# Test 3

## ACT ENGLISH TEST

*45 Minutes—75 Questions*

**DIRECTIONS:** In the five passages that follow, certain words and phrases are underlined and numbered. In the right-hand column, you will find alternatives for each underlined part. In most cases, you are to choose the one that best expresses the idea, makes the statement appropriate for standard written English, or is worded most consistently with the style and tone of the passage as a whole. If you think the original version is best, choose "NO CHANGE." In some cases, you will find in the right-hand column a question about the underlined part. You are to choose the best answer to the question.

You will also find questions about a section of the passage or the passage as a whole. These questions do not refer to an underlined portion of the passage but rather are identified by a number or numbers in a box.

For each question, choose the alternative you consider best and blacken the corresponding oval on your answer document. Read each passage through once before you begin to answer the questions that accompany it. For many of the questions, you must read several sentences beyond the question to determine the answer. Be sure that you have read far enough ahead each time you choose an alternative.

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**PASSAGE I**

### Roast Done Right

Just like being the artist[1] sculpting the Venus de Milo or painting the Sistine Chapel, preparing a delicious meal is an art. Even the seemingly mundane pot roast can be a true master-

piece. Nothing can be more rewarding to a cook than the sign[2] of a roast done right.

Cooking a delicious roast with vegetables require[3] three things: the freshest ingredients, a slow-cooker, and good

timing. My friend Eric goes to the butcher shop just after[4] its 5 a.m. delivery to snatch up the best cuts of meat, then heads to the local farmer's market. He fills his canvas shopping bag with ripe red tomatoes, crisp yellow onions, and thick russet potatoes. The tastiest vegetables are the results of natural sunshine and of a farmer's[5] careful tending.

With supplies in tote, Eric heads to the kitchen. While the beef marinates in garlic and spices, he chops the colorful

**1.** **A.** NO CHANGE
**B.** the artist
**C.** one
**D.** DELETE the underlined portion.

**2.** The writer would like to convey the distinct scent of a properly cooked roast. Given that all the choices are true, which best accomplishes the writer's goal?

**F.** NO CHANGE
**G.** the swirling rush of robust aromas
**H.** the fine textures of vegetables and meats
**J.** the diners' eager expectation

**3.** **A.** NO CHANGE
**B.** has the requirements of
**C.** requiring
**D.** requires

**4.** Which of the following would be the LEAST acceptable alternative for the underlined portion?

**F.** out to the butcher shop right before
**G.** into the butcher shop just around
**H.** at the butcher shop right after
**J.** to the butcher shop close to

**5.** **A.** NO CHANGE
**B.** sunshine, of which a farmer is
**C.** sunshine, and a farmer is
**D.** sunshine, which is a farmer's

**GO ON TO THE NEXT PAGE.**

array of fresh vegetables. Eric slowly places the vegetables [6]

around the meat in the slow-cooker's pot, he alternates [7] rings of bright orange carrots and chunks of red potatoes. He sprinkles in sliced onions and herbs until the ingredients nearly spill

over the top. Like with many [8] cooks, Eric has a secret, final ingredient: a splash of red wine for flavor.

At this point, [9] it's time to cram the lid onto the heaping potful of ingredients and turn on the cooker. The temperature

inside the pot rises slowly as the contents stew [10] in their natural juices. The roast will take six to eight hours to cook, but after

an hour or two, the first spicy scents start wafting through the [11] kitchen. A few hours later, the rich, juicy smell of beef begins

to escape. Every half hour, using a long, meat thermometer [12] Eric reads the temperature of the roast and carefully examines the stewing contents. He doesn't want it overcooked or

**6.** The writer wishes to emphasize Eric's attention to detail in making his pot roast. Given that all the choices are true, which one best accomplishes the writer's goal?

**F.** NO CHANGE
**G.** is very careful when pouring the vegetables
**H.** meticulously layers the finely cut vegetables
**J.** arranges the vegetables in a kind of order

**7.** **A.** NO CHANGE
**B.** he has alternated
**C.** alternates
**D.** alternating

**8.** **F.** NO CHANGE
**G.** Like many
**H.** As most
**J.** As many do

**9.** Which of the following alternatives to the underlined portion would be LEAST acceptable?

**A.** Next,
**B.** After that,
**C.** Now,
**D.** At least,

**10.** Given that all the choices are true, which one provides the most specific sensory detail and maintains the style and tone of the essay?

**F.** NO CHANGE
**G.** rises slowly but surely, stewing
**H.** rises slowly to a lazy, bubbling boil, stewing the savory contents
**J.** increases to about 200 degrees Fahrenheit to stew the contents

**11.** **A.** NO CHANGE
**B.** drifting through the air to make the whole kitchen smell.
**C.** wafting and floating through the whole kitchen.
**D.** wafting through the air of the kitchen.

**12.** **F.** NO CHANGE
**G.** half hour, using a long meat thermometer,
**H.** half hour using a long meat thermometer
**J.** half hour, using a long meat thermometer;

**GO ON TO THE NEXT PAGE.**

undercooked, but "just right." [13]

**13.** The writer is considering deleting the preceding sentence. Should it be kept or deleted?

- **A.** Kept, because it provides a reason for Eric's diligent attention to the temperature.
- **B.** Kept, because it reinforces that roasts are typically done cooking after 8 hours.
- **C.** Deleted, because it puts the focus on Eric and his cooking, rather than the roast.
- **D.** Deleted, because it doesn't provide enough information about temperature's effects on the roast.

Lift the finished roast[14] out of the pot to serve, the tender meat plops juicily onto our plates in generous servings. He tops it off with zesty, steaming vegetables. Eric is obviously proud to share his work of art, and his friends are more than willing to eat it, this masterpiece of his.[15]

**14.**
- **F.** NO CHANGE
- **G.** As he lifts the finished roast
- **H.** When you lift the finished roast
- **J.** Lifting the finished roast

**15.**
- **A.** NO CHANGE
- **B.** ready for us to eat.
- **C.** a masterpiece.
- **D.** DELETE the underlined portion, replacing the comma with a period after "it."

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**PASSAGE II**

**Growing Up On a Farm**

Back in middle school, I went to live with my mother for two years on her farm. Whenever people hear that I lived on a farm, they immediately conjure up an image visualized in their minds[16] of dairy cows, tractors, hay, and overalls. Nothing could be further from the truth.

**16.**
- **F.** NO CHANGE
- **G.** assuming that they know what it was like
- **H.** of my life on the farm that consists
- **J.** DELETE the underlined portion.

To start,[17] I wasn't on the kind of farm everyone imagines. I didn't feed cows or pigs;[18] I didn't grow corn or wheat. I helped my mother breed llamas.

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

- **A.** First of all,
- **B.** To begin,
- **C.** For start,
- **D.** Firstly,

**18.**
- **F.** NO CHANGE
- **G.** or, pigs
- **H.** or pigs,
- **J.** or pigs

[1] It is odd that such non-traditional livestock should be raised on a long-established farm such as ours, which has

**GO ON TO THE NEXT PAGE.**

been in the family for generations. [19] [2] Our family did indeed grow field crops, harvest orchards, and raise traditional

**19.** The writer is considering deleting the phrase "which has been in the family for generations" (and ending the sentence with a period) from the preceding sentence. If the writer were to make this change, the essay would primarily lose:

**A.** evidence of a broken relationship between the narrator and his mother.
**B.** a transition into the discussion of traditional farm practices.
**C.** a detail that reinforces the longevity of the family farm.
**D.** an indication of what will eventually happen to the narrator.

livestock for many decades. [3] He must <u>of learned that</u>[20] wool from llamas was more profitable than wool from sheep. [4] The

**20.** **F.** NO CHANGE
**G.** of learned of
**H.** have learned that
**J.** have learned about

llama wool business turned out to be so <u>successful in fact, that</u>[21] my great-grandfather converted the family business to a full-

**21.** **A.** NO CHANGE
**B.** successful, in fact, that
**C.** successful, in fact that
**D.** successful in fact that

fledged llama farm. [22]

**22.** Upon reviewing this paragraph and realizing that some information has been left out, the writer composes the following sentence:

> Then, fifty years ago, my great-grandfather decided to buy a llama.

This sentence should most logically be placed after Sentence:

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

Before I <u>began to live</u>[23] on the farm, I had held naive illusions of rural life. What could possibly be easier than

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

**A.** started to live
**B.** began living
**C.** went to live
**D.** begun to live

feeding and grooming some animals? <u>After I</u>[24] had settled into my new home, however, I realized that farm work was much more

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

**F.** As soon as I
**G.** When I
**H.** Once I
**J.** I

**GO ON TO THE NEXT PAGE.**

involved than I had expected. Collecting manure, for example, doesn't seem so bad when someone else does it on TV, but I had to get up before dawn every day to finish that chore before catching the bus to school.

School in the country was also not what I had expected. The school I attended had twenty students total: that's from first to twelfth grade, and I was the only student in my grade.

We had one teacher who would occasionally educate us on a specific academic study and methods of learning, but most of my learning came from studying textbooks on my own.

I don't mean to say that my life on the farm was a bad experience. I learned a lot about myself: for example, I'm not a morning person. I also learned about llama's habits, such as spitting when they are unhappy. Most importantly, my mother and I got to spend a lot of time together during those years, for which I'm so grateful. Although I doubt I'll pursue a career as farming, I look forward to returning to the family farm for short visits.

**25.** **A.** NO CHANGE
**B.** would expect.
**C.** would be expecting.
**D.** have expected.

**26.** Given that all the choices are true, which one most effectively introduces the information that follows in this paragraph?

**F.** NO CHANGE
**G.** Farming is a full-time job, taking up your entire day.
**H.** Llamas can grow to be six feet tall.
**J.** Life on the farm was tough but worthwhile.

**27.** **A.** NO CHANGE
**B.** verbally acknowledge how well the class was working for us,
**C.** tell us how to learn about a specific academic study,
**D.** lecture about a specific topic,

**28.** Which choice provides the most specific and precise information?

**F.** NO CHANGE
**G.** studying.
**H.** other things.
**J.** reading by myself.

**29.** **A.** NO CHANGE
**B.** llamas' habits,
**C.** llamas habits
**D.** llamas habits,

**30.** **F.** NO CHANGE
**G.** career of
**H.** career in
**J.** careers of

**GO ON TO THE NEXT PAGE.**

**PASSAGE III**

The following paragraphs may or may not be in the most logical order. Each paragraph is numbered in brackets, and question 45 will ask you to choose where Paragraph 2 should most logically be placed.

**Conjuring a Prophetic Literary Career**

[1]

Born in Ohio in 1858, Charles W. Chesnutt was an author and essayist whom, (31) during the Reconstruction era, spent much of his youth in North Carolina. Though his parents were free African-Americans, Chesnutt felt intensely the struggles of African-Americans in the United States in the period directly after the Civil War. [32] Amid all the turmoil of the South of his boyhood, Chesnutt took solace in literature, and he (33) had already decided, in his teens, that he would become a writer.

[2]

Although Chesnutt continues (34) to write until his death in 1932, it had become as clear as day (35) that the work he completed after *The House Behind the Cedars* and *The Marrow of Tradition* (1901) had become too inflammatory to a society ever uneasy about the topic of race relations in the United States, particularly when authors had brought these problems as close to the surface as Chesnutt had. In recent years, however, Chesnutt's reputation has been restored and he has been treated as the pioneer that he most certainly was. Today as much as in the late nineteenth century, Chesnutt's works provide us with a

**31.** **A.** NO CHANGE
**B.** who,
**C.** which,
**D.** DELETE the underlined portion.

**32.** If the writer were to delete the last part of the preceding sentence (ending the sentence with a period after the word *States*), the paragraph would primarily lose:

**F.** a direct link to the following paragraph.
**G.** an unnecessary digression into historical details.
**H.** an important detail about the period of Chesnutt's youth.
**J.** a fact suggesting the extent of Chesnutt's historical writing.

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

**A.** literature; he
**B.** literature, and he consequently
**C.** literature, he
**D.** literature. He

**34.** **F.** NO CHANGE
**G.** has continued
**H.** still continues
**J.** continued

**35.** **A.** NO CHANGE
**B.** so extremely clear
**C.** clear
**D.** clear to an incredible degree

**GO ON TO THE NEXT PAGE.**

number of literary masterpieces and a powerful and prophetic vision of race relations in the United States.

[3]

"The Goophered Grapevine," published in 1887 in *The Atlantic*, was Chesnutt's first major literary success, and this success encouraged Chesnutt to publish additional tales, which were eventually collected in *The Conjure Woman* (1899). *The Conjure Woman* was written in the tradition of earlier folklorists from a previous era [36] Joel Chandler Harris and Thomas Nelson Page. However, [37] it presented a much more frank treatment of race relations in the South during slavery and Reconstruction. [38] *The Conjure Woman* and it's [39] narrator, Uncle Julius McAdoo, were clearly written in response to the immensely popular Uncle Remus of Harris's tales, but the similarities between the two authors' works ended

**36.** **F.** NO CHANGE
**G.** from a previous time
**H.** from the years before
**J.** DELETE the underlined portion.

**37.** **A.** NO CHANGE
**B.** Page, however,
**C.** Page. Consequently,
**D.** Page, consequently,

**38.** At this point, the writer is considering adding the following true statement:

> The slaves were freed with the Emancipation Proclamation in 1862, but many conditions like those under slavery resurfaced after the collapse of Reconstruction efforts in 1877.

Should the writer add the sentence here?

**F.** Yes, because it shows how many of the gains made by ex-slaves were later taken away.
**G.** Yes, because it is necessary to understand Chestnutt's motivation.
**H.** No, because it provides information that is detailed later in this essay.
**J.** No, because it would distract readers from the essay's main focus.

**39.** **A.** NO CHANGE
**B.** their
**C.** its
**D.** its'

**GO ON TO THE NEXT PAGE.**

there. While Harris's tales used mostly animals and not voodoo, conjure, and the injustices of slavery, which *The Conjure Woman* did, also incorporating human characters instead of Brer Rabbit and animals.

[4]

Chesnutt's true masterpiece, however, is *The House Behind the Cedars*. The novel details the lives of an African-American familys children who have chosen to "pass" as white, making *The House Behind the Cedars* one of the first novels to talk about racial passing. Chesnutt uses his characters' divided status to travel back and forth between the black and white worlds of the South, and in the process, Chesnutt manages to show both the shocking disparity between the two worlds and the insurmountable difficulties his characters, and those who "pass" in real life, face. From the moment it was published in 1900, the novel was a sensation in American letters, garnering the respect and admiration of such prominent white literary critics as William Dean Howells and black intellectuals such as W.E.B. Dubois.

**40.** Which choice provides the most logical arrangement of the parts of this sentence?

- **F.** NO CHANGE
- **G.** Humans were used as characters by *The Conjure Woman* and participated in tales relating to conjure, and the injustice of slavery and voodoo, which was different from Brer Rabbit and the animals from Harris's tales.
- **H.** Conjure, voodoo, and the injustices of slavery and others were used by *The Conjure Woman*, along with real human characters instead of animals and Brer Rabbit from Harris's tales.
- **J.** In the place of Brer Rabbit and the animals from Harris's tales, *The Conjure Woman* used human characters in stories that incorporated conjure, voodoo, and the injustices of slavery.

**41.**

- **A.** NO CHANGE
- **B.** families
- **C.** family's
- **D.** families's

**42.**

- **F.** NO CHANGE
- **G.** it.
- **H.** them.
- **J.** its topics.

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

- **A.** From the moment of its publication in 1900,
- **B.** Having been first published in 1900,
- **C.** Publishing it first in 1900,
- **D.** In 1900, the year of its initial publication,

**GO ON TO THE NEXT PAGE.**

[5]

Author and essayist, Charles W. Chesnutt published two
44
books, *The Conjure Woman* and *The House Behind the Cedars*,
44
that were widely appreciated in his own time.
44

**44.** Given that all the choices are true, which one most effectively concludes and summarizes this essay?

- **F.** NO CHANGE
- **G.** Both author and essayist, Charles W. Chesnutt was a pioneer in African-American literature whose novels and tales are as meaningful today as they were when first published.
- **H.** Author of *The House Behind the Cedars*, Charles W. Chesnutt already knew he wanted to be a writer in his teens during the era of Reconstruction in the history of the United States.
- **J.** Author of *The Conjure Woman*, Charles W. Chesnutt succeeded where earlier writers Joel Chandler Harris and Thomas Nelson Page had failed in representing the characters in their stories as people.

Question 45 asks about the preceding passage as a whole.

**45.** For the sake of the logic and coherence of this essay, Paragraph 2 should be placed:

- **A.** where it is now.
- **B.** before Paragraph 1.
- **C.** after Paragraph 3.
- **D.** after Paragraph 4.

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**PASSAGE IV**

**Jackie Robinson: More Than a Ballplayer**

When baseball resumes in America every spring, one April day is always reserved to honor Jackie Robinson, the man who broke the color barrier of America's national pastime. While his accomplishments on the baseball field was
46
numerous and

**46.**

- **F.** NO CHANGE
- **G.** is
- **H.** will be
- **J.** were

impressive, his civil rights activism was according
47
to his widow Rachel Robinson, equally important and often overlooked

**47.**

- **A.** NO CHANGE
- **B.** was, according,
- **C.** was, according
- **D.** was—according

without being noticed.
48

**48.**

- **F.** NO CHANGE
- **G.** while not being noticed.
- **H.** as no one notices.
- **J.** DELETE the underlined portion and end the sentence with a period.

**GO ON TO THE NEXT PAGE.**

The tenacious and spirited way for the Brooklyn Dodgers[49] Jackie Robinson played baseball was a reflection of his focus on civil rights. From the outset of the "Great Experiment"

**49.** The best placement for the underlined portion would be:

**A.** where it is now.
**B.** after the word *baseball.*
**C.** after the word *focus.*
**D.** after the word *rights.*

of having African-Americans in baseball; he[50] knew that his performance on the field would be a determining factor in sports segregation. Jackie gradually converted jeers and

**50.** **F.** NO CHANGE
**G.** baseball, and he
**H.** baseball. He
**J.** baseball, he

harassment into cheers and acceptance because white spectators[51] could see his immense talent from any seat in the stadium. Jackie became a highly respected figure by continually succeeding on and off the field, all the while displaying stoic

**51.** Which choice fits most specifically with the information at the end of this sentence?

**A.** NO CHANGE
**B.** people
**C.** popcorn vendors
**D.** pitchers

restraint in the face of initial prejudice. [52]

**52.** If the writer were to delete this paragraph from the essay, which of the following would be lost?

**F.** A scientific explanation of the "Great Experiment"
**G.** A description of the way Jackie influenced society's outlook on segregation in baseball
**H.** A passionate plea to end prejudice around the world
**J.** A comment on why the Brooklyn Dodgers were the best team in baseball

[1] The vast amount of energy Jackie expended avoiding a myriad of potential pitfalls could have caused an ordinary man to wilt; for example,[53] Jackie instinctively and relentlessly increased his efforts for positive civil rights changes, both in his sport and in the African-American community at large.

**53.** **A.** NO CHANGE
**B.** as a result,
**C.** rather,
**D.** therefore,

[2] While many athletes today use their[54] status to garner endorsements and live as celebrities, Jackie constantly utilized his

**54.** **F.** NO CHANGE
**G.** his
**H.** its
**J.** theirs

**GO ON TO THE NEXT PAGE.**

status to stimulate civil rights advancements. [55] [3] He often used his baseball travels as opportunities to speak publicly to blacks in U.S. cities about ending segregation and vigilantly defending their rights. [4] Post-baseball, Jackie became an entrepreneur, but[56] his focus did not stray as he found time to write impassioned letters and telegrams to various U.S. presidents during the civil rights movement. [5] He had the status to demand that they too remain firmly focused on civil rights measures. [57]

Though Jackie Robinson's baseball exploits may be most widely known[58] than his tireless efforts in the civil rights movement his[59] astonishing courage on the baseball field was itself a resounding stance against segregation and inequality. His numerous detractors consistently found that not only was Jackie undeterred, but he was excelling in his efforts. As a result,[60] the spark of positive change was ignited. Jackie turned that spark for civil rights into a torch and carried it his entire life.

**55.** The writer is considering deleting the preceding sentence. Should this sentence be kept or deleted?

- **A.** Kept, because it describes important information about Jackie Robinson's endorsement deals.
- **B.** Kept, because it helps the reader understand how Jackie Robinson sacrificed personal advancement in favor of civil rights work.
- **C.** Deleted, because it doesn't provide exact details about the civil rights laws that Jackie Robinson enacted.
- **D.** Deleted, because it draws focus toward other athletes and away from Jackie Robinson.

**56.**
- **F.** NO CHANGE
- **G.** entrepreneur,
- **H.** entrepreneur
- **J.** entrepreneur; and

**57.** If the writer were to divide the preceding paragraph into two shorter paragraphs in order to differentiate between Jackie's civil rights activism during and after his baseball career, the new paragraph should begin with Sentence:

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

**58.**
- **F.** NO CHANGE
- **G.** very widely known
- **H.** more widely known
- **J.** widelier known

**59.**
- **A.** NO CHANGE
- **B.** movement. His
- **C.** movement; his
- **D.** movement, his

**60.** Which of the following alternatives to the underlined portion would be LEAST acceptable?

- **F.** Consequently,
- **G.** Instead,
- **H.** Thus,
- **J.** Therefore,

**GO ON TO THE NEXT PAGE.**

**PASSAGE V**

**Antarctica's Adaptable Survivors**

Many inhabit sporadic green patches of moss; (61) fertilized by excrement from migrating birds and sheltered by the rocky mountainsides. Some hibernate in the winter, frozen in ice under rocks and stones, becoming active (62) again when the climate warms and the ice is melting. (63) Extreme cold and wind are all good to go for survival; (64) indeed, some species are able to endure temperatures as low as –30 degrees Celsius. These adaptable invertebrates classified as arthropods; (65) are able to survive on a continent once thought to arctic, to windy, and to icy, (66) to maintain any permanent land animals. The coldest place on earth, Antarctica is home to great quantities of life that don't simply tolerate the lower temperatures; they (67) flourish in them.

Microscopic mites, springtails, and wingless midges accompanied (68) lice and ticks as the most prevalent permanent land fauna on Antarctica. The tiny midges and mites tolerate the cold due to the antifreeze liquid they carry in their bodies. Parasitic lice and ticks seek shelter from the harsh climate in the

**61.** **A.** NO CHANGE
**B.** patches, of moss
**C.** patches, of moss,
**D.** patches of moss

**62.** Which of the following options to the underlined portion would NOT be acceptable?

**F.** stones, only to become active
**G.** stones. Becoming active
**H.** stones. Then they become active
**J.** stones and then become active

**63.** **A.** NO CHANGE
**B.** melting.
**C.** melts.
**D.** to melt.

**64.** **F.** NO CHANGE
**G.** cool for survival;
**H.** all right for survival;
**J.** suitable for survival;

**65.** **A.** NO CHANGE
**B.** invertebrates, classified as arthropods
**C.** invertebrates, classified as arthropods,
**D.** invertebrates classified as arthropods,

**66.** **F.** NO CHANGE
**G.** to arctic, to windy, and to icy
**H.** too arctic, too windy, and too icy
**J.** too, arctic, too windy, and too icy,

**67.** Which of the following options to the underlined portion would NOT be acceptable?

**A.** temperatures they
**B.** temperatures; in fact, they
**C.** temperatures. They
**D.** temperatures—they

**68.** **F.** NO CHANGE
**G.** accompany
**H.** had accompanied
**J.** were accompanying

**GO ON TO THE NEXT PAGE.**

warm fur of seals, the waters of Antarctica teeming with marine life, and the feathers of sea birds and penguins.

In the Dry Valleys located on the western coast of McMurdo Sound in Antarctica, nematode worms feed on bacteria, algae, and tiny organisms known as rotifers and tardigrades. [70] Here, ice-covered land is not as abundant. Beneath the moss-covered polar rock, nematodes thrive, coping ingeniously by dehydrating themselves in the winter with the low temperatures and coming back to life with the summer and increasing moisture.

**69.** **A.** NO CHANGE
**B.** seals, who return to land to breed,
**C.** seals, six different types in all,
**D.** seals

**70.** The writer is considering deleting the following phrase from the previous sentence (and adjusting the capitalization accordingly):

> In the Dry Valleys located on the western coast of McMurdo Sound in Antarctica,

Should this phrase be kept or deleted?

**F.** Deleted, because this fact is presented later in this paragraph.
**G.** Deleted, because it negates the preceding paragraph, which makes it clear that only insects live in Antarctica.
**H.** Kept, because it clarifies that nematodes live both in Antarctica and McMurdo Sound.
**J.** Kept, because it gives specific details about the "Here" mentioned in the subsequent sentence.

**71.** Given that all the choices are true, which one most explicitly and vividly describes the terrain of McMurdo Sound?

**A.** NO CHANGE
**B.** rocky land is colored vibrantly by green, yellow, and orange lichen, algae, and moss.
**C.** there are signs that this is a place with extremely low humidity and no snow cover.
**D.** the effects of low humidity are apparent in the presence of flora and orange lichen.

**72.** The best place for the underlined portion would be:

**F.** where it is now.
**G.** after the word *thrive*.
**H.** after the word *coping*.
**J.** after the word *moisture*.

**GO ON TO THE NEXT PAGE.**

Algae are another resilient life form of the Dry Valleys of Antarctica. In an effort to adjust to the strong winds and icy temperatures, some algae live inside the rocks as opposed to on top of them. Phytoplankton, the most common of Antarctica's algae, is an important food resource within Antarctica's ecosystem. These tiny free-floating plants are preyed upon by copepods and krill, which then provide food for fish, seals, whales, and penguins. [74]

Excluding its aquatic life, Antarctica has a lower species diversity than any other place on earth. Nevertheless, Antarctica is a haven for 67 documented species of insects and 350 species of flora, proof that life persists in the most dramatic of conditions.

**73.** Given that all the choices are true, which one would LEAST effectively introduce the subject of this paragraph?

**A.** NO CHANGE
**B.** Algae lack the various structures that characterize land plants, such as the moss and lichen that inhabit Antarctica, which is why algae are most prominent in bodies of water.
**C.** Algae are typically autotrophic organisms whose adaptive qualities enable them to live successfully in the Dry McMurdo Valleys.
**D.** Although most often found in water, algae also inhabit terrestrial environments such as the Dry Valleys of Antarctica.

**74.** The writer is considering deleting the following phrase from the preceding sentence:

> which then provide food for fish, seals, whales, and penguins.

Should this clause be kept or deleted?

**F.** Kept, because it clarifies how phytoplankton support Antarctica's ecosystem.
**G.** Kept, because it addresses the most important life forms in Antarctica's waters: seals, penguins, and whales.
**H.** Deleted, because it is irrelevant to the passage as a whole, which addresses the smaller life forms living on Antarctica.
**J.** Deleted, because it misleads the reader into thinking that penguins, seals, and whales are among the permanent land dwelling life forms of Antarctica.

**75.** **A.** NO CHANGE
**B.** Indeed,
**C.** Consequently,
**D.** Therefore,

**END OF TEST 1**
**STOP! DO NOT TURN THE PAGE UNTIL TOLD TO DO SO.**

## MATHEMATICS TEST

*60 Minutes—60 Questions*

**DIRECTIONS:** Solve each problem, choose the correct answer, and then darken the corresponding oval on your answer document.

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

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

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

1. Illustrative figures are NOT necessarily drawn to scale.
2. Geometric figures lie in a plane.
3. The word *line* indicates a straight line.
4. The word *average* indicates arithmetic mean.

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**DO YOUR FIGURING HERE.**

**1.** $|8-5|-|5-8|=?$

**A.** $-6$
**B.** $-5$
**C.** $-3$
**D.** $0$
**E.** $6$

**2.** A science tutor charges $60 an hour to help students with biology homework. She also charges a flat fee of $40 to cover her transportation costs. How many hours of tutoring are included in a session that costs $220 ?

**F.** $2\frac{1}{5}$
**G.** $3$
**H.** $3\frac{2}{3}$
**J.** $4$
**K.** $5\frac{1}{2}$

**3.** Train A averages 16 miles per hour, and Train B averages 24 miles per hour. At these rates, how many more hours does it take Train A than Train B to go 1,152 miles?

**A.** 20
**B.** 24
**C.** 40
**D.** 48
**E.** 72

**4.** $33r^2-24r+75-41r^2+r$ is equivalent to:

**F.** $44r^2$
**G.** $44r^6$
**H.** $-8r^2-24r+75$
**J.** $-8r^4-23r^2+75$
**K.** $-8r^2-23r+75$

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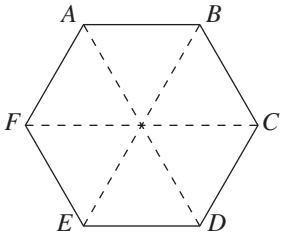
**DO YOUR FIGURING HERE.**

**5.** Six equilateral triangles form the figure below. If the perimeter of each individual triangle is 15 inches, what is the perimeter of *ABCDEF*, in inches?

**A.** 18
**B.** 30
**C.** 60
**D.** $54\sqrt{3}$
**E.** 90




**6.** The expression $(5x + 2)(x - 3)$ is equivalent to:

**F.** $5x^2 + 13x - 6$
**G.** $5x^2 - 13x - 6$
**H.** $5x^2 - 4x + 5$
**J.** $5x^2 - 6$
**K.** $5x^2 - 5$

**7.** If 35% of a given number is 14, then what is 20% of the given number?

**A.** 2.8
**B.** 4.9
**C.** 7.0
**D.** 7.7
**E.** 8.0

**8.** The 7 consecutive integers below add up to 511,
$x - 2$, $x - 1$, $x$, $x + 1$, $x + 2$, $x + 3$, and $x + 4$.
What is the value of $x$ ?

**F.** 71
**G.** 72
**H.** 73
**J.** 74
**K.** 75

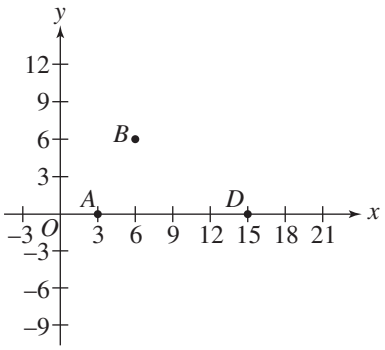
**9.** In the standard $(x,y)$ coordinate plane, point $B$ with coordinates of (5,6) is the midpoint of line $\overline{AC}$, and point $A$ has coordinates at (9,4).What are the coordinates of $C$ ?

**A.** (13, 2)
**B.** ( 7, 5)
**C.** ( 1, 8)
**D.** (14,10)
**E.** (–1,–8)

**GO ON TO THE NEXT PAGE.**

DO YOUR FIGURING HERE.

**10.** Isosceles trapezoid $ABCD$, with equal sides $\overline{AB}$ and $\overline{CD}$, has vertices $A$ (3,0), $B$ (6,6), and $D$ (15,0). These vertices are graphed below in the standard $(x,y)$ coordinate plane below. What are the coordinates of one possible vertex $C$ ?




**F.** (11,7)
**G.** (13,6)
**H.** (12,6)
**J.** (13,5)
**K.** (12,7)

**11.** The town of Ashville has three bus stations (A, B, and C) that offer round-trip fares to its business district at both peak and off-peak rates. The matrices below show the average weekly sales for each station at each rate and the costs for both rates. In an average week, what are the combined peak and off-peak sales for Ashville's three bus stations?

| | Peak | Off-peak |
|---|---|---|
| A | 180 | 60 |
| B | 200 | 120 |
| C | 150 | 70 |

| | Cost |
|---|---|
| Peak | \$3 |
| Off-peak | \$2 |

**A.** \$ 780
**B.** \$1,590
**C.** \$1,950
**D.** \$2,090
**E.** \$2,340

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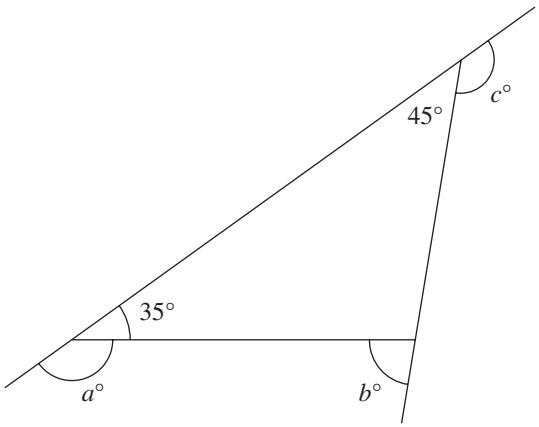
**12.** The triangle shown below has exterior angles $a$, $b$, and $c$. What is the sum of those angles?

DO YOUR FIGURING HERE.




**F.** 360°
**G.** 315°
**H.** 225°
**J.** 180°
**K.** Cannot be determined from the information given

Use the following information to answer questions 13–15.

A sample of 300 jellybeans was removed from a barrel of jellybeans. All of the jellybeans in the barrel are one of four colors: red, orange, green, and purple. For the sample, the number of jellybeans of each color is shown in the table below.

| Color | Number of jellybeans |
|---|---|
| red | 75 |
| orange | 120 |
| green | 60 |
| purple | 45 |

**13.** What percent of the jellybeans in the sample are green?

**A.** 15%
**B.** 20%
**C.** 25%
**D.** 40%
**E.** 60%

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DO YOUR FIGURING HERE.

**14.** The sample of jellybeans was removed from a barrel containing 25,000 jellybeans. If the sample is indicative of the color distribution in the barrel, which of the following is the best estimate of the number of red jellybeans in the barrel?

**F.** 3,750
**G.** 5,000
**H.** 6,250
**J.** 10,000
**K.** 18,750

**15.** If the information in the table were converted into a circle graph (pie chart), then the central angle of the sector for orange jellybeans would measure how many degrees?

**A.** 54°
**B.** 72°
**C.** 90°
**D.** 120°
**E.** 144°

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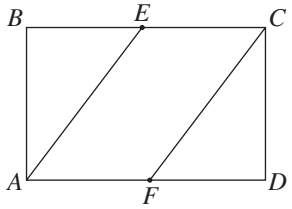
**16.** In rectangle *ABCD* shown below, *E* is the midpoint of $\overline{BC}$, and *F* is the midpoint of $\overline{AD}$. Which of the following is the ratio of the area of quadrilateral *AECF* to the area of the entire rectangle?




**F.** 1:1
**G.** 1:2
**H.** 1:3
**J.** 1:4
**K.** 2:5

**17.** In the standard $(x,y)$ coordinate plane, what is the slope of the line parallel to the line $y = \frac{1}{2}x - 3$ ?

**A.** –3

**B.** –2

**C.** $-\frac{1}{2}$

**D.** $\frac{1}{2}$

**E.** 2

GO ON TO THE NEXT PAGE.

**DO YOUR FIGURING HERE.**

**18.** Aru watches a movie that is 120 minutes long in 2 sittings. The ratio of the 2 sitting times is 3:5. What is the length, in minutes, of the longer sitting?

**F.** 8
**G.** 15
**H.** 45
**J.** 60
**K.** 75

**19.** Which of the following could be a value of $x$ if $11 < x < 12$ ?

**A.** $\sqrt{23}$
**B.** $\sqrt{121}$
**C.** $\sqrt{140}$
**D.** $\sqrt{145}$
**E.** $\sqrt{529}$

**20.** Susan is planning the layout of her garden. She wants to plant tomatoes in 3 plots, each 10 feet by 16 feet. Within the total area, she will leave a 4-foot-by-6-foot rectangular plot for beans, and a $2\frac{1}{2}$-foot-by-5-foot rectangular plot for lettuce. If each packet of tomato seeds will cover between 150 and 200 square feet of soil, which of the following is the minimum number of packets of seeds Susan needs to buy to plant tomatoes?

**F.** 5
**G.** 4
**H.** 3
**J.** 2
**K.** 1

**21.** What values of $x$ are solutions in the equation $x^2 + 4x = 12$ ?

**A.** 8 and 12
**B.** 0 and 4
**C.** –2 and 6
**D.** –4 and 0
**E.** –6 and 2

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**DO YOUR FIGURING HERE.**

**22.** For all $xy \neq 0$, and when both $x$ and $y$ are greater than 1, the expression $\frac{x^4y^2}{x^2y^4}$ equals which of the following?

**F.** $-\frac{x^2}{y^2}$

**G.** $-\frac{y^2}{x^2}$

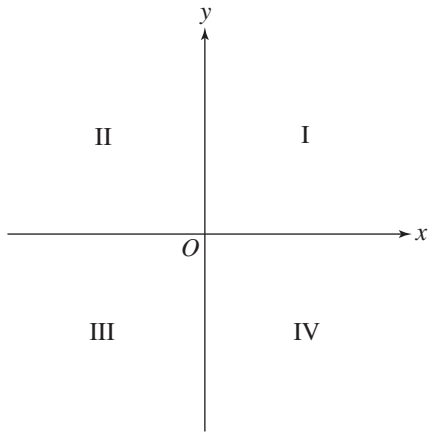
**H.** 1

**J.** $\frac{x^2}{y^2}$

**K.** $\frac{y^2}{x^2}$

**23.** If point $A$ has a non-zero $x$-coordinate and a non-zero $y$-coordinate and at least one of these coordinate values is positive, then point $A$ *must* be located in which of the 4 quadrants labeled below?

Quadrants of the standard $(x,y)$ coordinate plane




**A.** I only
**B.** I or II only
**C.** II or IV only
**D.** II, III, or IV only
**E.** I, II, or IV only

**24.** The variable cost to produce a box of paper is \$4.75. The fixed cost for the paper production machinery is \$1,600.00 each day. Which of the following expressions correctly models the cost of producing $b$ boxes of paper each day?

**F.** $1{,}600b + 4.75$
**G.** $1{,}600b - 4.75$
**H.** $1{,}600 + 4.75b$
**J.** $4.75b - 1600$
**K.** $1{,}600b$

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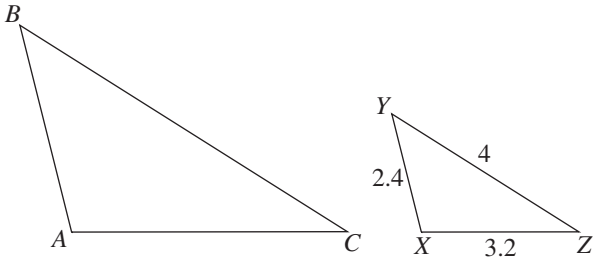
**DO YOUR FIGURING HERE.**

**25.** In the figure below, where $\Delta ABC \sim \Delta XYZ$, lengths are given in inches and the perimeter of $\Delta ABC$ is 576 inches. What is the length, in inches, of $\overline{AC}$ ?

(Note: The symbol ~ means "is similar to.")




**A.** $126\frac{2}{5}$

**B.** 144

**C.** $168\frac{1}{5}$

**D.** 192

**E.** 240

**26.** Given that $\frac{\sqrt{11}}{x} \times \frac{6}{\sqrt{11}} = \frac{3\sqrt{11}}{11}$, what is the value of $x$ ?

**F.** 6

**G.** 11

**H.** 121

**J.** $\sqrt{11}$

**K.** $2\sqrt{11}$

**27.** Natalie starts at the finish line of a straight 1,300-foot track and runs to the left toward the starting line at a constant rate of 12 feet per second. Jonathon starts 150 feet to the right of the starting line and runs to the right toward the finish line at a constant rate of 9 feet per second. To the nearest tenth of a second, after how many seconds will Natalie and Jonathon be at the same point on the track?

**A.** 483.3
**B.** 383.3
**C.** 63.7
**D.** 54.8
**E.** 10.9

**GO ON TO THE NEXT PAGE.**

**28.** Steve is going to buy an ice-cream sundae. He first must choose 1 of 3 possible ice-cream flavors. Next, he must choose 1 of 2 types of syrup. Finally, he must choose 1 of 6 kinds of candy toppings. Given these conditions, how many different kinds of sundaes could Steve possibly order?

**F.** 162
**G.** 36
**H.** 18
**J.** 9
**K.** 6

**DO YOUR FIGURING HERE.**

**29.** The width of a rectangular cardboard box is half its length and twice its height. If the box is 12 cm long, what is the volume of the box in cubic centimeters?

**A.** 72
**B.** 216
**C.** 252
**D.** 1,296
**E.** 1,728

**30.** At the end of each month, a credit card company uses the formula $D = B(1 + r) + 10m^2$ to calculate debt owed, where $D$ is the cardholder's total debt; $B$ is the amount charged to the card; $r$ is the rate of interest; and $m$ is the number of payments the cardholder has previously missed. If Daniel has charged $2,155 to his credit card with a 13% interest rate and has missed 2 payments, which value is closest to Daniel's total credit card debt?

**F.** $2,195
**G.** $2,435
**H.** $2,455
**J.** $2,475
**K.** $2,495

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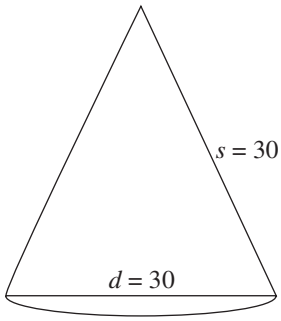
**DO YOUR FIGURING HERE.**

**31.** In the figure below, a cone is shown, with dimensions given in centimeters. What is the total surface area of this cone, in square centimeters? (Note: The total surface area of a cone is given by the expression $\pi r^2 + \pi rs$, where $r$ is the radius and $s$ is the slant height.)




**A.** $225\pi$
**B.** $450\pi$
**C.** $465\pi$
**D.** $675\pi$
**E.** $18{,}000\pi$

**32.** Given the functions $f$ and $g$ are defined as $f(a) = 3a - 4$ and $g(a) = 2a^2 + 1$, what is the value of $f(g(a))$ ?

**F.** $6a^2 - 1$
**G.** $6a^2 - 3$
**H.** $2a^2 + 3a - 3$
**J.** $-2a^2 + 3a + 3$
**K.** $18a^2 - 48a + 33$

**33.** The table below shows the results of a recent poll in which 262 high school students were asked to rank a recent movie on a scale from 1 to 5 stars. To the nearest hundredth, what was the average star-rating given to this movie?

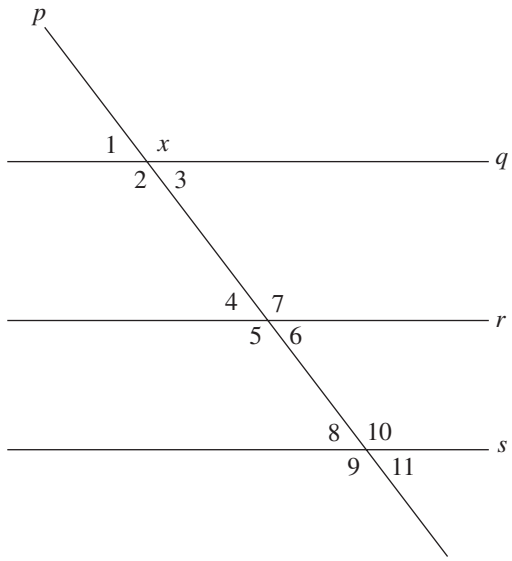
| Stars given | Number of students who gave this rating |
|---|---|
| 1 | 51 |
| 2 | 18 |
| 3 | 82 |
| 4 | 49 |
| 5 | 62 |

**A.** 0.31
**B.** 2.02
**C.** 3.06
**D.** 3.20
**E.** 18.8

**GO ON TO THE NEXT PAGE.**

**DO YOUR FIGURING HERE.**

**34.** Lines $p$, $q$, $r$, and $s$ are shown in the figure below and the set of all angles that are supplementary to $\angle x$ is {1,3,8,11}. Which of the following is the set of all lines that *must* be parallel?




**F.** $\{q,r\}$
**G.** $\{q,s\}$
**H.** $\{r,s\}$
**J.** $\{p,q\}$
**K.** $\{q,r,s\}$

**35.** $(4x^4y^4)^4$ is equivalent to:

**A.** $xy$
**B.** $16x^8y^8$
**C.** $16x^{16}y^{16}$
**D.** $256x^8y^8$
**E.** $256x^{16}y^{16}$

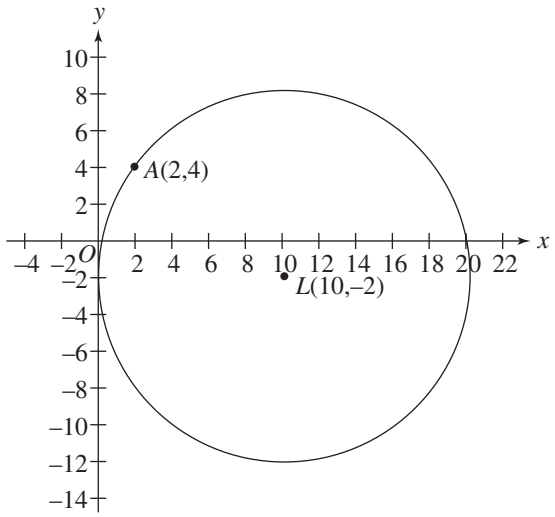
**36.** Which of the following expressions is equivalent to the inequality $6x - 8 > 8x + 14$ ?

**F.** $x < -11$
**G.** $x > -11$
**H.** $x < -3$
**J.** $x > -3$
**K.** $x < 11$

**GO ON TO THE NEXT PAGE.**

**DO YOUR FIGURING HERE.**

**37.** As shown in the standard $(x,y)$ coordinate plane below, $A$ (2,4) lies on the circle with center $L$ (10,–2) and radius 10 coordinate units. What are the coordinates of the image of $A$ after the circle is rotated 90° counterclockwise (↺) about the center of the circle?




**A.** (10, 2)
**B.** (–2, 10)
**C.** ( 2, –8)
**D.** ( 0, –2)
**E.** ( 4,–10)

**38.** The length of the hypotenuse of the right triangle figured below is 16, and the length of one of its legs is 12. What is the cosine of angle θ ?

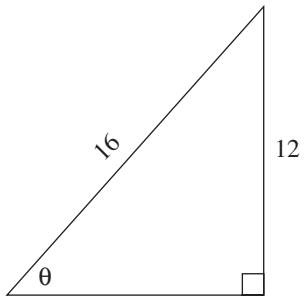
**F.** $\frac{\sqrt{112}}{16}$

**G.** $\frac{16}{\sqrt{112}}$

**H.** $\frac{\sqrt{112}}{12}$

**J.** $\frac{12}{16}$

**K.** $\frac{16}{12}$

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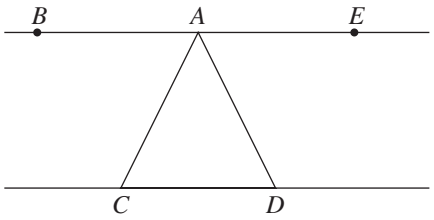
**DO YOUR FIGURING HERE.**

**39.** In the figure shown below, $\overline{CA}$ bisects $\angle BAD$, and $\overline{DA}$ bisects $\angle CAE$. What is the measure of $\angle CAD$ ?




**A.** 30º
**B.** 45º
**C.** 60º
**D.** 90º
**E.** Cannot be determined from the given information

**40.** If the average number of carbon dioxide molecules per cubic inch in a container is $3 \times 10^4$ and there are $6 \times 10^8$ molecules of carbon dioxide in the container, what is the volume of the container in cubic inches?

**F.** $5 \times 10^5$
**G.** $2 \times 10^2$
**H.** $2 \times 10^4$
**J.** $18 \times 10^{12}$
**K.** $18 \times 10^{32}$

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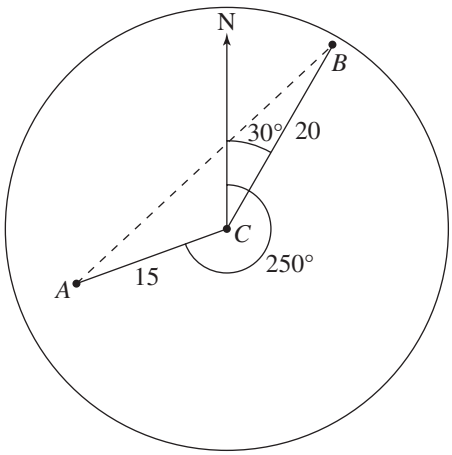
**DO YOUR FIGURING HERE.**

**41.** The figure below shows the screen of an automobile navigation map. Point *A* represents the car's starting point, point *B* represents the driver's intended destination, and point *C*, the center of the circle, is the car's current position. Currently, point *A* is 15 miles from point *C* and 250º clockwise from due north, and point *B* is 20 miles from point *C* and 30º clockwise from due north. Which of the following represents the shortest distance (a straight line) between the car's starting point and the driver's desired destination?

(Note: For any $\Delta ABC$ in which side $a$ is opposite $\angle A$, side $b$ is opposite $\angle B$, and side $c$ is opposite $\angle C$, the law of cosines applies: $c^2 = a^2 + b^2 - 2ab\cos\angle C$.)




**A.** $\sqrt{15^2 + 20^2 - 2(15)(20)\cos 30^\circ}$

**B.** $\sqrt{15^2 + 20^2 - 2(15)(20)\cos 140^\circ}$

**C.** $\sqrt{15^2 + 20^2 - 2(15)(20)\cos 220^\circ}$

**D.** $\sqrt{15^2 + 20^2 - 2(15)(20)\cos 250^\circ}$

**E.** $\sqrt{15^2 + 20^2 - 2(15)(20)\cos 280^\circ}$

**42.** What real number is halfway between $\frac{1}{4}$ and $\frac{1}{6}$?

**F.** $\frac{1}{6}$

**G.** $\frac{1}{5}$

**H.** $\frac{1}{2}$

**J.** $\frac{5}{24}$

**K.** $\frac{7}{24}$

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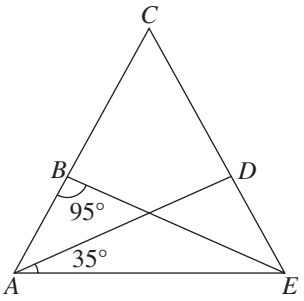
**DO YOUR FIGURING HERE.**

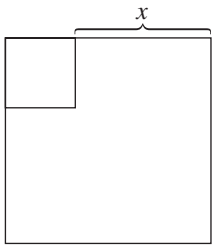
**43.** In isosceles triangle $\Delta ACE$, shown below, $B$ and $D$ are the midpoints of congruent sides $\overline{AC}$ and $\overline{CE}$, respectively. $\angle ABE$ measures 95°, and $\angle DAE$ measures 35°. What is the measure of $\angle DEB$ ?




**A.** 50°
**B.** 30°
**C.** 25°
**D.** 15°
**E.** 10°

**44.** A small square table and an L-shaped table fit together with no space between them to create a large square table. The area of the large square table is 108 square feet and is nine times the area of the small square. What is $x$, the edge of the L-shaped table labeled in the figure below in square feet?

**F.** $2\sqrt{3}$
**G.** 4
**H.** $4\sqrt{3}$
J. $4\sqrt{6}$
**K.** 12




**45.** Which of the following is NOT an irrational number?

**A.** $\sqrt{\pi}$
**B.** $\sqrt{5}$
**C.** $\sqrt{8}$
**D.** $\sqrt{\frac{7}{49}}$
**E.** $\sqrt{\frac{81}{25}}$

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**DO YOUR FIGURING HERE.**

**46.** If $x < 0$ and $y < 0$, then $|x + y|$ is equivalent to which of the following?

**F.** $x + y$

**G.** $-(x + y)$

**H.** $x - y$

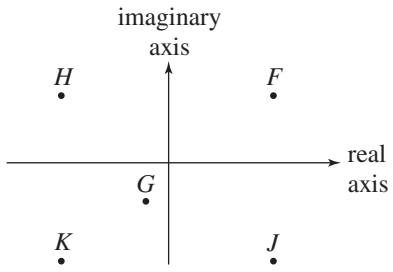
**J.** $|x - y|$

**K.** $\sqrt{x^2 + y^2}$

**47.** Jane wants to bring her bowling average up to an 85 with her performance on her next game. So far she has bowled 5 out of 7 equally weighted games, and she has an average score of 83. What must her score on her next game be in order to reach her goal?

**A.** 83
**B.** 85
**C.** 90
**D.** 93
**E.** 95

**48.** In a complex plane, the vertical axis is the *imaginary axis* and the horizontal axis is the *real axis*. Within the complex plane, a complex number $a + bi$ is comparable to the point $(a,b)$ in the standard $(x,y)$ coordinate plane. $\sqrt{a^2 + b^2}$ is the modulus of the complex point $a + bi$. Which of the complex numbers *F, G, H, J,* and *K* below has the smallest modulus?




**F.** *F*
**G.** *G*
**H.** *H*
**J.** *J*
**K.** *K*

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**DO YOUR FIGURING HERE.**

**49.** In the real numbers, what is the solution of the equation $9^{x-4} = 27^{3x+2}$ ?

**A.** $-\frac{6}{7}$

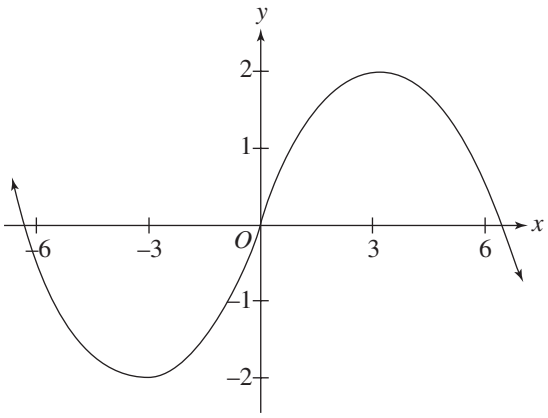
**B.** –2

**C.** –3

**D.** $-\frac{7}{2}$

**E.** –4

**50.** The graph of the trigonometric function $f(x) = 2 \sin \frac{1}{2} x$ is represented below. Which of the following is true of this function?




**F.** $f(x)$ is a 1:1 function (that is, $x$ is unique for all $f(x)$ and $f(x)$ is unique for all $x$).

**G.** $f(x)$ is undefined at $x = 0$.

**H.** $f(x)$ is even (that is, $f(x) = f(-x)$ for all $x$).

**J.** $f(x)$ is odd (that is, $f(-x) = -f(x)$ for all $x$).

**K.** $f(x)$ falls entirely within the domain $-6 \leq x \leq 6$.

**51.** An integer from 299 through 1,000, inclusive, will be chosen randomly. What is the probability that the number chosen will have 1 as at least 1 of its digits?

**A.** $\frac{234}{1{,}000}$

**B.** $\frac{134}{702}$

**C.** $\frac{70}{702}$

**D.** $\frac{63}{702}$

**E.** $\frac{17}{702}$

**GO ON TO THE NEXT PAGE.**

**DO YOUR FIGURING HERE.**

**52.** In the figure below, side $\overline{MN}$ of isosceles triangle $\Delta NLM$ lies on the line $y+\frac{2}{3}x=2$ in the standard $(x,y)$ coordinate plane, and side $\overline{NL}$ is parallel to the $x$-axis. What is the slope of $\overline{LM}$?

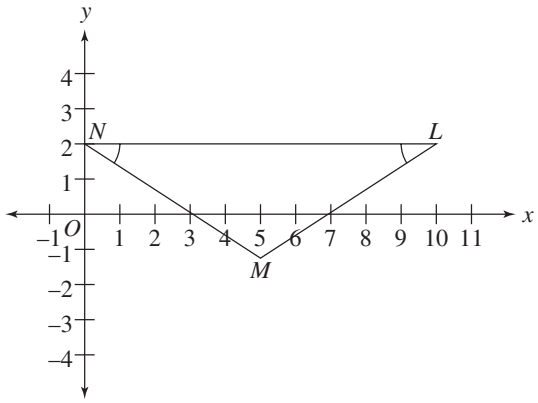
**F.** $\frac{3}{2}$

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

**H.** $\frac{1}{3}$

**J.** $-\frac{2}{3}$

**K.** $-\frac{3}{2}$




**53.** In the figure below, $0 < y < x$. One of the angle measures in the triangle is $\sin^{-1}\left(\frac{x}{\sqrt{x^2+y^2}}\right)$. What is $\tan\left[\sin^{-1}\left(\frac{x}{\sqrt{x^2+y^2}}\right)\right]$?

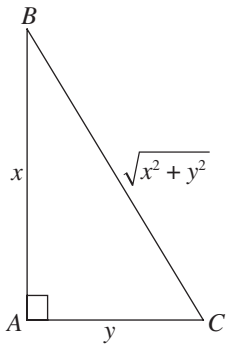
**A.** $\frac{x}{y}$

**B.** $\frac{y}{x}$

**C.** $\frac{x}{\sqrt{x^2+y^2}}$

**D.** $\frac{y}{\sqrt{x^2+y^2}}$

**E.** $\frac{\sqrt{x^2+y^2}}{x}$

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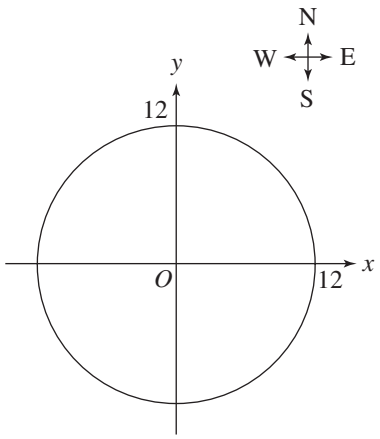
DO YOUR FIGURING HERE.

Use the following information to answer questions 54–56.

Melissa attaches her dog's leash to a metal anchor in the grass so that the dog can roam only within a radius of 12 feet in any direction from the anchor. A map of the area accessible to the dog is shown below in the standard $(x,y)$ coordinate plane, with the anchor at the origin and 1 coordinate unit representing 1 foot.




**54.** Which of the following is closest to the area, in square feet, the dog can roam?

**F.** 75
**G.** 144
**H.** 452
**J.** 904
**K.** 1,420

**55.** Which of the following is an equation of the circle shown on the map?

**A.** $(x - y)^2 = 12$
**B.** $(x + y)^2 = 12$
**C.** $(x + y)^2 = 12^2$
**D.** $x^2 + y^2 = 12$
**E.** $x^2 + y^2 = 12^2$

GO ON TO THE NEXT PAGE.

**DO YOUR FIGURING HERE.**

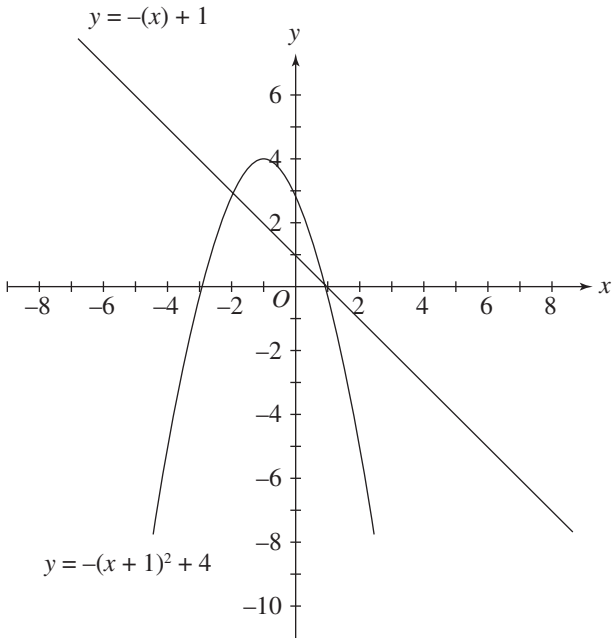
**56.** Joy brings her dog to the same park and anchors her dog 30 feet away from Melissa's anchor along a walking trail. Joy's dog can roam only within a radius of 20 feet in all directions from its anchor. For how many feet along the walking trail can *both* dogs roam?

(Note: Assume the leashes can't stretch.)

**F.** 2
**G.** 8
**H.** 10
**J.** 18
**K.** 42

---

**57.** The graphs of the equations $y = -(x) + 1$ and $y = -(x+1)^2 + 4$ are shown in the standard $(x,y)$ coordinate plane below. What real values of $x$, if any, satisfy the following inequality: $-(x + 1)^2 + 4 > -(x) + 1$ ?




**A.** $x < -3$ and $x > 1$
**B.** $x < -2$ and $x > 1$
**C.** $-3 < x < 1$
**D.** $-2 < x < 1$
**E.** No real values

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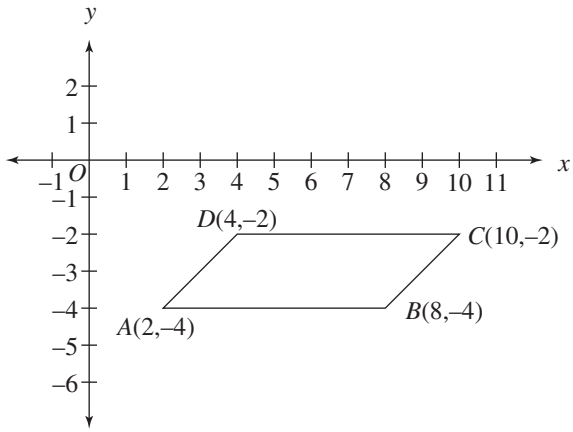
**DO YOUR FIGURING HERE.**

**58.** For any positive two-digit integer $x$ with tens digit $t$, units digit $u$, and $t \neq u$, $y$ is the two-digit integer formed when the digits of $x$ are reversed. What is the greatest possible value of $(y - x)$ when $t$ is less than $u$ ?

**F.** $u - t$
**G.** $ut - tu$
**H.** $t^2 - 10tu + u^2$
**J.** $9|u - t|$
**K.** Cannot be determined from the given information

**59.** In the figure below, the vertices of parallelogram $ABCD$ are $A$ (2,–4), $B$ (8,–4), $C$ (10,–2), and $D$ (4,–2). What is the area of the parallelogram?




**A.** 6
**B.** $6\sqrt{2}$
**C.** 12
**D.** $12\sqrt{2}$
**E.** 16

**60.** The sum, $S$, of an arithmetic sequence with first term $x_1$ is given by $S = n\left(\frac{x_1 + x_n}{2}\right)$, where $n$ is the number of terms in the sequence. The sum of 5 consecutive terms in a given arithmetic sequence is 145, and $x_5$ is 48. What is the sixth term of this sequence?

**F.** 49
**G.** 57.5
**H.** 77
**J.** 154.5
**K.** 174

**END OF TEST 2**
**STOP! DO NOT TURN THE PAGE UNTIL TOLD TO DO SO.**
**DO NOT RETURN TO THE PREVIOUS TEST.**

## READING TEST

*35 Minutes—40 Questions*

**DIRECTIONS:** There are four passages in this test. Each passage is followed by several questions. After reading each passage, choose the best answer to each question and blacken the corresponding oval on your answer document. You may refer to the passages as often as necessary.

### Passage I

**PROSE FICTION:** This passage is adapted from the short story "A Prisoner in His Castle" by Curtis Longweather (© 2008 by Curtis Longweather).

Since he returned from the hospital, he has been unable to reclaim his speaking voice. That is not to say that he can't make sounds, but that he often can't make his thoughts into sounds like words and sentences. Something is polluting the chemistry that distills mental language into vocal output. His mind lights up with ideas just like mine does, but his ideas cannot escape. His thoughts are dispatched like knights to battle only to find they are unable to cross the moat that surrounds their castle. They are held prisoner in their own home, quarantined in frustrated isolation from the outside world.

"I fear that I will eventually choke on my own thoughts," he worries aloud to me in one of his desperate letters.

"Then expel them all on to the page," I remind him. He is a volcano with no air vents to relieve the pressure of the heat churning in his belly. His insides roil with fire, occasionally bubbling to the surface. His core vibrates with tightly coiled anticipation, the roof of his head eventually shedding off all shingles as a prelude to its propelling explosively into the atmosphere.

I tell him that his speaking voice may be like the oceanic cloud of dust and debris that the volcano spews into the air, but his writing can flow like omni-directional lava, indiscriminately absorbing everything in its path. Eventually, the continents that form as this lava cools will be fertile grounds for his readers. Each of his letters stands proudly as an island within the sloshing seas of his mind, and his clarity of prose allows us explorers to navigate him.

"There is plenty of solace in writing," he acknowledges, but maintains, "never explain to someone who can't run that at least he can drive a car."

He will always hear his thoughts as an echo, either reverberating within his own skull or as a crude imitation when transferred by pen.

I concede that the Page's shortcoming is a lack of dynamic human ears, but I optimistically point to the fact that written language has the potential to be seen by *countless* human eyes. It has the potential to be richly revered classical music, not just catchy pop expressions that inspire bystanders to twitch in accordance. It has the advantage of being methodically composed and purposefully orchestrated. However, it can be spontaneous and stream-of-consciousness as well.

"A verbal speech can be a symphony of thought just as an essay can be an improvisational blunder." He responds. "You are wrongly contrasting two styles of music when the more appropriate comparison is two very different instruments."

His distinction is a valid one, but I continue to stubbornly assert the superiority of literary communication. When we *speak* to convey meaning, I argue, we can too easily get away with lazy word choice by using context, body language, tone, and other non-verbal devices to supplement our stated words. In a piece of writing, the words exist in isolation from their author. They belong only to each other, like pirates who share a common destiny but no longer pledge allegiance to any sovereign entity. Judge them by your own standards if you wish to be confused, but realize that the only telling diagnosis rests in the internal consistency of their ways. Do the various tensions created by the professed actions, ideas, and feelings of the writing allow the reader to vicariously behold the mental state of the author? If so, then the reader has the satisfying experience of being simultaneously in the audience and backstage as well.

He enjoys coming to watch me during my trials. Sometimes I look over at him while I am delivering my closing arguments to a jury, and I see the mix of pride and pain in his eyes as he listens to me express myself more lucidly than he may ever be able to again. If my profession would allow it, I would gladly yield my voice to him and become a mere puppet for his ideas, just so he could again experience the instant gratification of vocal persuasion. (I frequently wonder if my friendship with him will ultimately venture into the territory of Cyrano de Bergerac, who so wished to woo the heart of a woman that he enlisted the help of a friend to speak his thoughts aloud to her.)

It is not the organization of thought that he treasures in listening to my courtroom orations. It is the expressiveness that a human voice can add to the meaning of words that he deeply misses. He will occasionally have me rehearse my

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speeches to him and never permits me to begin reciting my words too mechanically. The moment I begin *reading* and not *speaking*, he will clap his hands and signal me to return back to the beginning of the idea.

In this way, just as I continue to remind him of the unspeakable value of written language, he continues to remind me of the irreplaceable value of the human voice.

**1.** As it relates to his friend's fear as described in the second paragraph, the narrator's description of a volcano (lines 13–19) most serves to:

**A.** elaborate the friend's inner torment.
**B.** speculate that his friend's thoughts will be unleashed.
**C.** explain why the friend is unable to speak.
**D.** imply the friend needs to be more patient.

**2.** Which of the following best describes the structure of the passage?

**F.** A detailed character study of two close friends by means of describing one extended argument between them.
**G.** A debate about a topic during which the two main characters take equal turns discussing their positions and reasons.
**H.** An exploration of the author's experience of his friend's speech impairment using their verbal and written exchanges as a primary source.
**J.** The depiction of a unique friendship that allows the narrator to explain his successes and struggles as a lawyer.

**3.** The erupting volcano simile refers to a dust cloud and a lava flow to portray:

**A.** intuition and logic.
**B.** simplicity and complexity.
**C.** instinct and deliberation.
**D.** vocal and non-vocal expression.

**4.** Based on the passage, which of the following statements most clearly portrays the respective attitudes of the narrator and his friend?

**F.** The friend is argumentative and cynical; the narrator is jaded and indifferent.
**G.** The friend is scornful and depressed; the narrator is apologetic and idealistic.
**H.** The friend is anxious and despondent; the narrator is sympathetic and encouraging.
**J.** The friend is shy and reclusive; the narrator is outgoing and nonchalant.

**5.** In the passage, the narrator most nearly describes Cyrano de Bergerac as:

**A.** someone who was afraid of losing the love of his life.
**B.** unable to produce any sound of his own due to a physical condition.
**C.** someone who had reason to communicate indirectly with a woman.
**D.** too caught up in the emotions of love to be able to describe them.

**6.** Which of the following statements about pirates is best supported by the narrator's characterization of them?

**F.** They have no rules of conduct that they must follow.
**G.** They succeed by means of confusing their enemies.
**H.** They are not accountable to anyone other than themselves.
**J.** They recognize the superior value of written language.

**7.** It can be most strongly inferred from the passage that the friend values which of the following in vocal speech?

**A.** Meaningful expression
**B.** Proper mechanics
**C.** Rich vocabulary
**D.** Clever humor

**8.** According to the passage, the friend is worried he may:

**F.** say something embarrassing if he speaks.
**G.** grow exasperated from his inability to vocalize thoughts.
**H.** be damaging the narrator's chances of courtroom success.
**J.** not be clever enough to compose a symphony of thought.

**9.** As it is used in (line 68), the word *puppet* most nearly means:

**A.** entertainer.
**B.** conversationalist.
**C.** toy.
**D.** mouthpiece.

**10.** Based on the narrator's account, the friend's reaction to watching the narrator during legal proceedings is:

**F.** appreciative and yearning.
**G.** confused and hopeless.
**H.** awestruck and overbearing.
**J.** bitter and resentful.

**GO ON TO THE NEXT PAGE.**

## Passage II

**SOCIAL SCIENCE:** This passage is adapted from the entry "Larsen B" in *Down Off the Shelf: Recent Antarctic Natural Disasters* (© 2009 Subzero Publications).

Most people associate Antarctica with frigid temperatures, glaciers, and massive sheets of ice; however, recent geological events highlight not the cold, but issues of warming. Further, such events emphasize the ways in which human behavior influences climactic and geological changes. Though scientists may disagree as to the extent of human influence, there is no doubt that our behavior does have significant and lasting outcomes. One of the most dramatic environmental events in recent years is the loss of ice shelves that float around much of Antarctica; in particular, the collapse of the Larsen B ice shelf. This long, fringing mass was assumed to be the latest in a long line of victims of Antarctic summer heat waves linked to global warming; new research, however, calls this assumption into question.

In 2002, the northern section of the Larsen B ice shelf (a thick floating sheet of freshwater ice fed by glaciers) shattered and separated from the continent in the largest single event in a 30-year series of ice-shelf retreats in the peninsula. The Larsen B was about 220 meters thick and is thought to have existed for at least 400 years prior to its collapse. The shattered ice from Larsen B set thousands of icebergs adrift in the Weddell Sea, east of the Antarctic Peninsula. A total of about 1,250 square miles of shelf area disintegrated in a 35-day period beginning on January 31 of 2002. The collapse was perhaps foreshadowed when standing water appeared on the ice. (Scientists theorize that once melt-water appears on the surface of an ice shelf, the rate of ice disintegration increases; pooling water puts weight on the ice, filling small cracks that expand, eventually causing breakage.) The appearance of standing water on ice shelves is generally attributed to global warming; thus, the collapse of the Larsen B ice shelf seemed to be one of the most obvious and stunning signs of worldwide climate change.

In support of this postulation, the *Journal of Climate* published a 2006 study by Dr. Gareth Marshall of the British Antarctic Survey, providing the first direct evidence linking human activity to the collapse of Antarctic ice shelves. Scientists revealed that stronger westerly winds in the northern Antarctic Peninsula, driven principally by human-induced climate change, are responsible for the significant increase in summer temperatures that led to the retreat and collapse of the Larsen B. They argue that global warming and the ozone hole have changed Antarctic weather patterns such that strengthened westerly winds force warm air eastward over the natural barrier created by the Antarctic Peninsula's mountain chain. Elevated temperatures in the summer warm the area by approximately five degrees Celsius, creating the conditions that allowed melt-water to drain into crevasses on the Larsen ice shelf, a key process that led to its 2002 break-up. Dr. Marshall asserts that this is the first time anyone has demonstrated a process directly linking the collapse to human activity, and that climate change does not impact our planet evenly, as evidenced by the significant increase in temperatures in certain geographical areas, particularly the western Antarctic Peninsula. According to his research, this icy region has shown the largest increase in temperatures observed anywhere on Earth over the past half-century.

Marshall's breakthrough research was followed, two years later, by new and somewhat contradictory information. In a paper published in the Journal of Glaciology, Professor Neil Glasser and Dr. Ted Scambos assert that despite the dramatic nature of the break-up in 2002, observations by glaciologists and computer modeling by scientists at NASA pointed to an ice shelf in distress for decades. Glasser and Scambos contend that the shelf was already teetering on the brink of collapse before the final summer, and though they acknowledge that global warming had a major role in the collapse, they emphasize that it is only one of a number of atmospheric, oceanic and glaciological factors. The amount of melt-water on the Larsen B shelf just before the collapse caused many to assume that air temperature increases were primarily to blame, but Scambos and Glasser's research shows that ice-shelf breakup is not controlled simply by climate, citing, for example, that the location and spacing of crevasses and rifts on the ice do much to determine its strength. Scientists in the field consider this study imperative, as the collapse of ice shelves contributes (albeit indirectly) to global sea-level rise.

Scientists agree that the break-up of Larsen B alone will not change sea level, but other glaciers previously restricted by the ice shelf have surged forward, lowering their surfaces. Since lower elevations have warmer temperatures, these glaciers melt more quickly, causing more ice to flow into the sea, and levels to rise. If more and more ice shelves are lost in subsequent years, the concern is that the rise in sea levels could affect ecosystems worldwide, generating such problems as widespread flooding, loss of coastal cities and island countries, decreased crop yields, and the possible extinction of millions of species. Determining the cause of ice shelf collapse, and the ways in which humans can contribute to both the problem and the solution, may help to prevent such catastrophes in the future; it becomes clear, then, why researchers are compelled to continue their studies of ice shelves in the Antarctic.

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**11.** The author most nearly characterizes the role of human activity in regard to the collapse of ice shelves as:

- **A.** a significant though previously unproven contributing factor.
- **B.** insignificant in comparison to glaciological influences.
- **C.** less of a contributor than initial evidence predicted.
- **D.** the primary and irreversible cause of all detrimental effects.

**12.** The author lists all of the following as possible effects of sea level rise EXCEPT:

- **F.** loss of island countries.
- **G.** extinction of millions of species.
- **H.** decreased crop yields.
- **J.** surging glaciers.

**13.** The author indicates that the common factor in Dr. Marshall's study (lines 34–57) and that of Doctors Scambos and Glasser (lines 58–77) is that both studies:

- **A.** cite global warming as a reason for the Larsen B ice-shelf collapse
- **B.** discredit climate change as a reason for the Larsen B ice-shelf collapse.
- **C.** found little compelling evidence to explain the Larsen B ice-shelf collapse.
- **D.** agree that structural weaknesses caused the Larsen B ice-shelf collapse.

**14.** In his statement in lines 50–55, the author most nearly means that human activity:

- **F.** is inconsequential compared to other factors influencing climate change.
- **G.** could eventually affect weather patterns worldwide, doing great harm.
- **H.** makes certain areas of the world much warmer than they would otherwise be.
- **J.** will cause sea level to rise, wiping out entire countries and species of animals.

**15.** The author calls which of the following a stunning sign of worldwide climate change?

- **A.** Worldwide sea-level rise
- **B.** Melt-water on the Larsen B ice shelf prior to its collapse
- **C.** The collapse of the Larsen B ice shelf
- **D.** Increased temperatures in the western Antarctic Peninsula

**16.** The author includes the findings in lines (64–75) primarily in order to:

- **F.** support the prevailing theory that global warming causes glacier break-up.
- **G.** encourage people to make environmentally-friendly choices in their daily lives.
- **H.** imply that ice shelf break-up is simpler than scientists originally thought.
- **J.** highlight the interaction between factors in a major environmental event.

**17.** The main idea of the third paragraph is that the Larsen B ice-shelf collapse:

- **A.** was not caused by global warming.
- **B.** was foreshadowed for years prior to the event.
- **C.** was caused by the uneven impact of climate change on the earth.
- **D.** was caused in part by direct human activity.

**18.** Which of the following is NOT listed in the passage as a cause of ice-shelf collapse?

- **F.** Global warming
- **G.** Human activity
- **H.** Spacing and location of crevasses and rifts
- **J.** Deep ocean currents

**19.** The author calls the increased westerly winds in the northern Antarctic Peninsula:

- **A.** irrelevant to the problem of ice-shelf collapse.
- **B.** responsible for an increase in summer temperatures.
- **C.** a common weather pattern in certain times of year.
- **D.** an unmistakable warning of sea-level rise.

**20.** The author uses the remark "largest increase in temperatures observed anywhere on Earth" lines (56–57) to:

- **F.** demonstrate how scientists are prone to exaggeration when talking about ice shelves.
- **G.** give a strong incentive for people to change their behavior.
- **H.** explain that global warming doesn't occur at the same rate in all regions.
- **J.** clarify a common misconception about weather patterns in cold areas.

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## Passage III

**HUMANITIES:** This passage is excerpted from the essay "Salman Rushdie: A Man of Multiple Worlds" by Paul Lopez (© 2010 by Paul Lopez). In this selection, the term *partition* refers to the British Empire's official relinquishment of its claim on India, at which point the area was divided into two self-governing countries: India and Pakistan. Also, the contemporary city of Mumbai was known as Bombay during the time this passage discusses.

As well-known for his life story as for his writing, Salman Rushdie is nonetheless a virtuosic author of the first degree. His books are filled with lyrical passages capable of transporting the reader to a kitchen in India, a mountain in Pakistan, or a street corner in London. Although his plots often involve metaphysical or even magical elements, somehow they seem reasonable. He has the art of drawing the reader in, explaining each bizarre incident in such a way that, suddenly, it becomes plausible, if only for the moment.

Born in Bombay, on the Western coast of India, to Muslim parents during the year of the partition, Rushdie grew up amidst the India-Pakistan and Hindi-Muslim struggle. Each group strove to create a new identity and independence, apart from the colonial past, and Rushdie paid close attention to each group's stories. Later, he immigrated to England to attend school, and there too he listened. As an author, he began to integrate these stories, and his books show the complex interplay that exists between these three cultures.

In his books, it is clear that each area has, for him, its own unique beauty. Rushdie's India is a world of food; in one book, he spends pages discussing chutneys—their flavor, their coloring, and their preparation. His Bombay is described as a raucous place, filled with colors, scents that assault the nostrils, and people thronging the streets everywhere you look. It is a place teeming with life and all that life entails. His Pakistan, on the other hand, is a place of stark beauty, and of dry, desert landscapes with communities centered on lakes scattered throughout the countryside. A people that has fought for its independence, filled with a ferocious pride of place, but quiet, withdrawn. A private people, in stark contrast to the overflowing life of India. In Rushdie's Pakistan, it seems, they have room for quiet and have chosen that for themselves. It is also a world of hospitality, but on a personal scale. Instead of describing markets or streets, Rushdie dwells on families and individuals, describing their appearances and behaviors minutely. And finally, there is Rushdie's England. Often, his characters in India and Pakistan long to be in England, causing the reader to wonder if Rushdie himself felt that longing at one time. Once they arrive, however, they often find England disconcerting, its orderly chaos overwhelming to someone unaccustomed to the Western world. The colors too are missing, along with the pungent spices in the air. Even when his characters are describing how happy they are to have made it to their promised land, they cannot seem to leave their homelands completely behind.

It is this merging of three disparate cultures that makes Rushdie's writing stand out. Each culture is made to come alive for the reader, allowing his Western readers a chance to peer into a culture very different from their own. One of his earlier books, written in 1981 and called *Midnight's Children*, takes as its focal point the partition of India. The main character is born at the stroke of midnight, drawing his first breath just as the partition becomes a reality. The book follows the many ways in which this coincidence affects the character throughout his life, tying the events in his personal life to those in the larger life of the country and community, showing that neither one exists separate of the other. While Rushdie was not quite born at the stroke of midnight, he was born a mere month before the partition took place, and he too would have grown up watching the people of India and Pakistan work to create new worlds for themselves. This experience permeates not only *Midnight's Children* but also all of his other works, as he describes characters striving to find a place for themselves in a world that doesn't always make sense. He wants, it seems, for his readers to get a sense of the struggle to merge yet stay distinct.

In the end, many writers have discussed colonialism, independence, and migration, but none perhaps as engagingly as Rushdie. As interesting as his subjects are, certainly the way his prose draws readers into his world has been the essential factor in making his work so enduring. His books may not be the first, but they are some of the most prominent books to deal with these subjects and, as such, have had a profound influence on the works of other writers, as well as on the reading public. No matter what the future holds, the portraits of India and Pakistan drawn by Rushdie will continue to influence the literary world for years to come.

**21.** The first paragraph establishes all of the following about Rushdie EXCEPT:

- **A.** his intention to make Western readers more aware of what life in India and Pakistan is like.
- **B.** the kinds of elements that might be included in Rushdie's writing.
- **C.** whether or not he is well-known in his chosen profession.
- **D.** some of the locations he tends to use in his writing.

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**22.** The primary function of the second paragraph (lines 10–18) is to:

- **F.** discuss Rushdie's religious upbringing and personal faith.
- **G.** give some background information on Rushdie's childhood.
- **H.** contrast the Hindi and Muslim belief systems.
- **J.** list all the factors that led to Rushdie's emigration from India.

**23.** Which of the following statements most correctly identifies the main idea of the passage?

- **A.** Rushdie is a highly talented writer but his personal failings prevent readers from empathizing with his characters.
- **B.** The partition of India was a traumatic experience for the many people who were compelled to move in the years following the division.
- **C.** Rushdie uses his personal life experiences to describe for readers what life is like in the part of the world where he grew up.
- **D.** The book *Midnight's Children* is an insightful book about the events surrounding the official partition of India.

**24.** All of the following details are used in the passage to describe Rushdie's vision of Bombay EXCEPT that it:

- **F.** is filled with scents, some of which can be very pungent.
- **G.** is a place filled with many colors.
- **H.** is typically very hot and humid, with temperatures reaching uncomfortable levels.
- **J.** is overwhelmed with people and life.

**25.** One of the main points in the fourth paragraph is that, in his writing, Rushdie is trying to convey a sense of:

- **A.** futility.
- **B.** sadness.
- **C.** struggle.
- **D.** longing.

**26.** Which of the following questions is NOT answered in the passage?

- **F.** In general terms, which parts of the world tend to be prominently featured in Rushdie's works?
- **G.** How do Rushdie's descriptions of the Pakistani people differ from his descriptions of the Indian people?
- **H.** In which part of the world was Rushdie himself born?
- **J.** How many books had Rushdie, at the time of this essay's publication, written?

**27.** According to the passage, in which of the following countries did Rushdie attend school?

- **A.** Pakistan
- **B.** England
- **C.** India
- **D.** America

**28.** Which of the following words is the best characterization of Rushdie's Bombay, according to this passage?

- **F.** Frustrating
- **G.** Chaotic
- **H.** Vibrant
- **J.** Stark

**29.** The information in lines 69–71 is most likely included by the author in order to suggest:

- **A.** that it is Rushdie's skill as a writer, rather than his subjects alone, that has brought him lasting fame.
- **B.** Rushdie's tendency to rely too heavily on historical events for the plots of his novels.
- **C.** Rushdie's likelihood of remaining a literary icon well into the future is very uncertain.
- **D.** that the subjects that Rushdie writes about aren't actually very interesting to most people.

**30.** The passage suggests that Rushdie's most important contribution to literature is his:

- **F.** description of Pakistan's landscapes.
- **G.** portrayal of India's partition.
- **H.** ability to draw readers into his world.
- **J.** beautifully crafted prose.

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## Passage IV

**NATURAL SCIENCE:** This passage is excerpted from the article "Alternative Medicines: A New Perspective" by Audrey C. Tristan (© 2004 by Audrey Tristan).

The view of health as a holistic and integrative state of physical, spiritual, and emotional well-being is deeply rooted in mind-body philosophies that have survived thousands of years. Traditional *mindful movement* therapies found in *yoga, tai chi,* and *qigong,* for example, couple aerobic and anaerobic exercise with mental focus. These practices, which originated in Eastern medicine, guide participants through a series of specialized movements synchronized to the breath and mental images. Involving more than cardiovascular activity, these exercise routines are said to improve overall health by bringing deeper awareness to the body and promoting strength, flexibility, and balance.

Modern Western biomedicine, on the other hand, has advanced largely by splitting the mind and body to allow for the objective study of health and disease mechanisms, and thus has been slow to embrace the implications of mind-body health. However, as alternative and traditional therapies have become increasingly more popular and available in the West, researchers have begun to delve deeper into mind-body therapy efficacy, that is, the ability to consistently produce a desired, therapeutic effect.

There is particularly solid research to support the use of mind-body therapy to counteract the debilitating effects of stress. Certain mind-body therapies may alter the way we experience pain and manage stress through the use of conscious strategies to avert automatic responses. Stress, as defined in biomedical terms, is the physiological response to a perceived threat. It is not to be confused with the common usage of the term, which generally equates stress with those activities that provoke a stress response (these are deemed *stressors*). When the central nervous system perceives a threat, the sympathetic division of the autonomic nervous system is engaged, signaling the release of stress hormones such as epinephrine and cortisol into the bloodstream that in turn activate particular physiological responses: heart and respiratory rate acceleration, muscles tension, perspiration, indigestion, and pupil dilation.

This "fight-or-flight" response alludes to the conditions of ancestral humans and the presumed adaptive function of such a response in evolutionary history. The response, however, does not occur only in reaction to isolated incidences. Indeed, most stressors today, related to work, family, school, and interpersonal relationships, are prolonged, and the fight-or-flight responses are thus sustained. This continual state of arousal results in deleterious effects on health over time, such as high blood pressure, cardiovascular disease, diabetes, digestive disorders, and suppressed immune response.

Mind-body therapies, such as guided imagery and meditation, essentially work by altering responses to stressors. The simple act of breathing deeply and focusing on the breath will, in contrast to a stress response, engage the parasympathetic division of the autonomic nervous system, which lowers blood pressure, heart, and respiratory rates, and decreases muscle tension, thus counteracting the negative consequences of fight-or-flight response.

Other mind-body therapies alter the experience of pain itself. Pain is a multidimensional experience that traverses four physiological pathways. *Transduction* occurs first, as sensory neurons, the *nociceptors*, detect potentially damaging stimuli and transmit signals from affected tissue to neural activity. The next step is *transmission*, in which the pain messages are exchanged between the nociceptors and the spinal cord. *Central representation* follows as the information is relayed from the spinal cord through the thalamus to the limbic and cortical structures of the brain, which identify the sensations relayed. *Modulation,* the last step, is a descending pathway in which the brain sends signals back to the spinal cord to moderate the sensation of pain, basically "numbing" the pain. Since the limbic system is also the brain center for emotion, memory, and autonomic nervous system integration, the experience of pain is ultimately mediated by emotions, an individual's own past experiences, and present external environment.

In clinical hypnosis, or *hypnotic analgesia,* patients are taught alternative skills to alter the experience of pain. Hypnotic analgesia produces psychophysiological effects as patients are taught to consciously re-evaluate and manage a painful stimulus, using visual imagery and positive emotional reinforcement. A recent review of controlled studies of hypnotic analgesia suggests that the treatment can reduce pain in chronic conditions resulting from osteoarthritis, cancer, fibromyalgia, and disability. The authors cautioned, however, that a number of questions remain unanswered.

Mind-body research has provided important insights into both the efficacy of such therapies and our understanding of the cognitive and physiological perception of pain. More investigation is needed, however, to ascertain if outcome expectations influence the success of particular therapies, if response rates differ as a result of pain type or pain diagnosis, and to what degree variation in individual response, and if research design should preclude broader inferences.

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**31.** The studies reviewed in the seventh paragraph (lines 73–82) have shown that hypnotic analgesia may be effective in:

- **A.** restructuring the brain non-invasively.
- **B.** fighting cancer and fibromyalgia.
- **C.** decreasing depression in patients.
- **D.** altering the experience of pain.

**32.** According to the sixth paragraph, (lines 56–72), when a door slams on a person's hand, the detection of pain results from:

- **F.** the transmission of nerve signals from damaged tissue to the spinal cord and sympathetic nervous system.
- **G.** the transmission of nerve signals from damaged tissue to the spinal cord and brain.
- **H.** the sympathetic nervous system releasing chemical hormones, which reach the heart via the bloodstream.
- **J.** the sympathetic nervous system releasing chemical hormones, which reach the brain via the spinal cord.

**33.** According to the passage, overall health may be improved in part through any of the following EXCEPT:

- **A.** exercise combined with mental focus.
- **B.** cardiovascular activity combined with nutritious diet.
- **C.** awareness of the body.
- **D.** movement synchronized with breath and mental imagery.

**34.** As it is used in line 33, the word *engaged* most nearly means:

- **F.** stimulated.
- **G.** taken.
- **H.** obligated.
- **J.** destined.

**35.** According to the passage, the limbic system would be directly involved in all of the following EXCEPT:

- **A.** pain modulation.
- **B.** stress management.
- **C.** muscle movement.
- **D.** memory.

**36.** Information in the second paragraph indicates that mind-body therapies in Western medicine have been:

- **F.** increasingly used in place of biomedicine.
- **G.** rejected because there has not been enough clinical studies.
- **H.** an emerging field of scientific investigation.
- **J.** successful in curing many conditions and diseases.

**37.** The mind-body therapies mentioned in the fifth paragraph (lines 48–55) function by:

- **A.** preventing stress hormones from activating negative physiological responses.
- **B.** engaging the sympathetic nervous system to reduce stress responses.
- **C.** effectively eliminating emotional stressors.
- **D.** counterbalancing the effects of flight or fight responses.

**38.** According to the passage, stress responses with adaptive functions, as would have evolved in ancestral conditions, can be expected to:

- **F.** increase cortisol levels in the blood.
- **G.** suppress immune activity.
- **H.** perceive threats.
- **J.** decrease muscle tension.

**39.** In the last paragraph, the author expresses the belief that mind-body therapy should be further investigated because results from research are:

- **A.** carefully controlled to yield results consistent with expectations.
- **B.** valid only when analyzing Western-originating therapies.
- **C.** susceptible to external variables, the effects of which are yet to be determined.
- **D.** proof of the effectiveness in fighting stress and eliminating pain.

**40.** According to the passage, healthy mind-body therapies would have been deemed ineffective if which of the following effects occurred after patients engaged in positive meditation to manage work-related stress?

- **F.** Nociceptive signals were transmitted.
- **G.** Parasympathetic nervous system was engaged.
- **H.** Fight-or-flight response was prolonged.
- **J.** Spinal cord activity diminished.

**END OF TEST 3**
**STOP! DO NOT TURN THE PAGE UNTIL TOLD TO DO SO.**
**DO NOT RETURN TO A PREVIOUS TEST.**

## SCIENCE REASONING TEST

*35 Minutes—40 Questions*

**DIRECTIONS:** There are seven passages in the following section. Each passage is followed by several questions. After reading a passage, choose the best answer to each question and blacken the corresponding oval on your answer document. You may refer to the passages as often as necessary.

You are NOT permitted to use a calculator on this test.

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### Passage I

In the solar system, solid planets and moons are made up of different layers, which have different compositions. The Earth's moon is surrounded by an outer crust, which is visible to observers on Earth. Beneath this crust is a solid *lithosphere*. Beneath the lithosphere is another layer called the *asthenosphere*. This layer is thought to have high temperatures, so the structure of this layer is said to be *plastic*, or easily changed. The innermost region of the moon is called the *core*, and it is thought to contain iron.

A solar eclipse occurs when the moon travels directly between the Earth and the Sun, temporarily blocking the transmission of sunlight to the Earth and creating a shadow. Most solar eclipses are partial, because the moon does not always travel entirely within the path of the sunlight. However, complete solar eclipses are possible because the moon and the Sun have approximately the same diameter from the perspective of a viewer on the Earth. An observer on the Earth would view the sky as occupying 180 degrees. Of this entire distance, the moon takes up 0.54 degrees while the Sun takes up 0.52 degrees. Since the Sun appears to take up a smaller section of the sky, the Sun's rays can be blocked from traveling to the Earth during a complete solar eclipse (see Figure 1).

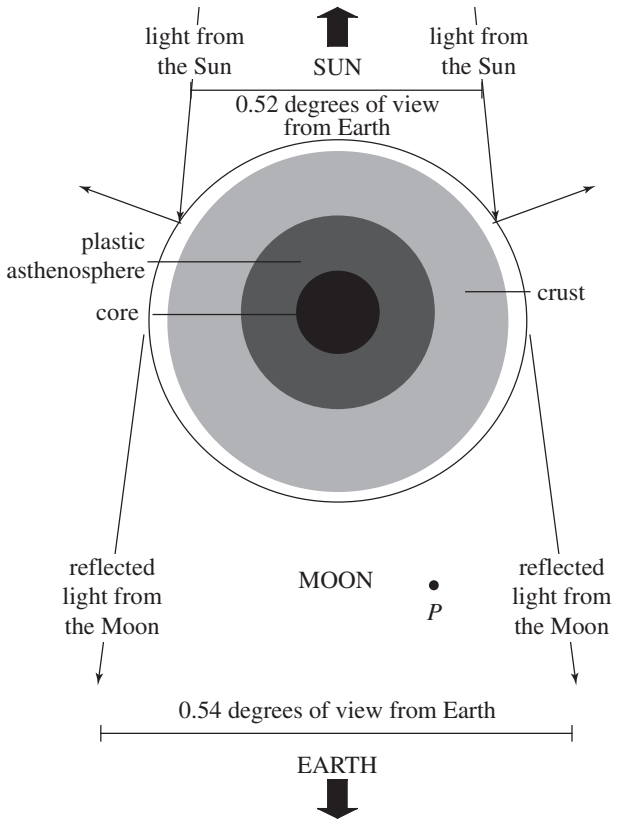


Figure 1

The gravitational force exerted on the Earth by the moon, and by the Sun to a lesser extent, results in water *tides*, which are the changes in the level of the Earth's ocean surface. Figure 2 shows data collected by a tidal station on the western coast of the United States, showing the change in the ocean water level over a 60-hour period. During this period, the highest water level was 6 feet above mean sea level, while the lowest water level was 1 foot below mean sea level (represented by "–1" feet).

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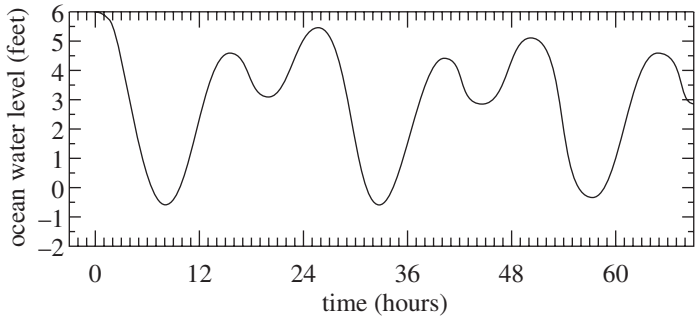


Figure 2

The highest and lowest ocean surface levels change over the course of a year. Figure 3 shows the change in the highest and lowest water levels measured by the same tidal station over a year.

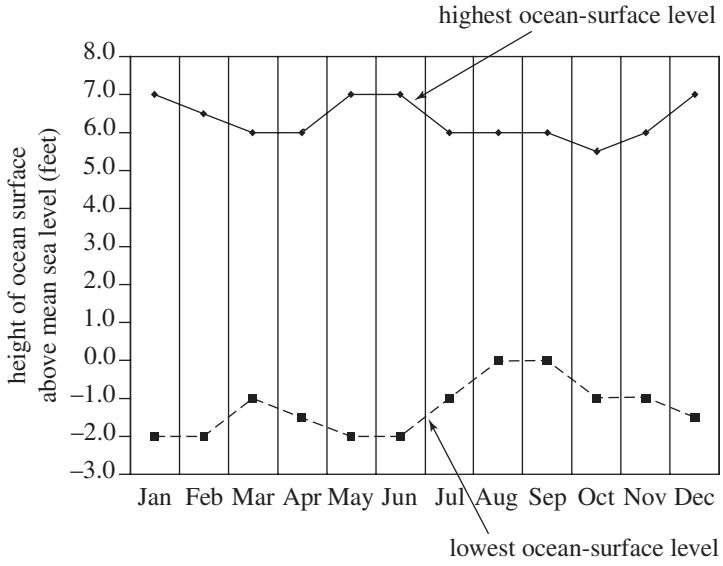


Figure 3

**1.** Figure 1 shows that a lunar orbiter at point *P* would be able to view which of the following?

**A.** The moon only
**B.** The Sun only
**C.** The moon and the Earth only
**D.** The moon, the Sun, and the Earth

**2.** According to Figure 1, when the Sun's rays encounter the surface of the moon during a solar eclipse, the rays most likely:

**F.** stop transmitting forward and do not continue to the Earth's surface.
**G.** enter the plastic asthenosphere and are absorbed.
**H.** reflect off the surface of the moon, and then continue to the Earth.
**J.** transmit unobstructed to the Earth's surface.

**3.** Based on Figure 2, for a given set of consecutive days, the time elapsed between the maximum values of the highest ocean-surface levels would most nearly be:

**A.** 12 hours.
**B.** 24 hours.
**C.** 48 hours.
**D.** 60 hours.

**4.** Based on the information provided in Figure 3, during what month was the data in Figure 2 most likely collected?

**F.** January
**G.** March
**H.** June
**J.** December

**5.** According to Figure 2, which of the following statements best describes the ocean surface level between $t = 0$ hours and $t = 12$ hours?

**A.** The ocean surface level rises continuously during that entire time.
**B.** The ocean surface level falls continuously during that entire time.
**C.** The ocean surface level rises and then falls during that time.
**D.** The ocean surface level falls and then rises during that time.

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**Passage II**

Approximately 45,000 to 35,000 years ago, Lake Brussia straddled the boundary between modern Smith and Union counties. The lake was believed to have been formed as a result of seismic activity in the region. As seen in Figure 1, the cities of Middleton, West Union, and Basalt Valley rest over the sediment of the ancient lake. In order to test this hypothesis, a study examining the strata of the region was conducted using radioactive dating. Inconsistencies in the age of the rock layers indicate the presence of a fault in the region.

Radioactive dating is a technique which utilizes the amount of radiation exhibited by a distinct isotope within a sample to approximate its age. Uranium-235 is an isotope commonly found in varying types of strata with a half-life of approximately 700 million years. The half-life of an isotope is the time it takes for half of the isotope to decompose. 1,000-m core samples were acquired from three sites between the modern cities of Middleton and West Union as seen in Figure 2. Figure 3 shows the results of the Uranium-235 assays for each of the three sites. The age of the rock is determined using a ratio of the Uranium content in the sample to that of newly formed rock.

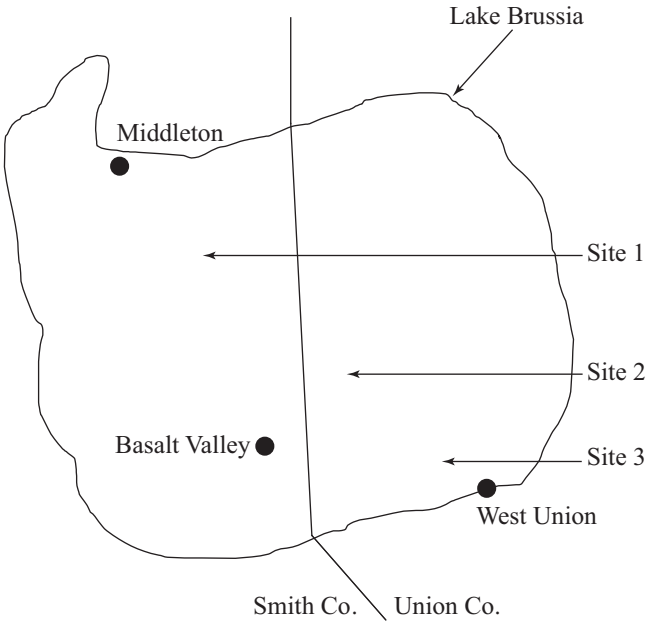


Figure 1

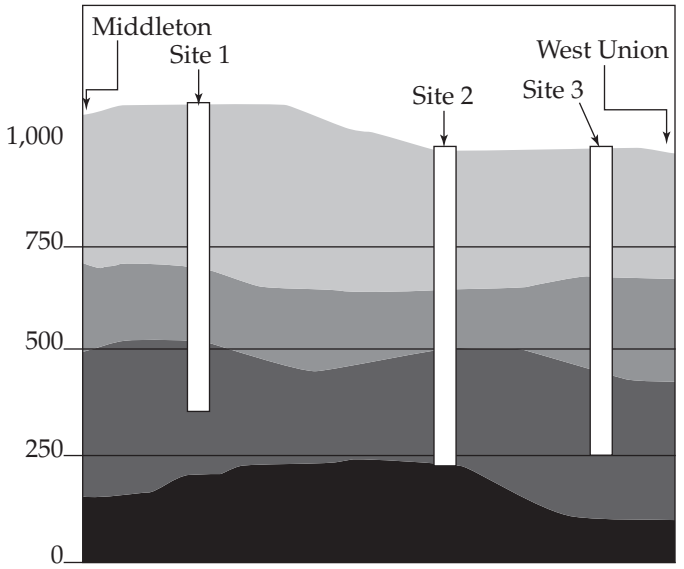


Figure 2

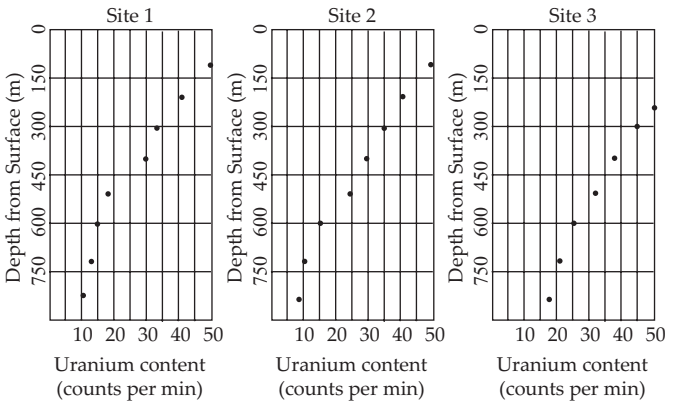


Figure 3

Note: $\frac{64}{\text{Counts per minute of Uranium -235 in Sample}} \times 700 =$ approx. age of rock in millions of years

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**6.** According to Figure 2, the shale layer was thickest at which of the following cities or sites?

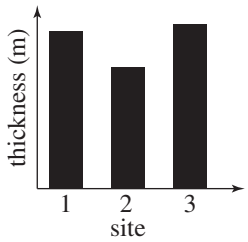
**F.** Middleton
**G.** Site 1
**H.** Site 3
**J.** West Union

**7.** According to Figure 2, as the thickness of shale decreases between Sites 2 and 3, the thickness of limestone residing below:

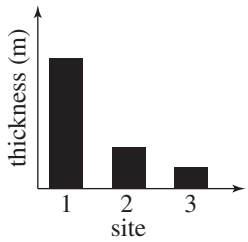
**A.** increases.
**B.** decreases.
**C.** first decreases then increases.
**D.** remains constant.

**8.** Based on Figure 2, which of the following graphs best displays the thickness of the shale layer at Sites 1, 2, and 3 ?

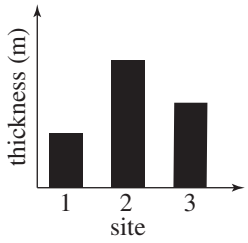
**F.**



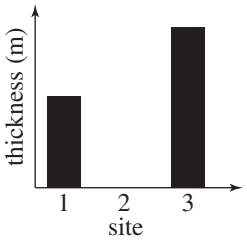

**H.**




**G.**




**J.**




**9.** According to Figure 3, at Sites 1, 2, and 3 the highest number of counts of Uranium-235 detected were recorded at a depth of:

**A.** less than 300 m below the surface.
**B.** between 300 and 450 m below the surface.
**C.** between 450 and 600 m below the surface.
**D.** greater than 600 m below the surface.

**10.** The uranium recorded in Sites 1, 2, and 3 is reduced by ½ roughly every 0.7 billion years. Based on Figure 3, and assuming no alteration of this uranium decay, the age of the rock with the greatest depth surveyed at Site 2 is closest to:

**F.** 2.8 billion years old.
**G.** 5.6 billion years old.
**H.** 280 million years old.
**J.** 560 million years old.

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## Passage III

For a science fair, a middle school student tested the hypothesis that bubbles in liquids would affect how far a water gun could shoot. To do this, she set up a holding device so that the water gun would always shoot at the same angle (the angle of inclination) and from the same place. She then measured the horizontal distance from the holding device to the furthest observable trace of liquid (see Figure 1).

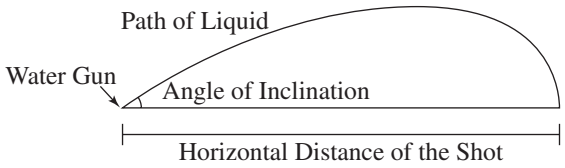


Figure 1

The angle of inclination was 30° in all experiments. The same metal water gun was used in Experiments 1 and 2.

*Experiment 1*

The student filled the metallic water canister of a water gun to 80% of its capacity with water from her tap (water with no bubbles in it) and measured how far from the holding device the water gun shot. Then, she again filled the canister to 80% of its capacity with tap water, shook the water gun, and immediately measured how far it shot. She repeated these tests with water mixed with laundry detergent, which contained many bubbles, and a flat-tasting cola beverage that showed no visible bubbles. Table 1 shows the results of these trials.

Table 1

| Trial | Liquid | Distance Shot | |
|---|---|---|---|
| | | before shaking (meters) | after shaking (meters) |
| 1 | water | 6.42 | 6.42 |
| 2 | water with detergent | 5.36 | 4.79 |
| 3 | flat-tasting cola | 6.42 | 5.49 |

*Experiment 2*

Next, the student filled the water gun canister to 80% of its capacity with the flat-tasting cola, shook it to create bubbles and then let it sit, undisturbed. When 10 minutes had elapsed, she tested how far the water gun shot the cola, before and after shaking it (Trial 4). She then let it sit undisturbed for an hour before again testing how far it shot before and after shaking it (Trial 5). Table 2 shows the results of these trials.

Table 2

| Trial | Distance shot | |
|---|---|---|
| | before shaking (meters) | after shaking (meters) |
| 4 | 5.98 | 5.49 |
| 5 | 6.42 | 5.61 |

*Experiment 3*

For the third experiment, the student used an old-fashioned, plastic water gun, with transparent walls and the water container in the handle of the water gun. The student added the flat-tasting cola to fill the water container to 80% of its capacity, shot the water gun, and observed that no bubbles formed upon shooting. She then shook the water gun, which caused bubbles to form. After 10 minutes, there were still some visible bubbles in the cola; however, after an hour had passed, there were no visible bubbles.

**11.** In Experiment 3, what is the most likely reason the student chose to use an old-fashioned plastic water gun rather than a metal water gun? Compared to the metal water gun, the plastic water gun:

**A.** exhibited different effects of bubbles on shooting distance.
**B.** did not shoot as far as the metal gun.
**C.** allowed the student to view the bubbles in the liquid.
**D.** was easier to fit into the holding device.

**12.** Based on the results of Experiments 1 and 2, in which of the following two trials, before shaking the water gun, were the distances shot the same?

**F.** Trials 1 and 4
**G.** Trials 2 and 3
**H.** Trials 3 and 4
**J.** Trials 3 and 5

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**13.** In Experiment 2, a result of shaking the water gun containing the flat-tasting cola was that the:

- **A.** density of the liquid increased.
- **B.** bubbles in the liquid disappeared.
- **C.** distance the liquid was shot increased.
- **D.** distance the liquid was shot decreased.

**14.** In Trial 5, is it likely that bubbles were present in large numbers in the cola immediately before the can was shaken?

- **F.** Yes; based on the results of Experiment 1, the bubbles generated in Trial 4 probably lasted for less than 10 minutes.
- **G.** Yes; based on the results of Experiment 1, the bubbles generated in Trial 4 probably lasted for more than 1 hour.
- **H.** No; based on the results of Experiment 3, the bubbles generated in Trial 4 probably lasted for less than 1 hour.
- **J.** No; based on the results of Experiment 3, the bubbles generated in Trial 4 probably lasted for more than 2 hours.

**15.** Suppose that in Experiment 2, the student had decided to measure the distance the water gun shot the cola one hour after finishing Trial 5 without shaking the water gun again. Based on the observations made in Trials 4 and 5, the horizontal distance the cola was shot would most likely have been:

- **A.** less than 5.49 meters.
- **B.** between 5.49 and 5.51 meters.
- **C.** between 5.52 and 5.98 meters.
- **D.** greater than 5.98 meters.

**16.** Based on the results of Trials 3–5, if the student filled the metal water gun to 80% of its capacity with the flat-tasting cola and shook it, the time it would take for the bubbles in the cola to disappear to the point that they would have no effect on the distance of the shot would most likely have been:

- **F.** greater than 1 hour.
- **G.** between 10 minutes and 1 hour.
- **H.** between 3 minutes and 9 minutes.
- **J.** less than 3 minutes.

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## Passage IV

An ecological study measured the reflection of light by different algae types and water samples. The study found that a water sample's reflectance of light is determined by the density of algae in it. As the density of algae in a water sample increases, the water sample's reflectance of light became more similar to the pure algae's reflectance of light.

Table 1 lists the wavelength range of the visible spectrum and the wavelength ranges of the colors of the visible spectrum.

| Table 1 | |
|---|---|
| Color | Wavelength (nm) |
| Violet | 380–430 |
| Blue | 430–500 |
| Green | 500–565 |
| Yellow | 565–585 |
| Orange | 585–630 |
| Red | 630–750 |

Figure 1 shows the relative reflectance of light by pure samples of water and three types of algae versus the wavelength of light from 350 nm to 750 nm.

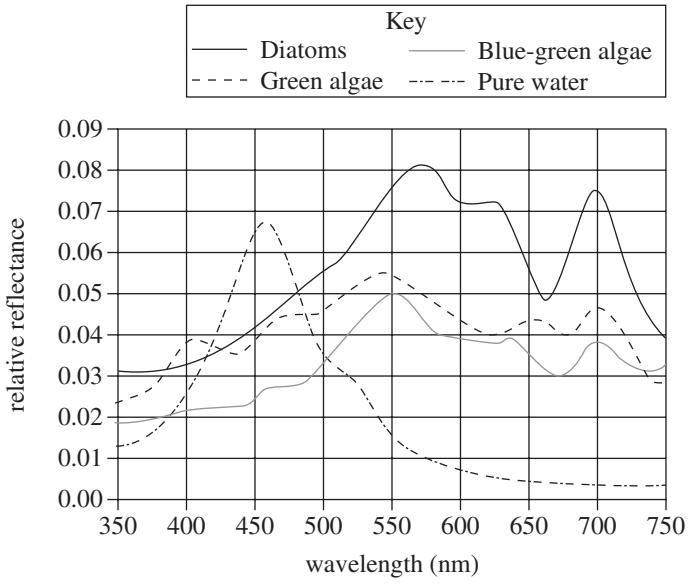


Figure 1

Figure 2 shows the relative reflectance light of a sample of lake water versus the wavelength of light from 350 nm to 750 nm.

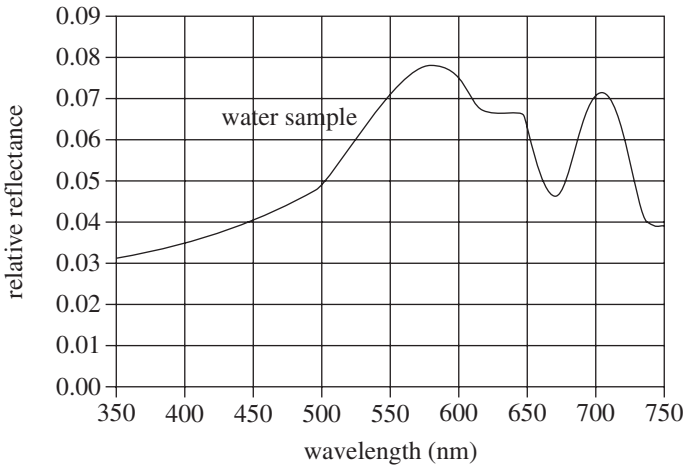


Figure 2

**17.** Based on Table 1 and Figure 1, which color of light is most reflected by blue-green algae?

**A.** Violet
**B.** Yellow
**C.** Red
**D.** Green

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**18.** Autotrophic organisms, such as blue-green algae, absorb wavelengths using the molecule chlorophyll. Chlorophyll is typically associated with which of the following chemical reactions?

**F.** Binary fission
**G.** Condensation
**H.** Photosynthesis
**J.** Respiration

**19.** According to Figure 1, at which of the following wavelengths does the amount of light reflected by green algae exceed the amount of light reflected by diatoms?

**A.** 400 nm
**B.** 520 nm
**C.** 670 nm
**D.** 710 nm

**20.** Green algae is classified in which kingdom of organisms?

**F.** Animalia
**G.** Plantae
**H.** Fungi
**J.** Protista

**21.** Based on Figures 1 and 2, what type of algae has the greatest density in the lake water sample?

**A.** Blue-green algae
**B.** Diatoms
**C.** Green algae
**D.** No algae are in the water sample.

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## Passage V

Oceanographers conducted a series of experiments with water to explore the relationship between temperature, salinity (% salt by mass), and density (mass per unit volume).

*Experiment 1*

In a beaker, 35 g of NaCl and 965 g of distilled $H_2O$ were mixed, and the solution was brought to a specific temperature. A graduated cylinder was then used to measure 150 mL of the solution. The mass of this 150-mL sample was measured with an electronic balance and the density (g/mL) was calculated. This procedure was repeated for 5 different temperatures with the results recorded in Table 1.

Table 1

| Sample | Solution mass (g) | Temperature (ºC) | Density (g/mL) |
|---|---|---|---|
| I | 154.2 | 0 | 1.028 |
| II | 154.1 | 10 | 1.027 |
| III | 153.9 | 15 | 1.026 |
| IV | 153.8 | 20 | 1.025 |
| V | 153.3 | 30 | 1.022 |

*Experiment 2*

A graduated cylinder was placed on an electronic balance and a certain mass of NaCl was added. Distilled water at 10°C was added to make a 150 mL solution, and the total mass of this was noted. The density (g/mL) and salinity (%) of the solution were calculated. This procedure was repeated for 5 different quantities of NaCl with the results recorded in Table 2.

Table 2

| Sample | Solution mass (g) | Salinity (%) | Density (g/mL) |
|---|---|---|---|
| VI | 153.0 | 2.60 | 1.020 |
| VII | 152.7 | 2.35 | 1.018 |
| VIII | 152.4 | 2.10 | 1.016 |
| IX | 152.1 | 1.83 | 1.014 |
| X | 151.8 | 1.58 | 1.012 |

*Experiment 3*

Water samples from Experiments 1 and 2 were used individually to fill a test pool. For each sample, multiple prototypes of a newly designed instrument were placed in the pool. If a prototype stayed afloat, it was marked with a (+). If a protoype sank, it was marked with a (–). These data were then collected and recorded in Table 3.

Table 3

| Water Sample | Prototype | | | | | |
|---|---|---|---|---|---|---|
| | R5 | R6 | U3 | U4 | X1 | X2 |
| I | + | + | + | + | + | + |
| II | + | + | + | + | + | + |
| III | – | + | + | + | + | + |
| IV | – | + | + | + | + | + |
| V | – | – | + | + | + | + |
| VI | – | – | – | + | + | + |
| VII | – | – | – | – | + | + |
| VIII | – | – | – | – | – | + |
| IX | – | – | – | – | – | – |
| X | – | – | – | – | – | – |

**22.** In Experiment 1, if an additional sample were brought to 40ºC and a density of 1.018 g/mL, what would its expected mass be in the graduated cylinder?

**F.** 150.9 g
**G.** 151.8 g
**H.** 152.7 g
**J.** 153.6 g

**GO ON TO THE NEXT PAGE.**

**23.** Based on Table 2, what is the most likely density of water at 10ºC and 2.50% salinity?

**A.** 1.019
**B.** 1.017
**C.** 1.013
**D.** 1.010

**24.** An engineer states that prototype U3 is better suited than X2 for water surface data collection in a 10ºC and 2.35% salinity environment. Do the results of the experiments support this claim?

**F.** Yes, because prototype U3 will sink and X2 will float in these water conditions.
**G.** Yes, because prototype U3 will float and X2 will sink in these water conditions.
**H.** No, because prototype U3 will sink and X2 will float in these water conditions.
**J.** No, because prototype U3 will float and X2 will sink in these water conditions.

**25.** A new prototype is tested in water samples IV through VII in a manner similar to Experiment 3. Which of the following results would NOT be possible?

| | Water Sample | | | |
|---|---|---|---|---|
| | IV | V | VI | VII |
| **A.** | – | – | – | – |
| **B.** | + | + | + | + |
| **C.** | + | + | – | – |
| **D.** | – | – | + | + |

**26.** In Experiment 1, samples were transferred to a graduated cylinder to obtain a more accurate and precise measurement of the:

**F.** mass of the NaCl added to the $H_2O$.
**G.** salinity after it reached the designated temperature.
**H.** volume used to calculate the density.
**J.** temperature used to determine the final salinity.

**27.** In a later analysis, the density of prototype U3 is manually determined. Which of the following values would be consistent with the results of Experiments 1 through 3 ?

**A.** 1.021 g/mL
**B.** 1.023 g/mL
**C.** 1.026 g/mL
**D.** 1.028 g/mL

GO ON TO THE NEXT PAGE.

## Passage VI

Haloarchaea are single-celled microorganisms that can use light to generate energy, through a unique form of *photosynthesis*. To compare haloarchaeal photosynthesis with plant photosynthesis and bacterial fermentation, researchers performed two experiments in which they exposed plant haloarchaeal and bacterial cells to either red or green light. The researchers measured the growth of these cells by measuring how much acid and $CO_2$ were produced; more production of these indicated more growth.

*Experiment 1*

Water containing salt and sucrose was added to eight large test tubes. Next, *phenolphthalein* (a pH indicator that is colorless in the presence of acid and has a pink color in its absence) was added to each large test tube. A smaller test tube was then added, inverted, into each large test tube to collect $CO_2$; if $CO_2$ had been produced, a gas bubble would appear in this smaller tube (see Figure 1).

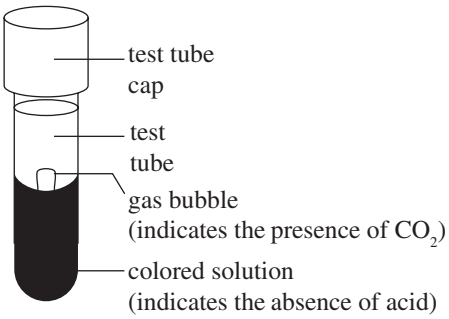



Figure 1

The large test tubes were capped, heated until the solutions were sterile, and then cooled. Nothing was added to the first test tube (T1). Cells of the plant *Rosa carolina* were added to the second test tube (T2), cells of the haloarchaea *NRC-1* were added to the third test tube (T3), and cells of the bacterium *Bacillus anthracis* were added to the fourth test tube (T4). These four test tubes were exposed to red light, and incubated at 37ºC for 48 hr. Then, the procedure was repeated with exposure to green light, using the four remaining test tubes: T5 (no cells), T6 (plant cells), T7 (haloarchaeal cells), and T8 (bacterial cells). In Table 1, + means presence and – means absence.

Table 1

| Red light | | | Green light | | |
|---|---|---|---|---|---|
| | Acid | $CO_2$ | | Acid | $CO_2$ |
| T1: Control | – | – | T5: Control | – | – |
| T2: Plant | – | + | T6: Plant | – | – |
| T3: Haloarchaea | – | – | T7: Haloarchaea | + | – |
| T4: Bacterium | + | + | T8: Bacterium | + | + |

*Experiment 2*

Some of the cells tested in Experiment 1 are thought to contain pigments that help them absorb light. To determine whether these cells absorbed light to generate energy, cells of the same species are exposed to red and green light in new test tubes. The researchers measure the *transmittance*, or the amount of light that transmits through the test tube. If the transmittance is low, then the cells in the test tube are assumed to contain pigments that absorb most of the light to generate energy. If the transmittance is high, then the cells are assumed to contain no pigment that could absorb light and generate energy. Instead, most of the light passes through the test tube.

Table 2

| Red light | | Green light | |
|---|---|---|---|
| | Transmittance | | Transmittance |
| T9: Plant | Low | T12: Plant | High |
| T10: Haloarchaea | High | T13: Haloarchaea | Low |
| T11: Bacterium | High | T14: Bacterium | High |

**28.** In Experiment 1, which cell types grew in the presence of green light?

**F.** Plant cells only
**G.** Plant and bacterial cells only
**H.** Plant and haloarchaeal cells only
**J.** Haloarchaeal and bacterial cells only

**GO ON TO THE NEXT PAGE.**

**29.** Suppose that plant cells and haloarchaeal cells that are situated close to each other do not interfere with each other's absorption of light and generation of energy. If a new test tube containing both plant and haloarchaeal cells were prepared, what would be the most likely results for Experiments 1 and 2 ?

| | Red light | | | Green light | | |
|---|---|---|---|---|---|---|
| | Acid | $CO_2$ | Transmittance | Acid | $CO_2$ | Transmittance |
| **A.** | – | – | High | – | – | High |
| **B.** | – | + | Low | + | – | Low |
| **C.** | + | – | Low | – | + | High |
| **D.** | + | + | High | + | + | Low |

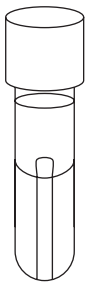
**30.** Suppose that a scientist isolates a cell type that is one of the four cell types used in Experiment 1. She finds that this cell type produces $CO_2$ in the presence of red light. She then tests the cell type in the presence of green light and finds that neither $CO_2$ nor acid is produced. Based on the results of Experiment 1, the cell type is most likely the:

**F.** control with nothing added.
**G.** plant *Rosa carolina*.
**H.** haloarchea *NRC-1*.
**J.** bacterium *Bacillus anthracis*.

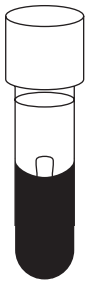
**31.** What is the evidence from Experiments 1 and 2 that haloarchaea require green light to generate energy?

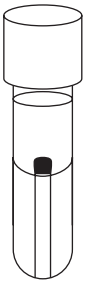
**A.** In the presence of red light, haloarchaea show low transmittance of light and produce acid.
**B.** In the presence of red light, haloarchaea show high transmittance of light and produce no acid.
**C.** In the presence of green light, haloarchaea show low transmittance of light and produce acid.
**D.** In the presence of green light, haloarchaea show high transmittance of light and produce no acid.

**32.** Which of the following best illustrates the results of Experiment 1 for the plant *Rosa carolina* in red light?

**F.**


**H.**


**G.**


**J.**


**33.** Do the results of Experiment 1 support the hypothesis that haloarchaea and bacteria use similar processes to generate energy?

**A.** Yes, because both haloarchaea and bacteria produce $CO_2$ in the presence of green light.
**B.** Yes, because both haloarchaea and bacteria produce $CO_2$ in the presence of red light.
**C.** No, because haloarchaea produce only acid in the presence of green light, while bacteria produce acid and $CO_2$ in both red and green light.
**D.** No, because neither haloarchaea nor bacteria produce $CO_2$ in the presence of either red or green light.

**GO ON TO THE NEXT PAGE.**

## Passage VII

For most of the 20th century, scientists recognized two basic domains of living organisms, *prokaryotes* and *eukaryotes*. The presence of nuclei and other membrane-bound organelles within the cell primarily distinguished eukaryotes from prokaryotes. The possibility of revising this dichotomy resulted from the discovery of the *Archaea*, organisms with unique cell membrane and *ribosomal RNA (rRNA)* structure. Cell membranes are composed of *phospholipids* that have both water-insoluble and water-soluble subunits. *Ribosomes* are made of protein and rRNA and build new proteins within the cell.

Two scientists in the 1990s debate whether organisms should be classified into two or three domains.

*2-Domain Hypothesis*

The Archaea are prokaryotes because they lack intracellular membrane-bound organelles. Although they are found in extreme and unusual environments, the gross structure and life cycle of the Archaea are similar to prokaryotic bacteria. Like bacteria, their cells are usually surrounded by a cell wall, and they reproduce asexually through binary fission.

The structural and metabolic characteristics that are unique to the Archaea are not significantly different from other prokaryotes to warrant their separation into a third domain. Although the Archaea were distinguished very early on in the diversification of life, today they remain appropriately defined by the original definition of prokaryote.

*3-Domain Hypothesis*

The Archaea are a distinct form of life requiring a revision of the previously held dichotomy of prokaryote and eukaryote. Eukaryota should remain the same, but prokaryotes should be split into Archaea and Bacteria because of significant differences in genetics, structure, and metabolism.

Archaea as a domain is justified by detailed analysis. The genetic sequence of rRNA in the Archaea is so distinct from prokaryotes and eukaryotes that these groups of organisms likely diverged over 3 billion years ago. Archaea cell membranes contain more rigid *ether linkages* instead of the *ester linkages* found in eukaryotes and bacteria. This contributes to their survival in harsh environments. Finally, the Archaea are capable of exploiting a wider range of energy sources compared to eukaryotes and bacteria.

**34.** Which of the following statements is most consistent with the *3-Domain Hypothesis*? The time, in millions of years ago, when two groups of organisms diverge on the evolutionary tree increases as the:

**F.** similarities between rRNA gene sequences increases.
**G.** differences between rRNA gene sequences increases.
**H.** number of ester linkages in the cell membrane increases.
**J.** number of ether linkages in the cell membrane decreases.

**35.** By referring to the observation that the newly discovered organisms do not have membrane-bound organelles, the scientist supporting the 2-Domain Hypothesis implies that these new organisms do not have which of the following structures?

**A.** Phospholipids
**B.** Ribosomes
**C.** rRNA
**D.** Nuclei

**36.** According to the passage, a similarity between eukaryotes and prokaryotes is that both groups of organisms:

**F.** have ester linkages in their membranes.
**G.** contain membrane-bound organelles.
**H.** reproduce sexually.
**J.** are composed of cells.

**37.** According to the scientist who supports the 2-Domain Hypothesis, which of the following is the strongest argument *against* using a 3-Domain classification?

**A.** rRNA does not exist in prokaryotes.
**B.** Ether linkages are found in the cell membranes of the Archaea.
**C.** The Archaea meet the primary definition of prokaryotic.
**D.** The Archaea synthesize proteins in the cell cytoplasm.

GO ON TO THE NEXT PAGE.

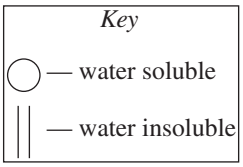
**38.** It is shown that the Archaea have protein synthesis structures and mechanisms more like eukaryotes than prokaryotes. This observation contradicts arguments stated in which hypothesis?

- **F.** The 2-Domain Hypothesis, because the discovery would show that the new organisms and bacteria fundamentally differ in cellular metabolism.
- **G.** The 2-Domain Hypothesis, because the discovery would show that the new organisms and eukaryotes fundamentally differ in cellular metabolism.
- **H.** The 3-Domain Hypothesis, because the discovery would show that the new organisms and bacteria fundamentally differ in cellular metabolism.
- **J.** The 3-Domain Hypothesis, because the discovery would show that the new organisms and eukaryotes fundamentally differ in cellular metabolism.

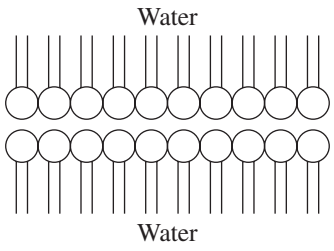
**39.** The scientist who supports the 3-Domain Hypothesis implies that the 2-Domain Hypothesis is *weakened* by which observation?

- **A.** The Archaea have membrane-bound organelles.
- **B.** Microscopes cannot accurately describe organisms.
- **C.** The Archaea lack ester linkages in their cell membranes.
- **D.** Eukaryotes are not related to the Archaea.

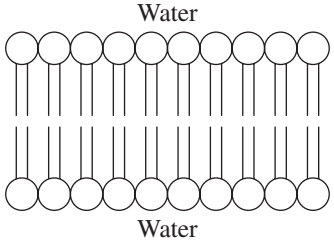
**40.** Which of the following illustrations of a portion of a phospholipid cell membrane is consistent with the description in the passage?



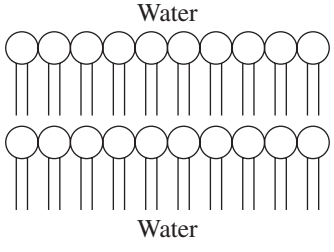

**F.**



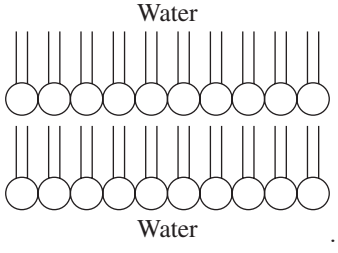

**G.**




**H.**




**J.**




**END OF TEST 4**
**STOP! DO NOT RETURN TO ANY OTHER TEST.**

## Directions

This is a test of your writing skills. You will have thirty (30) minutes to write an essay. Before you begin planning and writing your essay, read the writing prompt carefully to understand exactly what you are being asked to do. Your essay will be evaluated on the evidence it provides of your ability to express judgments by taking a position on the issue in the writing prompt; to maintain a focus on the topic throughout your essay; to develop a position by using logical reasoning and by supporting your ideas; to organize ideas in a logical way; and to use language clearly and effectively according to the conventions of standard written English.

You may use the unlined pages in this test booklet to plan your essay. These pages will not be scored. ***You must write your essay on the lined pages in the answer folder.*** Your writing on those lined pages will be scored. You may not need all the lined pages, but to ensure you have enough room to finish, do NOT skip lines. You may write corrections or additions neatly between the lines of your essay, but do NOT write in the margins of the lined pages. ***Illegible essays cannot be scored, so you must write (or print) clearly.***

If you finish before time is called, you may review your work. Lay your pencil down immediately when time is called.

**DO NOT OPEN THIS BOOKLET UNTIL TOLD TO DO SO.**

## ACT Assessment Writing Test Prompt

Recently, one state has passed legislation making it illegal for anyone under the age of 18 to use a cell phone—including hands-free models—or any other electronic communications device while driving. Supporters argue that such devices distract drivers' attention from the road, and thus this law will lower the number of accidents and save lives. Opponents argue the law is discriminatory, since adults may use hands-free cell phones while driving. In your opinion, should all states pass a law banning drivers 18 and younger from using communication devices while driving?

In your essay, take a position on this question. You may write about either one of the two points of view given, or you may present a different point of view on this question. Use specific reasons and examples to support your position.

# ACT Diagnostic Test Form

Use a No. 2 pencil only. Be sure each mark is dark and completely fills the intended oval. Completely erase any errors or stray marks.

**1. YOUR NAME:** _____
(Print) Last First M.I.

**SIGNATURE:** _____ **DATE:** ____/____/____

**HOME ADDRESS:** _____
(Print) Number and Street

_____
City State Zip

**E-MAIL:** _____

**PHONE NO.:** _____
(Print)

**SCHOOL:** _____

**CLASS OF:** _____

IMPORTANT: Please fill in these boxes exactly as shown on the back cover of your tests book.

**2. TEST FORM**

_____

**3. TEST CODE**

| | | | |
|---|---|---|---|
| | | | |
| 0 | 0 | 0 | 0 |
| 1 | 1 | 1 | 1 |
| 2 | 2 | 2 | 2 |
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| 7 | 7 | 7 | 7 |
| 8 | 8 | 8 | 8 |
| 9 | 9 | 9 | 9 |

**4. PHONE NUMBER**

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| 5 | 5 | 5 | 5 | 5 | 5 | 5 |
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| 7 | 7 | 7 | 7 | 7 | 7 | 7 |
| 8 | 8 | 8 | 8 | 8 | 8 | 8 |
| 9 | 9 | 9 | 9 | 9 | 9 | 9 |

**5. YOUR NAME**

| First 4 letters of last name | | | | FIRST INIT | MID INIT |
|---|---|---|---|---|---|
| | | | | | |
| A | A | A | A | A | A |
| B | B | B | B | B | B |
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| E | E | E | E | E | E |
| F | F | F | F | F | F |
| G | G | G | G | G | G |
| H | H | H | H | H | H |
| I | I | I | I | I | I |
| J | J | J | J | J | J |
| K | K | K | K | K | K |
| L | L | L | L | L | L |
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| N | N | N | N | N | N |
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| P | P | P | P | P | P |
| Q | Q | Q | Q | Q | Q |
| R | R | R | R | R | R |
| S | S | S | S | S | S |
| T | T | T | T | T | T |
| U | U | U | U | U | U |
| V | V | V | V | V | V |
| W | W | W | W | W | W |
| X | X | X | X | X | X |
| Y | Y | Y | Y | Y | Y |
| Z | Z | Z | Z | Z | Z |

**6. DATE OF BIRTH**

| MONTH | DAY | | YEAR | |
|---|---|---|---|---|
| | | | | |
| JAN | | | | |
| FEB | | | | |
| MAR | 0 | 0 | 0 | 0 |
| APR | 1 | 1 | 1 | 1 |
| MAY | 2 | 2 | 2 | 2 |
| JUN | 3 | 3 | 3 | 3 |
| JUL | | 4 | 4 | 4 |
| AUG | | 5 | 5 | 5 |
| SEP | | 6 | 6 | 6 |
| OCT | | 7 | 7 | 7 |
| NOV | | 8 | 8 | 8 |
| DEC | | 9 | 9 | 9 |

**7. SEX**

- MALE
- FEMALE

**8. OTHER**

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| 1 | A | B | C | D | E |
| 2 | A | B | C | D | E |
| 3 | A | B | C | D | E |

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## ENGLISH

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

## MATHEMATICS

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

# The Princeton Review
# Diagnostic ACT Form

**Completely** darken bubbles with a No. 2 pencil. If you make a mistake, be sure to erase mark completely. Erase all stray marks.

## READING

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

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

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## The Princeton Review
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