their ability to move efficiently. The students created a scale from 5 to 30 (least to most resistant to motion due to friction) and tested four objects of a known rating. Three trials were conducted for each object, using the same methods as in Experiment 1. The results are shown in Table 3.

Object rating	Time (s)			
	Trial 1	Trial 2	Trial 3	Average
5	1.05	1.08	1.08	1.07
9	1.26	1.28	1.33	1.29
13	1.45	1.44	1.34	1.42
19	1.76	1.82	1.79	1.79

GO ON TO THE NEXT PAGE.

4



4

1. If Experiment 1 were repeated with a plane length of 4 meters, the movement time for the wood block, in seconds, would be closest to:
 - A. 2.31
 - B. 1.64
 - C. 1.32
 - D. 0.64
2. What value would the plastic object used in Experiment 2 likely have on the scale described in Experiment 3?
 - F. Less than 5
 - G. Between 5 and 9
 - H. Between 9 and 13
 - J. Between 13 and 19
3. A furniture maker wants to build a chair whose legs can move more easily across a smooth wooden floor. Based on Experiment 3, which of the following object ratings should the chair material have to best accomplish that goal?
 - A. 5
 - B. 9
 - C. 13
 - D. 19
4. In which of the following ways are the designs of Experiments 1 and 2 different?
 - F. In Experiment 1 mass was held constant, while in Experiment 2 it varied.
 - G. In Experiment 1 volume varied, while in Experiment 2 it was held constant.
 - H. In Experiment 1 volume was held constant, while in Experiment 2 mass was varied.
 - J. In Experiment 1 volume was held constant, while in Experiment 2 mass was held constant.
5. Based on the assumption that the loss in speed that is due to friction is responsible for longer travel times down the inclined plane, which of the following lists of objects used in Experiment 2 is in order of increasing loss of speed due to friction?
 - A. Plastic, aluminum, wood, concrete
 - B. Glass, aluminum, wood, concrete
 - C. Aluminum, steel, wood, concrete
 - D. Concrete, wood, glass, aluminum
6. Based on the results of Experiments 1 and 2, as the volume of the blocks increased, the average time it took each block to move down the inclined plane:
 - F. increased only.
 - G. decreased only.
 - H. increased for some blocks and decreased for other blocks.
 - J. remained the same.

4



4

PASSAGE II

The Earth's magnetic field is one of its most significant natural phenomena. For centuries, the field has been used to aid navigation and exploration, and has been vital to many major discoveries. The magnetic field of the Earth extends several thousands of miles into space. It has the effect of shielding the Earth from solar wind, protecting the planet from dangerous high-energy particles and radiation. The exact source of the Earth's magnetic field is not certain. The following two Scientists attempt to explain the phenomenon.

Scientist 1

The Earth's magnetic field is similar to that of a bar magnet tilted 11 degrees from the spin axis of the Earth. The magnetic field of a bar magnet, or any other type of permanent magnet, is created by the coordinated motions of electrons within iron atoms. It is widely accepted that the Earth's core consists of metals. The inner core is 70% as wide as the moon and consists of a solid iron ball, which would exhibit properties of *ferromagnetism* (the natural magnetic tendency of iron). The core has its own rotation and is surrounded by a "sea" of molten rock. The magnetic field grows and wanes, and the Earth's poles drift and occasionally flip as the rotation of the core changes. The poles of the magnetic field have "flipped" many times due to the fluctuations in the rotation of the solid inner core. Other fluctuations in the magnetic field that can occur on a daily basis are largely the result of interference by solar wind.

Scientist 2

The Earth's magnetic field is attributed to a *dynamo effect* of circulating electric current in the molten outer core. Electric currents cause magnetic fields; therefore, the circulating electric currents in the Earth's molten metallic core are the origin of the magnetic field. When conducting fluid flows across an existing magnetic field, electric currents are induced, creating another magnetic field. When this magnetic field reinforces the original magnetic field, a *dynamo* is created which sustains itself.

Sitting atop the hot, iron inner core, the Earth's molten outer core churns and moves. The outer core also has cyclones or whirlpools powered by the Coriolis effects of Earth's rotation. These complex and unpredictable motions generate the fluctuating magnetic field. The outer core is seething, swirling, and turbulent, which has been detected by the constant changes and reversals in polarity throughout the planet's history. Further, iron has a special characteristic. When it is hotter than 1043 K, its Curie temperature, iron loses its magnetic properties. Therefore the Earth's magnetic field is caused not by magnetised iron deposits, but mostly by electric currents in the liquid outer core.

7. Which of the following statements about the Earth's core was implied by Scientist 2?
- A. The Earth's inner core is a rotating mass of iron.
 - B. The Earth's inner core is solely responsible for the magnetic field.
 - C. The Earth's core is iron and possesses properties similar to a bar magnet.
 - D. The Earth's core has a temperature above 1043 K.

8. A scientific article stated, "Since 1848, when the strength of the Earth's magnetic field was first measured, the field has lost 10% of its strength." Which of the scientists' viewpoints, if any, is (are) in agreement with this statement?
- F. Scientist 1 only.
 - G. Scientist 2 only.
 - H. Scientist 1 and 2.
 - J. Neither Scientist 1 nor 2.
9. Researchers notice that volcanic rocks exhibit regular and predictable variations in their magnetic properties depending on their age. Which of the following statements about the variations would both scientists most likely agree with?
- A. Electric currents, the liquid outer core cause variation in the magnetic properties of volcanic rock.
 - B. Solar wind levels at the time the rocks were created determine the magnetic properties of the rock.
 - C. The varying magnetic properties of the volcanic rocks are a result of the status of the Earth's fluctuating magnetic field at the time the rocks cooled.
 - D. The Earth's magnetic field shields it from solar wind, thereby altering the magnetic properties of volcanic rocks.
10. Scientists 1 and 2 would most likely disagree about which of the following statements?
- F. The strength of the Earth's magnetic field fluctuates over time.
 - G. The polarity of the Earth's magnetic field can change over time.
 - H. The Earth's inner core is surrounded by a liquid outer core.
 - J. The inner core of the Earth possesses magnetic properties.
11. Do the Scientists differ in their description of the Earth's magnetic field?
- A. Yes; Scientist 1 claims that the Earth's magnetic field is significant and Scientist 2 does not.
 - B. Yes; Scientist 1 claims that the Earth's magnetic field is created by the coordinated motions of electrons within iron atoms and Scientist 2 does not.
 - C. No; both Scientists claim that the Earth's magnetic field is created from the circulating electric currents in the Earth's molten outer core.
 - D. No; neither Scientist discusses the Earth's magnetic field in detail.

4



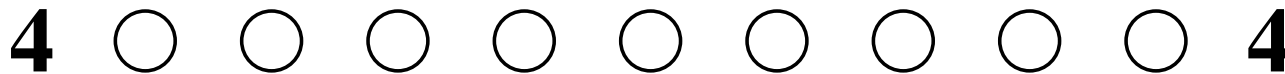
4

12. Suppose a new type of sensor was invented that could detect electric currents in the outer core. This new technology would:

- F. be consistent with the view of Scientist 1 only.
- G. be consistent with the view of Scientist 2 only.
- H. be consistent with the view of Scientist 1 and 2.
- J. have no relevance to either scientist's viewpoint.

13. According to Scientist 1, which of the following assumptions about the source of the Earth's magnetic field is a major flaw in Scientist 2's theory?

- A. The iron in the inner core possesses no magnetic properties.
- B. The iron in the liquid outer core possesses ferromagnetic properties.
- C. The outer core can conduct electricity.
- D. The magnetic field shields the Earth from solar wind.



PASSAGE III

Radioactive decay is a natural process by which an atom of a radioactive *isotope* (chemical element) spontaneously decays into another element. The unstable nucleus disintegrates by emitting alpha or beta particles, or gamma rays. This process changes the composition of the nucleus and continues to take place until a stable nucleus is reached. *Half-life* refers to the amount of time it takes for half (50%) of the atoms in a sample to decay.

Figure 1 shows the decay from Radon 222 to Polonium 218 and other decay products.

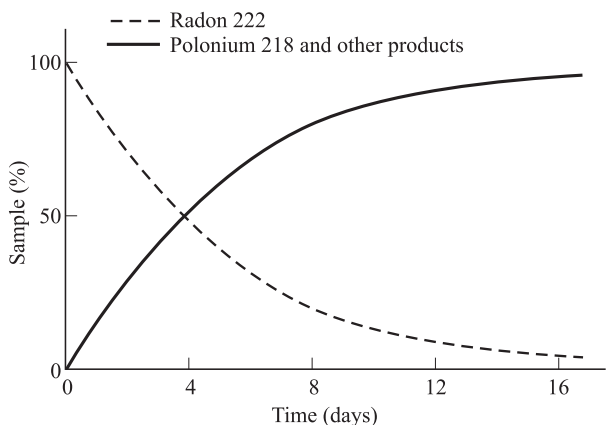


Figure 1

Figure 2 shows the decay from Mercury 206 to Thallium 206 to Lead 206.

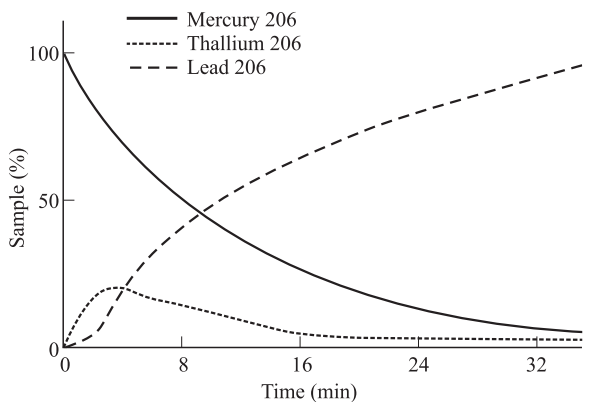


Figure 2

Table 1 shows decay products and associated energy in MeV, million electron volts, and the type of particle emitted from the decay.

Table 1			
Isotope	Decay product	Energy (MeV)	Particle emitted
Radon 222	Polonium 218	5.590	Alpha
Lead 210	Mercury 206	3.792	Alpha
Mercury 206	Thallium 206	1.308	Beta
Thallium 206	Lead 206	1.533	Beta

14. According to Figure 1, what is the approximate half-life of Radon 222?

- F. 2 days
- G. 4 days
- H. 12 days
- J. 16 days

15. Based on the passage, radioactive decay:

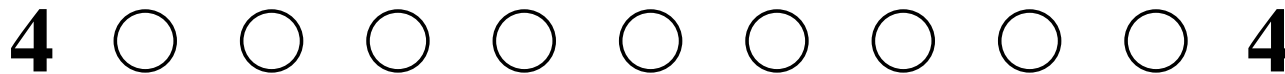
- A. is unstable.
- B. does not occur in nature.
- C. is a natural process.
- D. only occurs in half of the atoms.

16. Based on Table 1, what is the relationship between decay energy and the type of particle emitted?

- F. Beta particles tend to have higher decay energies.
- G. Alpha particles tend to have lower decay energies.
- H. Alpha particles tend to have higher decay energies.
- J. There is no apparent relationship between type of particle and decay energy.

4**4**

17. When Technetium 98 decays into Ruthenium 98, the decay energy is 1.796 MeV. According to the data in Table 1, the decay particle type is most likely:
- A. an alpha particle.
 - B. a beta particle.
 - C. similar to that of Radon 222.
 - D. gamma ray.
18. According to the passage, approximately when do Radon 222 and Polonium 218 have the same percent of atoms remaining?
- F. On Day 2.
 - G. On Day 4.
 - H. On Day 8.
 - J. On Day 16.
19. What statement best explains the meaning of the shape of the Radon 222 curve in Figure 1 and the Mercury 206 curve in Figure 2?
- A. The rate of decay is erratic.
 - B. The rate of decay starts off slowly and then speeds up.
 - C. The rate of decay occurs very quickly at first and slows as the number of atoms is reduced.
 - D. The rate of decay occurs at a steady rate over time.



PASSAGE IV

When connection to a municipal water system is not feasible, wells are drilled to access ground water. Engineers employed by a company interested in developing a remote plot of land conducted studies to compare the water quality of 2 possible well locations on the land. Water quality is determined by a number of factors, including the levels of nitrates, lead, microbes, pH, “hardness” (calcium carbonate), and alkalinity. The water samples were kept at a constant temperature of 72°F throughout the study. The results in Table 1 show the readings of each test for the two different 100 mL samples of water, as well as the ideal level, or concentration, for each chemical.

Factor	Ideal	Sample 1	Sample 2
Nitrates	<10 mg/L	8 mg/L	7 mg/L
Lead	<0.015 mg/L	0.01 mg/L	0.008 mg/L
Iron	<0.3 mg/L	0.45 mg/L	<0.40 mg/L
pH	6.5–8.5	6.0	7.5
Hardness	80–100 mg/L	40 mg/L	200 mg/L
Alkalinity	200–500 mg/L	120 mg/L	350 mg/L
Total dissolved solids	<1,500 mg/L	1,050 mg/L	900 mg/L

The pH scale measures how acidic or basic a substance is on a scale of 0 to 14. Lower numbers indicate increasing acidity and higher numbers indicate increasing basicity. The normal pH level of groundwater systems is between 6 and 8.5. Water with a low pH (<6.5) could be acidic, soft, and corrosive, and could contain elevated levels of toxic metal that might cause premature damage to metal piping. Water with a pH >8.5 could indicate that the water is hard. Hard water does not pose a health risk, but can cause mineral deposits on fixtures and dishes and can have a bad taste and odor.

Alkalinity is the water’s capacity to resist decreases in pH level. This resistance is achieved through a process called *buffering* (a buffered solution resists changes in pH until the buffer is used up). Alkalinity of natural water is determined by the soil and bedrock through which it passes. The main sources for natural alkalinity are rocks that contain carbonate, bicarbonate, and hydroxide compounds. These compounds, however, also cause hardness, which is less desirable in a drinking source. To illustrate the affect of alkalinity on pH stability, acid was added to two 100 milliliters sample solutions that initially had a pH of 6.5. The solution in Figure 1A had an alkalinity level of 200 mg/L while the solution in Figure 1B tested at zero alkalinity. The pH of the two solutions was recorded after every addition of acid and the results are shown in the figures below.

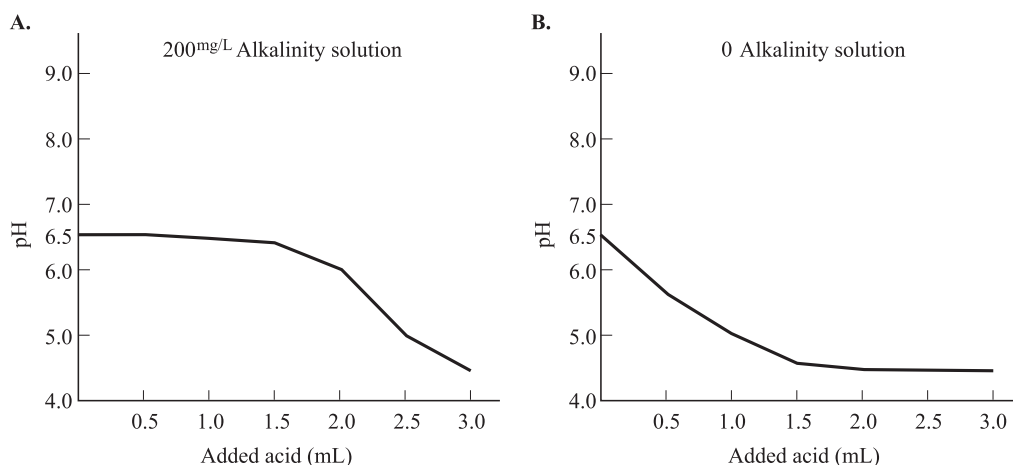


Figure 1

4



4

20. Which of the following statements best describes the concentration of lead in Sample 1?
- F. The concentration of lead in Sample 1 is above the ideal level.
 - G. The concentration of lead in Sample 1 may be corrosive to surfaces.
 - H. The concentration of lead in Sample 1 is at or below the ideal level.
 - J. The concentration of lead in Sample 1 is less than the concentration of lead in Sample 2.
21. An ideal alkalinity level prevents pH levels from becoming too low. Which statement is best supported by this fact? When testing drinking water:
- A. an alkalinity test is not necessary.
 - B. an alkalinity level above 500 is ideal.
 - C. ideal samples will have levels similar to that of Sample 1.
 - D. a proper alkalinity level can prevent water from becoming overly corrosive.
22. The test results of Sample 1 indicate that:
- F. the water from Sample 1 is probably balanced and safe.
 - G. the water from Sample 1 is too acidic and corrosive.
 - H. alkalinity levels are high enough to prevent it from becoming overly acidic.
 - J. the water tested in Sample 1 is hard water.
23. Based on the test results, Sample 2 is acceptable as a water source as long as the developers:
- A. are willing to accept high iron levels and hard water.
 - B. are willing to accept high lead levels and soft water.
 - C. are willing to accept high alkalinity levels and soft water.
 - D. treat the water to reduce its corrosive nature.
24. Suppose chemicals could be added to treat the high iron levels in either sample. The chemical additive would be safe to use in Sample 2 and not safe to use in Sample 1 if:
- F. the chemical additive caused a drastic increase in pH levels in unbuffered solutions.
 - G. the chemical additive caused an increase in water hardness levels.
 - H. the chemical additive caused a decrease in total dissolved solids.
 - J. the chemical additive increased the amount of dissolved solids by at least 200 mg/L.

4



4

PASSAGE V

Some students performed 3 studies to measure the average speed on a flat surface of a gas-powered golf cart. Each study was conducted on a fair day with no wind. A 500-foot long flat surface was measured, and the cart's travel time was measured from start to finish with a stopwatch. The cart was not modified in any way, the same driver was used each time, and the cart's fuel tank was filled before each trial.

Study 1

The students first drove the cart on a smooth asphalt road. One student drove the cart as the other student started the stopwatch. The student stopped the stopwatch as the cart crossed the 500-foot mark. The students calculated the results of three separate trials and averaged the results (see Table 1).

Table 1		
Trial	Time (s)	Speed (ft/s)
1	34.5	14.2
2	33.4	15.0
3	33.7	14.8
Average	33.9	14.7

Study 2

The students repeated the procedure used in Study 1, except the cart was driven on the fairway (very short, well-groomed grass). The results are shown in Table 2.

Table 2		
Trial	Time (s)	Speed (ft/s)
1	39.4	12.7
2	39.9	12.5
3	38.7	12.9
Average	39.3	12.7

Study 3

The students repeated the procedure used in Study 1, except they drove the cart through the rough (thick, long grass). The results are shown in Table 3.

Table 3		
Trial	Time (s)	Speed (ft/s)
1	52.6	9.5
2	55.4	9.0
3	51.3	9.7
Average	53.3	9.4

25. The highest average speeds resulted from using which surface?
- A. Fairway
 - B. Rough
 - C. Asphalt
 - D. The speeds remained constant.

26. According to Table 1, the average speed for all three trials is:
- F. less than the speed measured in Trial 1.
 - G. greater than the speed measured in Trial 3.
 - H. greater than the speed measured in Trial 2.
 - J. less than the speed measured in Trial 3.

27. According to Tables 1, 2, and 3:
- A. the average speed of the cart in the rough is approximately two-thirds of the average speed of the cart on asphalt.
 - B. the average speed of the cart on the fairway is approximately one-third of the average speed of the cart on asphalt.
 - C. the average speed of the cart in the rough is approximately two-thirds of the average speed of the cart on the fairway.
 - D. the average speed of the cart on asphalt is approximately two-thirds of the average speed of the cart in the rough.

28. According to the passage, which of the following was the independent variable in each of the studies?
- F. The surface upon which the golf cart was driven.
 - G. The amount of fuel in the tank of the golf cart.
 - H. The average speed of the golf cart.
 - J. The number of trials conducted.

29. During which of the following was the average travel time of the car the slowest?
- A. Study 1, Trial 2.
 - B. Study 2, Trial 2.
 - C. Study 3, Trial 2.
 - D. Study 3, Trial 3.

4



4

PASSAGE VI

The common grackle is one of the most abundant species of bird in North America. When two male grackles encounter each other, there is often a threat display (a loud, abrasive call). The dominant male usually forces the submissive male to cower and eventually fly away. A biologist conducted two experiments to determine the rank in aggression in male grackles. In the experiments described below, five adult male birds were placed together in a cage and their interactions were observed and recorded.

Experiment 1

To determine what factors might affect aggressiveness, the biologists recorded the sequence in which the birds were placed in the cage, their weight, their ages, and the number of calls each grackle made during the experiment. In addition, the birds were ranked according to their aggressiveness toward each other, from most aggressive (1) to least aggressive (5). The results are shown in Table 1.

Grackle	Sequence	Body weight (g)	Age in months	Number of calls	Aggression (rank)
A	1st	200	6	17	4
B	2nd	325	18	34	1
C	3rd	300	12	29	2
D	4th	340	24	12	5
E	5th	350	30	24	3

Experiment 2

The male grackles were placed back into the cage in the same sequence as in Experiment 1. The results of all aggressive encounters (number of calls) between pairs of birds were recorded. A bird was declared a “winner” if it forced the other bird, the “loser,” to flee from the encounter. Table 2 shows the results of the interactions between the birds. There were no draws (ties) observed.

		Losing grackle				
		A	B	C	D	E
Winning grackle	A	–	0	5	10	10
	B	25	–	15	25	30
	C	20	10	–	20	30
	D	15	0	5	–	15
	E	10	0	0	5	–

Table 3 summarizes the results of all the encounters for each bird.

Grackle	Wins	Losses	Encounters
A	25	70	95
B	95	10	105
C	80	25	105
D	35	60	95
E	15	75	90

30. Which of the following generalizations about the relationship between body weight and rank is consistent with the experimental results?
- F. The heaviest bird will be the most dominant.
 G. The heaviest bird will be the most submissive.
 H. Body weight has no effect on rank.
 J. The lightest bird will be the most dominant.
31. It was suggested that the more dominant a male grackle is, the more likely it is to mate. Accordingly, one would predict, based on win–loss records, that the grackle with the highest likelihood of mating would be:
- A. Grackle B.
 B. Grackle D.
 C. Grackle C.
 D. Grackle A.
32. A sixth grackle, whose body weight was 330 grams and whose age was 24 months, was added to the experimental cage. It was observed that the bird called a total of 10 times during the experiment. Based on the results of Experiment 1, what would be the rank of the sixth grackle in terms of its aggressiveness?
- F. 3
 G. 4
 H. 5
 J. 6

4



4

33. According to the results of Experiments 1 and 2, which of the following factors is (are) related to the dominance of one male grackle over other males?
- I. Age
 - II. Body weight
 - III. Number of calls
- A. I and II only
 - B. I and III only
 - C. II only
 - D. III only
34. One can conclude from the results of Experiment 2 that Grackle C and Grackle A had a total of how many encounters with each other?
- F. 5
 - G. 20
 - H. 25
 - J. 30
35. A criticism of this study is that the order that the grackles were placed in the cage may have affected the aggressiveness of each bird. The best way to refute this criticism would be to:
- A. randomize the order before starting the experiments.
 - B. repeat the experiments several times with different orders each time.
 - C. place the birds in the cage in order of their age.
 - D. place the birds in the cage in order of their weight.

4



4

PASSAGE VII

In nature, different types of organisms often form *symbiotic* (mutually beneficial) relationships with each other. One such example of this is between certain types of fungi and plants; this relationship is known as a *mycorrhiza*. The association provides the fungus with food through access to sugars from photosynthesis in the plant. In return, the plant gains the use of the fungi's surface area to absorb mineral nutrients from the soil. It is believed that without the assistance of fungi, these plants would not be able to absorb crucial nutrients, including phosphates, from the soil. Two experiments were performed to study the effect that the plant-fungi relationship has on plant growth.

Experiment 1

For 6 weeks, several specimens of three different types of plants, selected from among four different types of plants, were grown in a greenhouse. The average growth of each type of plant was recorded every two weeks. The soil used for the plants was treated to remove any trace of fungi to establish expected growth without the plant-fungi association. The results are shown in Table 1.

Plant type	Average plant growth (in)		
	Week 2	Week 4	Week 6
1	1.2	2.8	3.7
3	0.6	1.7	2.0
4	0.9	2.6	3.5

Experiment 2

In this experiment, several specimens of four different types of plants were grown in a greenhouse for six weeks, and the average growth of each type of plant was recorded every two weeks. This time, however, untreated soil that contained fungi was used. The results are shown in Table 2.

Plant type	Average plant growth (in)		
	Week 2	Week 4	Week 6
1	2.6	3.8	5.1
2	2.9	4.1	5.9
3	1.9	3.3	5.4
4	1.7	3.4	4.9

Information on the plant types used is given in Table 3.

Plant type	Root structure	Native climate type	Leaf type
1	Diffuse	Prairie	Grass-like
2	Taproot	Northern forest	Evergreen needle
3	Taproot	Prairie	Broad
4	Diffuse	Tropical forest	Broad

36. The results of Experiment 1 indicate that during what time frame did all of the plant types studied experience the greatest increase in growth rate?
- F. 0–2 weeks
 G. 2–4 weeks
 H. 4–6 weeks
 J. Cannot be determined from the given information.
37. A plant from which climate type was NOT studied in Experiment 1?
- A. Prairie
 B. Tropical forest
 C. Northern forest
 D. All climate types were studied in Experiment 1.
38. Based on the results of Experiment 1, which plant type experienced the most total growth between Week 2 and Week 6?
- F. Plant Type 1
 G. Plant Type 3
 H. Plant Type 4
 J. Each plant type experienced the same total growth.

4**4**

39. Based on the experiments, on the growth of which plant type did the presence of fungi in the soil have the greatest effect?
- A. Plant Type 1
 - B. Plant Type 3
 - C. Plant Type 4
 - D. The fungi had the exact same effect on all three plant types

40. Based on the results of Experiments 1 and 2, which of the following statements is most accurate?
- F. The presence of fungi has little or no impact on plant growth.
 - G. Removing fungi from soil can help to increase growth in some plants.
 - H. The presence of certain fungi in the soil increases plant growth.
 - J. Fungi cannot survive in local greenhouses.

**END OF THE SCIENCE REASONING TEST.
STOP! IF YOU HAVE TIME LEFT OVER, CHECK YOUR WORK ON THIS SECTION ONLY.**

WRITING TEST PROMPT

DIRECTIONS: This test is designed to assess your writing skills. You have 30 minutes to plan and write an essay based on the stimulus provided. Be sure to take a position on the issue and support your position using logical reasoning and relevant examples. Organize your ideas in a focused and logical way, and use the English language to clearly and effectively express your position.

When you have finished writing, refer to the Scoring Rubrics discussed in the Introduction (page 4) to estimate your score.

Some high schools in the United States have installed security cameras in various locations throughout the school, including the classrooms. Some educators and parents think that student behavior must be constantly monitored in order to ensure the safety of both teachers and students. Others think that security cameras can create distractions during class and even promote bad behavior in some students.

In your opinion, should high schools install security cameras in the classroom?

In your essay, take a position on this question. You may write about one of the points of view mentioned above, or you may give another point of view on this issue. Use specific examples and reasons for your position.

ANSWER KEY**English Test**

1. C	21. D	41. A	61. B
2. F	22. H	42. J	62. J
3. B	23. D	43. C	63. A
4. H	24. F	44. H	64. J
5. D	25. B	45. A	65. A
6. H	26. F	46. J	66. G
7. D	27. D	47. B	67. B
8. F	28. H	48. G	68. J
9. B	29. A	49. D	69. C
10. G	30. G	50. F	70. H
11. D	31. D	51. B	71. B
12. H	32. G	52. H	72. F
13. C	33. A	53. B	73. B
14. F	34. H	54. H	74. J
15. B	35. A	55. C	75. C
16. G	36. J	56. J	
17. D	37. B	57. A	
18. F	38. H	58. F	
19. B	39. B	59. B	
20. H	40. J	60. H	

Mathematics Test

1. C	21. D	41. D
2. F	22. H	42. H
3. B	23. C	43. A
4. J	24. G	44. G
5. D	25. C	45. D
6. H	26. G	46. F
7. D	27. E	47. C
8. K	28. J	48. F
9. A	29. B	49. C
10. J	30. H	50. K
11. C	31. B	51. B
12. G	32. H	52. F
13. C	33. D	53. E
14. J	34. J	54. K
15. A	35. E	55. C
16. H	36. F	56. J
17. E	37. D	57. E
18. G	38. G	58. J
19. A	39. E	59. D
20. J	40. H	60. K

Reading Test

1. C	21. B
2. G	22. H
3. D	23. C
4. G	24. H
5. C	25. A
6. H	26. J
7. B	27. D
8. J	28. G
9. A	29. C
10. J	30. G
11. A	31. C
12. G	32. G
13. B	33. A
14. J	34. H
15. C	35. D
16. J	36. J
17. A	37. A
18. H	38. H
19. C	39. B
20. F	40. G

Science Reasoning Test

1. A	21. C
2. H	22. G
3. A	23. A
4. J	24. F
5. B	25. C
6. J	26. J
7. D	27. A
8. H	28. F
9. C	29. C
10. J	30. H
11. B	31. A
12. G	32. J
13. A	33. D
14. G	34. H
15. C	35. B
16. H	36. G
17. B	37. C
18. G	38. H
19. D	39. B
20. H	40. H