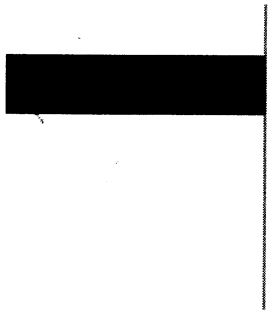
Form 70G

(April 2012)



The ACT® 2011 | 2012

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If you wish to order a photocopy of your answer document—including, if you took the Writing Test, a copy of your written essay—please use the order form on the inside back cover of this booklet.

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1 ■ ■ ■ ■ ■ ■ ■ ■ ■ 1

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 the 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 about 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 fill in 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.

PASSAGE I

Sculpting History's Heroes

Tina Allen's bronze sculptures are striking for their powerful combination of monumental size and fine detail. Allen created large statues to <u>acknowledge</u> [1] the historical <u>contributions'</u> [2] of African Americans.

Her statue of Sojourner <u>Truth:</u> [3] a nineteenth-century abolitionist and women's rights advocate, stands twelve feet tall and weighs two tons. Her thirteen-foot-tall depiction of *Roots* author Alex Haley <u>weighs</u> [4] five tons. <u>As famous as she is,</u> [5] Allen captured each figure with lifelike precision.

1. **A.** NO CHANGE
   B. remark
   C. perceive
   D. mention

2. **F.** NO CHANGE
   G. contributions
   H. contribution's
   J. contributions's

3. **A.** NO CHANGE
   B. Truth;
   C. Truth,
   D. Truth

4. **F.** NO CHANGE
   G. at a weight of
   H. weighing
   J. weighted

5. **A.** NO CHANGE
   B. Consistent with public opinion,
   C. Even working on such a large scale,
   D. Although Haley died in 1992,

For these sculptures, Allen used the "lost wax" process. In this ancient technique, the sculpture is first carved in clay; the clay is then covered with rubber to make the creation of (6) a mold. The rubber mold is carefully removed from the clay and filled with wax.

After the wax was cooled (7) and the rubber is discarded, that one (8) is touched up to mirror the clay original. The wax statue is then coated with liquid ceramic, which hardens over several days. (9) When the ceramic mold is fired in a kiln, the wax burns out of the mold, leaving the empty ceramic shell—thus the name "lost wax" process. The statue is then completed by filling the empty ceramic shell with molten bronze and breaking away the shell once the bronze has cooled.

Allen became interested in painting and sculpting (10) as a young girl. She took over four years to complete the Alex Haley Memorial in Tennessee, in his hands (11) which portrays Haley seated with an open book. For some (12) Sojourner Truth statue in Michigan, Allen spent more than a year on the clay model alone.

6. **F.** NO CHANGE
G. produce the creation of
H. create the manufacture of
J. create

7. **A.** NO CHANGE
B. cooled
C. cools
D. had cooled

8. **F.** NO CHANGE
G. this wax version of the statue
H. this one
J. that

9. **A.** NO CHANGE
B. a time period of several days.
C. the duration of several days long.
D. several days' duration of time.

10. Given that all the choices are true, which one most effectively introduces the paragraph?
F. NO CHANGE
G. Allen insisted on time-consuming detail at every step of the process.
H. Allen's father, a professional percussionist, was supportive of Allen's artistic pursuits.
J. Originally from the West Indies, Allen moved to Los Angeles.

11. The best placement for the underlined portion would be:
A. where it is now.
B. after the word *portrays*.
C. after the word *with*.
D. after the word *book* (and before the period).

12. **F.** NO CHANGE
G. their
H. her
J. its

[13] To mimic the coarse fabric in Truth's dress, for which Allen pounded the clay with a mallet covered with chicken wire. She also used a delicate paintbrush to create the small wrinkles on Truth's hands.

Like many of her works, the statues of Truth and Haley are displayed in public because Allen wanted to make the accomplishments of African Americans visible in everyone's day-to-day lives. She also wanted to speak directly to African Americans through her art, characterizing it as a way of "writing our history in bronze."

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

> Her sculpture of Frederick Douglass was featured in the motion picture *Akeelah and the Bee*.

Should the writer make this addition here?

A. Yes, because it provides another example of Allen's accomplishments.
B. Yes, because it explores one thing that Douglass and Truth have in common.
C. No, because it interrupts the paragraph's description of Allen's creation of the Truth statue.
D. No, because it shifts the main focus of the essay from sculpture to motion pictures.

14. **F.** NO CHANGE
G. Allen pounded
H. by pounding
J. pounding

15. The writer is considering deleting the underlined portion (adjusting the punctuation as needed). Should the underlined portion be kept or deleted?

A. Kept, because it adds information about the purpose for the location of Allen's statues.
B. Kept, because it gives additional details about how Allen created the statues of Truth and Haley.
C. Deleted, because it introduces new information about Truth and Haley in the conclusion of the essay.
D. Deleted, because it is redundant with information already presented in the preceding paragraph.

PASSAGE II

Polaris: Not Always the North Star

Polaris, the star now almost directly over the North Pole, has played a significant role in many mythologies and in the history of navigation. For centuries, sailors and leaders of desert caravans used the North Star to chart their courses. Polaris has been called the Lodestar, the Steering Star, and *Stella Maris* (the Star of the Sea). [17]

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

F. an important
G. a prominent
H. an abundant
J. a major

17. If the writer were to delete the phrase "the Star of the Sea" (and the parentheses) from the preceding sentence, the sentence would primarily lose:

A. an explanation of the importance of Polaris to sailors and caravan leaders.
B. a translation of a phrase from a language other than English.
C. a clarification of the exact location of Polaris.
D. the name of a specific caravan.

Finally, people in ancient India believed it was the Golden Peg that held the universe together. In Scandinavian mythology, Polaris was thought to be the jeweled head of the World Spike—an enormous nail the Norse gods had hammered into the sky so the stars could revolve around it. [19]

[1] However, as the Greek astronomer Hipparchus discovered around 129 BC, the North Star, or polestar, is not eternally fixed over the North Pole, as the mythmakers had supposed. [2] In the process of compiling an astronomical catalog, Hipparchus noticed that the stars had seemingly shifted from positions noted in Babylonian records from many centuries earlier. [3] He concluded that it was not the stars that were moving but rather the position from which they were being observed that varied. [4] Precession, in turn, is caused by the gravitational pull of the Sun and the Moon on the bulge at Earth's equator. [5] A wobbling in Earth's axis of rotation, called precession, cause this variation in position. [23]

18. **F.** NO CHANGE
G. Nevertheless, people
H. Anyway, people
J. People

19. If the writer were to delete the words "so the stars could revolve around it" from the preceding sentence, the sentence would primarily lose:

A. the method used to secure the World Spike in the sky, according to Scandinavian mythology.
B. an explanation of why the World Spike exists, according to Scandinavian mythology.
C. a description of the jeweled head of the World Spike.
D. a suggestion of a breakthrough in astronomy.

20. **F.** NO CHANGE
G. having noted
H. were noted
J. noting

21. **A.** NO CHANGE
B. rotation: called
C. rotation (called)
D. rotation called

22. **F.** NO CHANGE
G. causes
H. are causing
J. are caused

23. For the sake of the logic and coherence of this paragraph, Sentence 5 should be placed:

A. where it is now.
B. after Sentence 1.
C. after Sentence 2.
D. after Sentence 3.

As Earth rotates round and round and round
24
like a spinning top, its axis traces a huge circle that

takes 26,000 years to complete. As a result, the North
25
Pole's position in relation to the stars change. Astronomers
26

now, know, that, around 3000 BC, Thuban, a star in
27
the tail of the constellation Draco (the Dragon), was

directly above the pole. Three thousand years from now,

Alderamin, in the constellation Cepheus, is the polestar.
28

Over the 26,000-year cycle, numerous stars will take its'
29
turn as the North Star for a few thousand years each. But

the Babylonian records should not be discarded. [30]

24. **F.** NO CHANGE
G. and twirls about
H. on its spinning axis
J. DELETE the underlined portion.

25. **A.** NO CHANGE
B. complete, as a result,
C. complete as a result,
D. complete as a result

26. **F.** NO CHANGE
G. would of changed.
H. changed.
J. changes.

27. **A.** NO CHANGE
B. now know that
C. now know, that
D. now, know that

28. **F.** NO CHANGE
G. has been
H. will be
J. was

29. **A.** NO CHANGE
B. they're
C. their
D. it's

30. Which of the following true statements, if added here, would best conclude the paragraph and the essay by explaining the statement in the preceding sentence?

F. Twenty-six thousand years after they were created, they will again be accurate.
G. The Babylonian records were not necessarily complete, as Hipparchus had discovered.
H. Many of these records were compiled by Kidinnu, who served as the director of an astronomical school in the Babylonian city of Sippar.
J. Babylonian astronomers not only kept records pertaining to the motion of stars and planets, but they also developed a detailed system of rules for a calendar.

PASSAGE III

Creek Walk

On summer afternoons, my sister and I used to go on creek walks. Starting near the barn, we'd slide down an embankment into a stream that bisected the family farm. The water ran clear and foot-numbingly cold. We'd set off, walking downstream with the current, skipping under overhanging foliage. Our dogs trotted reassuringly at our heels, drinking from pools and splashing through the shallows. Cicadas buzzed in the hot Kentucky air. [34]

And always, we looked for fossils.

[1] But once our eyes had adjusted to the task, they were unmistakable: perfectly formed little stone disks. [2] Our father told us they were fossilized crinoids. [3] Some were embedded in larger stones, while others were loose among the pebbles. [4] Still others, the best ones, were cylinders as fat as my thumb, with hollow star-shaped centers, they're outlines as distinct as when the crinoids were alive. [5] When either of us located such a treasure, we'd snatch it up and crow, "Got one!" [6] At first, they were hard to see. [37]

31. **A.** NO CHANGE
B. sister, and I—
C. sister and I,
D. sister, and I

32. **F.** NO CHANGE
G. farm, so the
H. farm, which
J. farm, the

33. Which choice best conveys the idea that the foliage was hanging low?

A. NO CHANGE
B. walking
C. vaulting
D. ducking

34. Which of the following true statements, if added here, would most effectively continue the narration of what happened during the creek walks the sisters took?

F. Occasionally, we'd pause to set a leaf afloat or watch minnows darting past.
G. Both of the dogs had been part of our family for a very long time.
H. At the time, we were both students in elementary school.
J. The creek ran from north to south on our farm.

35. **A.** NO CHANGE
B. unmistakably: perfectly
C. unmistakable perfectly,
D. unmistakable perfect

36. **F.** NO CHANGE
G. they are
H. their
J. its

37. For the sake of the logic and coherence of this paragraph, Sentence 6 should be placed:

A. where it is now.
B. before Sentence 1.
C. after Sentence 3.
D. after Sentence 4.

Growing up in Kentucky, these fossils were common.
38

Eons ago my father taught us that our farm and everything
39
around it had been covered by a tropical sea. Furthermore, in that sea lived a great variety of marine animals,

including the crinoids; animals that looked like plants,
40
with brightly colored heads atop segmented stems. The stems attached the crinoids to the ocean floor. I tried to picture the hills around our farm submerged beneath an ocean. I imagined crinoids waving in the current, then
41
sinking into sediment that eventually turned into limestone. Otherwise, the fossils we plucked from the
42.
creek were pieces of those ancient stems, freezing in time.
43

The fossils fascinated us, both because of the span of
44
geologic time they represented and because we could make them into jewelry. We strung them like beads or buttons onto thread to make: necklaces and bracelets. Around our
45
necks and on our wrists, we wore fragments of Earth's history, beautifully preserved.

38. **F.** NO CHANGE
G. Where we grew up
H. Living as children
J. Having grown up

39. The writer wants to stress the amount of geologic time that had passed since the land their farm is now on was underwater. Assuming that the capitalization would be adjusted as needed, where should the underlined portion be placed?
A. Where it is now
B. After the word *father*
C. After the word *us*
D. After the word *that*

40. **F.** NO CHANGE
G. crinoids are
H. crinoids:
J. crinoids

41. **A.** NO CHANGE
B. than
C. that
D. so

42. **F.** NO CHANGE
G. On the contrary, the
H. Whether the
J. The

43. **A.** NO CHANGE
B. freezed
C. frozen
D. froze

44. Which of the following alternatives to the underlined portion would NOT be acceptable?
F. stride
G. amount
H. period
J. length

45. **A.** NO CHANGE
B. to make necklaces
C. to make necklaces,
D. to: make necklaces

PASSAGE IV

Wild West, White Linens

In the late 1800s, people who traveled [46] west of the Mississippi River by train meant heading into a region still rough around the edges: The terrain was rugged. The weather was harsh. Rigid were the train's seats. [47] Food was scarce.

Then suddenly one day, [48] "eating houses" appeared anywhere trains took a twenty-minute stop to replenish an engines' water supply. [49] These eateries were often a little more then [50] ramshackle sheds or hastily erected tents. The use of campfire cooking and a lack of refrigeration meant passengers were likely to be served a concoction of spoiled produce and half-cooked meat impersonating stew.

In 1901, Fred Harvey's sons took over the company. [51]

Out of Harvey's talent and ambition to grow [52] the Harvey House chain of restaurants. Harvey struck a deal with a major railroad line, the Atchison, Topeka, and Santa Fe

46. **F.** NO CHANGE
G. when people traveled
H. by traveling
J. traveling

47. Which choice most closely maintains the sentence pattern the writer is attempting to establish in the specific examples following the colon?

A. NO CHANGE
B. Train seats were well known for being rigid.
C. Rigid train seats were the norm.
D. Train seats were rigid.

48. Which choice most effectively gives one possible explanation for the fact that "eating houses" began to appear wherever trains stopped?

F. NO CHANGE
G. In spite of the discomfort,
H. As rail travel increased,
J. Within a short time,

49. **A.** NO CHANGE
B. a water supply for the engines'.
C. an engines supply of water.
D. an engine's water supply.

50. **F.** NO CHANGE
G. much more then
H. little more than
J. least than

51. Given that all the choices are true, which one offers the most effective transition from the preceding two paragraphs to the rest of the essay?

A. NO CHANGE
B. Then entrepreneur Fred Harvey stepped onto the scene.
C. There were forty-seven Harvey House restaurants open in 1902 due to Fred Harvey.
D. In 1835, Fred Harvey was born in London.

52. **F.** NO CHANGE
G. could have grown
H. would grow
J. growing

Railway. In return for Santa Fe trains delivering fresh produce, meat, and dairy products to his kitchens daily, Harvey promised not to open any restaurants along competitors' routes. Which resulted in that only (53) the Santa Fe railroad would offer passengers hot, savory meals served in elegant style.

[1] Instead of food-stained planks, Harvey House tables were draped in white linen. [2] Tin plates were replaced by fine china and silverware. [3] A cadre of young women—dubbed "the Harvey Girls" (54) served guests quickly and cordially. [4] Harvey believed the term "waitress" implied servitude not (55) *his* staff would offer gracious hospitality. [5] And incredible food. [6] Rather than suffering days-old stew, customers at Harvey House were served meals such as meat, vegetables, and dessert, (56) all for about seventy-five cents. [7] In fact, the first known use of the expression "blue plate special," indicating a bargain-cost, (57) complete, inexpensive meal (served on an actual blue plate), (58) was on

53. **A.** NO CHANGE
B. Resulting in only
C. To result only
D. Only

54. **F.** NO CHANGE
G. women—dubbed "the Harvey Girls"—
H. women dubbed—"the Harvey Girls"—
J. women dubbed "the Harvey Girls"—

55. **A.** NO CHANGE
B. servitude;
C. servitude,
D. servitude

56. The writer is considering revising the underlined portion to the following:

roast pork with applesauce, asparagus, mashed potatoes, and peach pie,

Should the writer make the revision?

F. Yes, because it makes the comparison in the sentence more vivid.
G. Yes, because it helps explain why the meal cost so little.
H. No, because it contains details that are only loosely related to the paragraph's topic.
J. No, because it makes the sentence redundant and wordy.

57. **A.** NO CHANGE
B. a low-priced,
C. an affordable,
D. a

58. When revising the essay, the writer considers whether the parenthetical phrase should be deleted. Which of the following sentences best explains the function of the underlined portion?

F. It provides a comparison between the Harvey House menu in 1892 and the food being served at Harvey House restaurants today.
G. It offers a partial explanation for an expression used earlier in the sentence.
H. It supplies a link that connects the main topic of this paragraph back to the essay's introduction.
J. It helps to establish the approximate time period in which events in the essay take place.

an 1892 Harvey House menu. [59]

Today, only a few Harvey Houses remain. Still, whenever a roadside diner advertises a blue plate special—irrespective of the actual color of the plate—its (60) invoking Harvey's dining philosophy: good food at a reasonable price.

59. The writer wants to divide this paragraph into two in order to separate the description of the Harvey House decor and service from the description of the type of meals offered. The best place to begin the new paragraph would be at the beginning of Sentence:

A. 3.
B. 4.
C. 6.
D. 7.

60. **F.** NO CHANGE
G. there
H. their
J. it's

PASSAGE V

Aquaculture: A Solution or a Problem?

Overfishing has depleted much of the world's naturally occurring supply of edible aquatic creatures. Despite a growing recognition of this ecological threat, demands (61) for seafood continues to rise. The United States alone consumed around six million metric tons of seafood in 2000, and that figure is expected to increase to over eight million by 2025. Aquaculture—commercially raising fish, shellfish, and other aquatic organisms in tanks or enclosures, (62) is one way to reduce people's dependence on wild-caught creatures, but it has its own drawbacks.

By increasing the supply of seafood and avoiding the high transportation costs associated with ocean-based fishing, aquaculture helps keep prices low for consumers. [63]

61. **A.** NO CHANGE
B. the demands
C. demanding
D. demand

62. **F.** NO CHANGE
G. enclosures—
H. enclosures:
J. enclosures;

63. The writer is considering revising the preceding sentence to the following:

> By increasing the amount and cutting costs, aquaculture helps keep prices low.

Should the writer make this revision?

A. Yes, because the revised sentence would be more concise and therefore clearer.
B. Yes, because the revised sentence would eliminate jargon, such as *supply* and *consumers*.
C. No, because the revised sentence would lack important clarifying details.
D. No, because the revised sentence would be too formal in style for the essay.

Freshness is also a benefit, commercially raised fish can reach market more quickly than ocean-caught fish. Relying less on wild-caught fish, aquaculture supporters say, this is also an ecologically sound approach to helping threatened natural populations recover.

The ecological impact of aquaculture depends on which species are raised and what method is used. Mussels and oysters [68] can benefit the coastal environments in which they're raised. On the other hand, farmed salmon, typically raised in netted ocean pens, quickly pass diseases, which make salmon ill, in the pens' crowded conditions. When salmon escape the nets, the diseases they carry can infect wild populations. Salmon also produce massive quantities of waste. If untreated, that waste can contaminate the land or water where it's deposited.

64. **F.** NO CHANGE
G. benefit, that's because
H. benefit:
J. benefit

65. **A.** NO CHANGE
B. which is
C. that's
D. is

66. Which choice offers the most effective and logical lead-in to the sentence and the paragraph?

F. NO CHANGE
G. financial profitability
H. nutritional benefit
J. long history

67. **A.** NO CHANGE
B. depends, on
C. depends on,
D. depends on:

68. At this point, the writer is considering adding the following true information:

—filter feeders that help clear waste from water—

Should the writer make this addition here?

F. Yes, because it explains why mussels and oysters can be beneficial to coastal areas.
G. Yes, because it identifies which species of mussels and oysters are raised commercially.
H. No, because it interrupts the sentence with unnecessary scientific detail.
J. No, because it merely restates what's already clearly indicated in the sentence.

69. Which choice makes clear that the writer is describing farmed salmon in general rather than a particular type of farmed salmon?

A. NO CHANGE
B. salmon typically raised in netted ocean pens
C. salmon, typically raised in netted ocean pens
D. salmon typically raised in netted ocean pens,

70. **F.** NO CHANGE
G. diseases owing to the fish being close together
H. sicknesses known as diseases
J. diseases

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

A. Allowed to go untreated,
B. What's untreated,
C. Left untreated,
D. Untreated,

Many ecological experts believe that the safest place for aquaculture is far from a natural body of water. Catfish produce little waste, and raising them in inland pens has a fairly small environmental impact. By contrast, shrimp create much more waste, and farms can yield 100,000 kilograms of shrimp per [72] hectare yearly. To combat some of the problems [72] associated with aquaculture, by the way, scientists [73] and aquaculturists are developing better waste-removal processes as well as hard-walled pen systems designed to keep them separate. [74]

72. Given that all the choices are true, which one most effectively completes the paragraph's contrast of raising shrimp with raising catfish?

F. NO CHANGE
G. it takes about twelve days after hatching for them to become adults.
H. the farms that raise them are generally described as "extensive" or "intensive."
J. polluted water from coastal farm ponds is usually discharged into the environment.

73. **A.** NO CHANGE
B. besides,
C. in short,
D. DELETE the underlined portion.

74. **F.** NO CHANGE
G. commercial and wild populations
H. these sorts of things
J. those two

Question 75 asks about the preceding passage as a whole.

75. Suppose the writer's goal had been to write an essay condemning the use of aquaculture. Would this essay accomplish that goal?

A. Yes, because it lists numerous environmental problems associated with aquaculture.
B. Yes, because it argues that aquaculture can't be used to address the problem of overfishing.
C. No, because it presents the benefits and drawbacks of aquaculture to a roughly equal extent.
D. No, because it focuses instead on how aquaculture can be made more environmentally friendly.

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 fill in the corresponding oval on your answer document.

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

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

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

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

DO YOUR FIGURING HERE.

1. What is the value of x when $\frac{3x}{2} + 16 = 10$?

A. -9
B. -4
C. 4
D. 9
E. 39

2. A bowl contains 100 jelly beans, of which 42 are red, 36 are blue, and 22 are green. What is the probability that a jelly bean picked at random from the bowl will NOT be red?

F. $\frac{11}{50}$
G. $\frac{9}{25}$
H. $\frac{21}{50}$
J. $\frac{29}{50}$
K. $\frac{39}{50}$

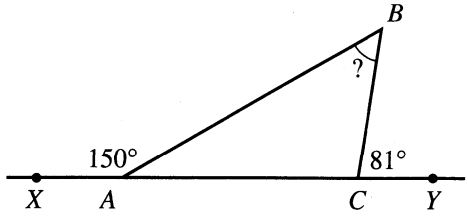
3. For what value of x is the equation $3.6x + 7.99 = 1.03 - 2.4x$ true?

A. -58
B. -5.8
C. -1.16
D. 1.16
E. 5.8

DO YOUR FIGURING HERE.

4. In the figure below, the measure of $\angle XAB$ is 150°; the measure of $\angle YCB$ is 81°; and X, A, C, and Y are collinear. What is the measure of $\angle B$?

F. 30°
G. 51°
H. 60°
J. 69°
K. 77°



5. Which of the following numbers is a solution to $x^2 - 16 = 6x$?

A. −8
B. 2
C. 4
D. $4 + \sqrt{6}$
E. 8

6. $|6 - 4| - |3 - 7| = ?$

F. −6
G. −2
H. 2
J. 6
K. 20

7. Dakota bought a pair of shoes that had an original price of $70.00. The store offered a 20% discount on the original price of the shoes, and Dakota paid 6% sales tax on the discounted price of the shoes. How much did Dakota pay for the shoes, including tax?

A. $51.80
B. $52.64
C. $59.36
D. $60.20
E. $79.80

8. What is the value of $x^2y^3 - xy^2 + x$ when $x = -3$ and $y = 2$?

F. −63
G. −57
H. 57
J. 63
K. 81

9. A toy car travels at a constant rate of 11 inches every 5 seconds. At this rate, which of the following is closest to the number of *feet* the car travels in 2 *minutes* ?

A. 5
B. 13
C. 22
D. 24
E. 28

DO YOUR FIGURING HERE.

10. Dalia is taking inventory of cases of soda cans. There are 24 cans in a full case, and Dalia has 4 partially filled cases: 1 case is $\frac{1}{2}$ full, 1 case is $\frac{2}{3}$ full, and 2 cases are each $\frac{5}{6}$ full. How many soda cans are in the 4 partially filled cases?

F. 48
G. 64
H. 68
J. 80
K. 96

11. Each side of a square is 3 cm long. One vertex of the square is at (6,4) on a square coordinate grid marked in centimeter units. Which of the following points on the grid could be another vertex of the square?

A. (9, 4)
B. (6, 3)
C. (4, 5)
D. (1,–5)
E. (–3, 4)

12. Eduardo is making a cake with frosting. The recipe calls for $\frac{1}{8}$ teaspoon of vanilla extract for the cake and $\frac{3}{4}$ teaspoon of vanilla extract for the frosting. To make 2 cakes with frosting by doubling this recipe, how many teaspoons of vanilla extract does Eduardo need?

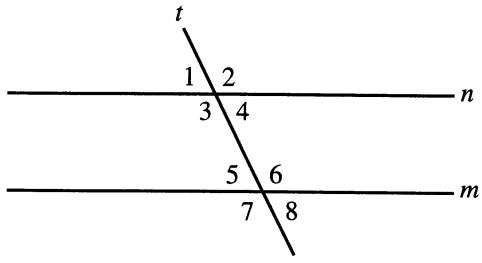
F. $\frac{2}{3}$
G. $\frac{7}{8}$
H. $\frac{7}{16}$
J. $1\frac{1}{2}$
K. $1\frac{3}{4}$

13. In the standard (x,y) coordinate plane, what is the midpoint of the line segment with endpoints (1,9) and (7,–3) ?

A. (–3,–6)
B. (–1, 8)
C. (4, 3)
D. (5, 2)
E. (8, 6)

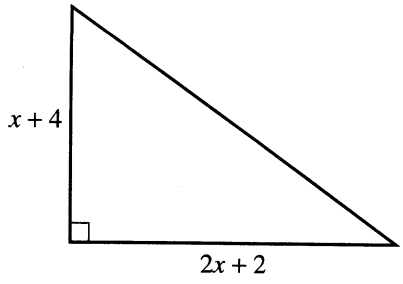
DO YOUR FIGURING HERE.

14. In the plane shown in the figure below, lines m and n are cut by transversal line t. The 8 angles at the intersections of these lines are labeled. Which of the following statements, when it is true, CANNOT *always* be used to prove that lines m and n are parallel?



F. $\angle 1 \cong \angle 5$
G. $\angle 1 \cong \angle 7$
H. $\angle 1 \cong \angle 8$
J. $\angle 2 \cong \angle 7$
K. $\angle 4 \cong \angle 5$

15. The dimensions of the right triangle shown below are in feet. What is the area, in square feet, of the triangle?



A. $x^2 + 4$
B. $x^2 + 8$
C. $x^2 + 5x + 4$
D. $2x^2 + 8$
E. $8x^2$

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

F. -11
G. -5
H. 7
J. 10
K. 13

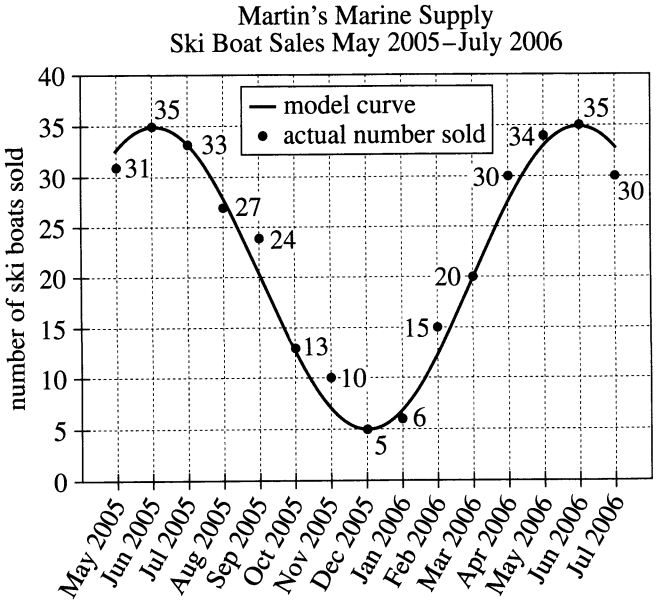
17. What is the length, in feet, of the side of a square whose area, in square feet, is equal to the area of a 25-foot-by-16-foot rectangle?

A. $\sqrt{41}$
B. $2\sqrt{10}$
C. 9
D. 20
E. 400

DO YOUR FIGURING HERE.

Use the following information to answer questions 18–20.

The graph below shows the number of ski boats sold each month by Martin's Marine Supply. The number near each point is the actual number of ski boats sold for the month corresponding with the point. The curve represents a model equation that comes close to fitting the actual numbers sold by month.



18. One of the following is the value for September 2005 on the model curve. Which one?

F. 5
G. 20
H. 24
J. 27
K. 35

19. What is the average number of ski boats actually sold per month between and including the months of January 2006 and April 2006 ?

A. $13\frac{2}{3}$

B. $15\frac{1}{4}$

C. $16\frac{3}{4}$

D. $17\frac{3}{4}$

E. $21\frac{2}{3}$

DO YOUR FIGURING HERE.

20. During the period shown in the graph, each ski boat sold for exactly $30,000 before sales tax. On January 1, 2006, the sales tax was increased from 6% to 7%. How much more was the total sales tax on the actual number of ski boats sold in July 2006 than on the actual number sold in July 2005 ?

F. $3,600
G. $5,400
H. $6,300
J. $9,000
K. $9,900

---

21. For nonzero real numbers a, b, and c, the expression $\frac{a^5b^3c^4}{5a^2b^7c}$ is equivalent to:

A. $\frac{a^3c^3}{5b^4}$

B. $\frac{a^3c^4}{5b^4}$

C. $\frac{a^3bc^4}{5ab^4c}$

D. $\frac{(abc)^{12}}{(5abc)^9}$

E. $5a^7b^{10}c^5$

22. Akiko's average heart rate is 70 beats per minute. In scientific notation, how many times would her heart beat in 24 hours?

F. 1.44×10^3
G. 1.68×10^3
H. 4.2×10^3
J. 1.008×10^4
K. 1.008×10^5

23. The lengths of the 3 sides of a triangle are in the ratio 5:6:9. The perimeter of the triangle is 100 inches. What is the length, in inches, of the longest side of the triangle?

A. 10
B. 25
C. 30
D. 45
E. 50

DO YOUR FIGURING HERE.

24. Given that $\sin A = \frac{20}{25}$, which of the following values could $\tan A$ equal?

F. $\frac{5}{20}$

G. $\frac{15}{20}$

H. $\frac{20}{15}$

J. 4

K. 5

25. Which of the following sets of 3 numbers could be the side lengths, in meters, of a right triangle?

A. 1, 1, 1
B. 2, 3, 5
C. 3, 4, 7
D. 4, 9, 13
E. 6, 8, 10

26. When graphed in the standard (x,y) coordinate plane, the line $2x + 3y - 1 = 0$ has a slope of:

F. -2

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

H. $\frac{2}{3}$

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

K. 2

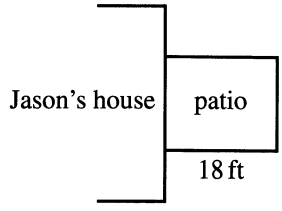
27. Which of the following expressions is equivalent to $(2x^2 + x + 3) + (2x + 1) + (3x - 1) - (2x + 2x + 2x)$?

A. $2x^2 + 8x + 3$
B. $2x^2 + 2x + 3$
C. $2x^2 + 3$
D. $8x + 3$
E. $2x + 3$

DO YOUR FIGURING HERE.

Use the following information to answer questions 28–30.

Jason will have a rectangular concrete patio constructed beside his house, as shown below. The patio will have a length of 18 feet, and the top surface of the patio will have an area of 270 square feet. The patio will be constructed so that one side of the patio is against a side of Jason's house.



28. The patio will have a thickness of 6 *inches*. The patio will consist of how many cubic *feet* of concrete?

F. 45
G. 90
H. 108
J. 117
K. 135

29. Jason chooses Tully's Concrete Finishing to seal his patio. Tully's Concrete Finishing uses the formula $C = 3.5A + 120$ to calculate the charge, C dollars, to seal a patio, where A square feet is the area of the top surface of the patio. What will be the charge for sealing Jason's patio?

A. $ 483
B. $ 945
C. $1,065
D. $1,128
E. $1,365

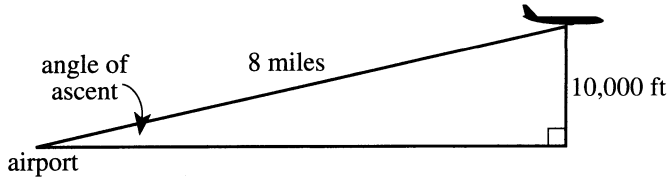
30. Jason will plant shrubs along the portion of the perimeter of the patio that is NOT against his house. What is the length, in feet, of that portion?

F. 33
G. 43.5
H. 48
J. 51
K. 66

DO YOUR FIGURING HERE.

31. An airplane taking off from an airport climbs at a constant angle of ascent so that it will reach an altitude of 10,000 feet when the airplane has flown 8 miles, as illustrated in the figure below. Which of the following expressions gives the angle of ascent?

(Note: 1 mile = 5,280 feet)



A. $\text{Arcsin}\left(\frac{8}{10{,}000}\right)$

B. $\text{Arctan}\left(\frac{10{,}000}{8(5{,}280)}\right)$

C. $\text{Arcsin}\left(\frac{10{,}000}{8(5{,}280)}\right)$

D. $\text{Arccos}\left(\frac{10{,}000}{8(5{,}280)}\right)$

E. $\text{Arctan}\left(\frac{8(5{,}280)}{10{,}000}\right)$

32. Which of the following inequalities orders the 4 numbers $\sqrt{3}$, $1\frac{5}{6}$, 1.6, and $\frac{5}{3}$ from largest to smallest?

F. $1\frac{5}{6} > \sqrt{3} > \frac{5}{3} > 1.6$

G. $1\frac{5}{6} > \frac{5}{3} > 1.6 > \sqrt{3}$

H. $1\frac{5}{6} > \sqrt{3} > 1.6 > \frac{5}{3}$

J. $\frac{5}{3} > 1\frac{5}{6} > \sqrt{3} > 1.6$

K. $\sqrt{3} > 1\frac{5}{6} > \frac{5}{3} > 1.6$

33. What is the 7th term of the geometric sequence 1, −2, 4, −8, ⋯ ?

A. −32
B. −10
C. 16
D. 56
E. 64

34. The hypotenuse of $\triangle POM$ is $\overline{PM}$. Which of the following statements could be true about $\triangle POM$?

F. $\overline{MO} \cong \overline{OP}$

G. $\overline{MP} \cong \overline{OP}$

H. $\angle M$ is a right angle.

J. The 3 sides of $\triangle POM$ are congruent.

K. The 3 interior angles of $\triangle POM$ are congruent.

DO YOUR FIGURING HERE.

35. Let $\triangle ABC$ and $\triangle DEF$ be similar triangles such that the scale factor of $\triangle ABC$ to $\triangle DEF$ is $\frac{2}{3}$. The perimeter of $\triangle ABC$ is 20 inches. What is the perimeter of $\triangle DEF$, in inches?

A. 13
B. 25
C. 30
D. 40
E. 45

36. Planter's Greenhouse estimates its profit by subtracting its overhead costs from 40% of its net sales. Which of the following equations represents this relationship between estimated profit (P), net sales (S), and overhead costs (C) of Planter's Greenhouse?

F. $P = \frac{40}{100}C - S$

G. $P = \frac{40}{100}S - C$

H. $P = S - \frac{40}{100}C$

J. $P = 40C - S$

K. $P = 40S - C$

37. In right triangle $\triangle PQR$ shown below, $\overline{QR}$ is 450 feet long and the measure of $\angle R$ is 35°. What is the length, in feet, of $\overline{PQ}$?

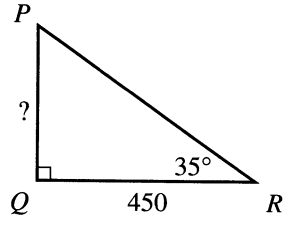
A. 450 sin 35°

B. 450 tan 35°

C. $\frac{450}{\sin 35°}$

D. $\frac{450}{\cos 35°}$

E. $\frac{450}{\tan 35°}$



38. Which of the following is equivalent to $\frac{5+3x}{2} - 3 > 0$?

F. $x > 0$

G. $x > \frac{1}{3}$

H. $x > 1$

J. $x > 3$

K. $x > 6$

DO YOUR FIGURING HERE.

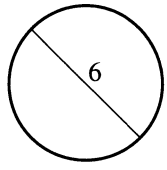
39. Sofia and Lance are contributing a total of $2,500 per year to help their nephew pay for college. Each year, Lance contributes $1\frac{1}{2}$ times the amount Sofia contributes. What is the amount, in dollars, Lance will contribute over a period of 4 years?

A. $1,250
B. $1,875
C. $4,000
D. $5,000
E. $6,000

40. Which of the following is the least common denominator for $\frac{1}{x^2-4} + \frac{1}{4x-8}$?

F. $(x-2)$
G. $4(x+2)$
H. $(x-2)(x+2)$
J. $4(x-2)(x+2)$
K. $4(x-2)^2(x+2)$

41. The circle shown below has a diameter of 6 cm. What is the area, in square centimeters, of the circle?



A. 3π
B. 6π
C. 9π
D. 12π
E. 36π

42. Which of the following is an equation of the line that passes through $(10,-2)$ and $(-2,-5)$ in the standard (x,y) coordinate plane?

F. $y = \frac{1}{4}x - \frac{9}{2}$
G. $y = \frac{1}{4}x - \frac{1}{2}$
H. $y = \frac{1}{4}x - 2$
J. $y = -\frac{1}{4}x - \frac{1}{2}$
K. $y = -\frac{1}{4}x + \frac{9}{2}$

43. A health club surveyed 175 members about which types of equipment they had used in the past month. Of the 175 members, 117 had used treadmills, 89 had used stationary bikes, and 53 had used both types of equipment. Some members had used neither type of equipment. Of the 175 members, how many had used treadmills, stationary bikes, or both?

A. 53
B. 81
C. 122
D. 134
E. 153

DO YOUR FIGURING HERE.

44. What is the largest 2-digit integer that is divisible by 7 and is a multiple of 3 ?

F. 21
G. 42
H. 84
J. 98
K. 105

45. In the standard (x,y) coordinate plane, the line $y = \frac{1}{4}x + 6$ is perpendicular to the line:

A. $y = -4x + 6$

B. $y = 4x + 6$

C. $y = -\frac{1}{4}x + 6$

D. $y = \frac{1}{4}x - 6$

E. $y = \frac{1}{4}x$

46. An emergency helicopter is located 2 miles north and 4 miles east of City Center. There is an emergency 22 miles south and 6 miles west of City Center. Which of the following is the distance, in miles, between the helicopter and the emergency?

F. 20
G. 22
H. 24
J. 26
K. 34

47. The 3 statements given below are all true about certain positive integers x, y, and z.

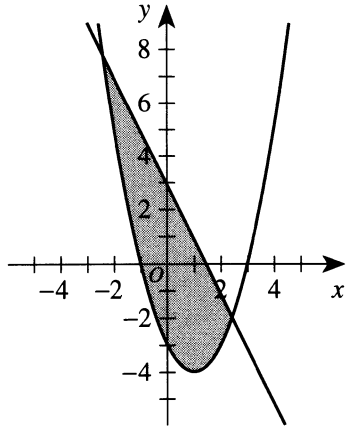
1. x is an even prime number
2. $6 < y < 9$
3. z is a perfect square such that $10 < z < 20$

Which of the following integers could be the value of $\frac{yz}{x}$?

A. 4
B. 32
C. 48
D. 56
E. 72

DO YOUR FIGURING HERE.

48. The shaded region in the standard (x,y) coordinate plane below is bounded by a parabola and a line. The shaded region and its boundary is the solution set of which of the following systems of inequalities?



F. $\begin{cases} y \geq -2x + 3 \\ y \leq x^2 - 2x - 3 \end{cases}$

G. $\begin{cases} y \leq -2x + 3 \\ y \geq x^2 - 2x - 3 \end{cases}$

H. $\begin{cases} y \leq -2x + 3 \\ y \leq x^2 - 2x - 3 \end{cases}$

J. $\begin{cases} y \geq -2x - 3 \\ y \leq x^2 - 2x + 3 \end{cases}$

K. $\begin{cases} y \leq -2x - 3 \\ y \geq x^2 - 2x + 3 \end{cases}$

49. What is the value of y in the solution of the system of equations below?

$$\begin{aligned} x + y &= -a \\ x - y &= b \end{aligned}$$

A. $-\left(\frac{a+b}{2}\right)$

B. $b - a$

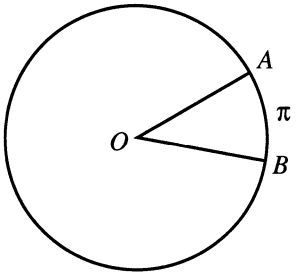
C. $\frac{b-a}{2}$

D. $a + b$

E. $\frac{a-b}{2}$

DO YOUR FIGURING HERE.

50. In the circle shown below, central angle $\angle AOB$ measures 45°, and arc $\overset{\frown}{AB}$ is π centimeters long. How many centimeters long is the circle's radius?



F. 2
G. 4
H. 8
J. 16
K. $4\sqrt{2}$

51. The solution to $ax = b$ is $x = 3$. The solution to $ax - 2 = b$ is $x = 8$. What is the value of a ?

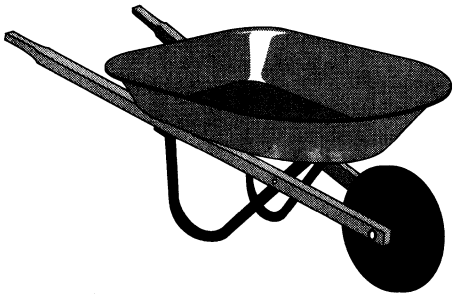
A. $\frac{2}{5}$
B. $\frac{2}{7}$
C. $\frac{3}{8}$
D. $\frac{8}{3}$
E. $\frac{8}{5}$

52. Consider the equation $x^2 - 6x + k = 0$. When solved for x, this equation will have exactly one real solution for which of the following values of k ?

F. −9
G. −3
H. 6
J. 9
K. 36

53. In the distance that Molly pushed the wheelbarrow shown below, the wheel rotated $\frac{3\pi}{2}$ radians. The distance that Molly pushed the wheelbarrow is what fraction of the circumference of the wheel?

A. $\frac{1}{4}$
B. $\frac{1}{2}$
C. $\frac{2}{3}$
D. $\frac{3}{4}$
E. $\frac{3}{2}$



DO YOUR FIGURING HERE.

54. The domain of the function $f(x) = \frac{1}{100 - |x|}$ contains all real values of x EXCEPT:

F. 0

G. 0 and 100

H. 0 and $\frac{1}{100}$

J. $-\frac{1}{100}$ and $\frac{1}{100}$

K. −100 and 100

55. In the figure below, E lies $\frac{3}{5}$ of the way from B to C on rectangle $ABCD$. The area of $\triangle AED$ is what fraction of the area of rectangle $ABCD$?

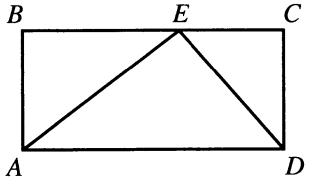
A. $\frac{1}{2}$

B. $\frac{2}{3}$

C. $\frac{2}{5}$

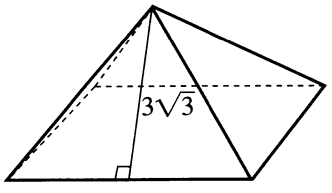
D. $\frac{3}{5}$

E. $\frac{3}{10}$



56. A right square pyramid with equilateral triangular faces is shown in the figure below. The slant height of the pyramid is $3\sqrt{3}$ inches. What is the total length, in inches, of all 8 edges of the pyramid?

F. 12
G. 21
H. 24
J. 36
K. 48



57. A circle in the standard (x,y) coordinate plane intersects the x-axis at (−7,0) and (1,0). The radius of the circle is 5 coordinate units. Which of the following could be the center of the circle?

I. (−3,−3)
II. (−3, 0)
III. (−3, 3)

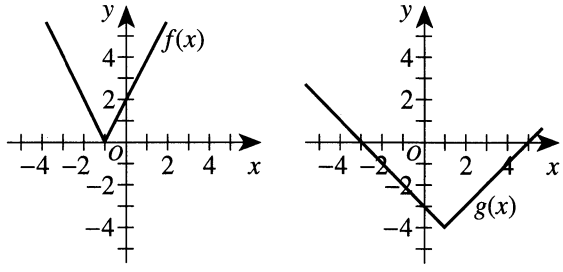
A. I only
B. II only
C. III only
D. I and III only
E. I, II, and III

DO YOUR FIGURING HERE.

58. What percent of the *even* numbers from 2 to 50, inclusive, have a units digit that is twice the tens digit?

F. 4%
G. 5%
H. 8%
J. 16%
K. 20%

59. The graphs of $f(x)$ and $g(x)$ are shown in the standard (x,y) coordinate planes below. One of the following expressions represents $g(x)$ in terms of $f(x)$. Which one?



A. $\frac{1}{2}f(x-2)-4$

B. $\frac{1}{2}f(x-2)+4$

C. $\frac{1}{2}f(x+2)+4$

D. $f(x-2)-4$

E. $f(x+2)-4$

60. A news anchor made the true statement below.

If it is raining, then the parade is canceled.

Which of the following statements is logically equivalent to the news anchor's statement?

F. If it is not raining, then the parade is not canceled.
G. The parade is canceled if and only if it is raining.
H. If it is not raining, then the parade is canceled.
J. If the parade is canceled, then it is raining.
K. If the parade is not canceled, then it is not raining.

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 a passage, choose the best answer to each question and fill in 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 novel *Aloft* by Chang-rae Lee (©2004 by Chang-rae Lee).

For most of my life I worked in the family business, Battle Brothers Brick & Mortar, a masonry company that my grandfather started in the Depression and that my father and uncles gradually turned into a landscaping company that I maintained and that my son Jack has plans for expanding into a publicly traded specialty home improvement enterprise to be renamed Battle Brothers Excalibur, L.L.C., replete with a glossy annual report and standby telephone operators and an Internet website.

The family name was originally Battaglia, but my father and uncles decided early on to change their name to Battle for the usual reasons immigrants and others like them will do, for the sake of familiarity and ease of use and to herald a new and optimistic beginning, which is anyone's right, whether warranted or not.

Battle, too, is a nice name for a business, because it's simple and memorable, ethnically indistinct, and then squarely patriotic, though in a subtle sort of way. Customers—Jack says *clients*—have the sense we're fighters, that we have an inner resolve, that we'll soldier through all obstacles to get the job done, and done right (this last line can actually be found in the latest company brochure). My father insists that the idea for the name originated with him, and for just the connotations I've mentioned, which I don't doubt, as he was always the savviest businessman of his brothers, and talked incessantly through my youth about the awesome power of words. But it's not just marketing—for the most part the tag has been true, though certainly more so in my father's generation than my own, probably more in mine than in Jack's; but this is world history and I'm not going to rail on about the degradation of standards or the work ethic. My father and uncles did their work in their time, and I did mine, and Jack will do his at this post-turn-of-the-millennium moment, and who can say who will have had the hardest go?

Sometimes I think Jack's is a tough slot, given the never-ending onslaught of instant information and the general wisdom these days that if you don't "grow" your business at a certain heady rate it will wither and die. Good for him that for the last four years he has seemed to be practically printing money, what with all the trucks out every day and him needing to hire extra help literally off the street each morning. Now with the economy in the doldrums he probably wishes he hadn't built his mega-mini-mansion but he doesn't seem concerned.

I do sometimes worry about Jack, and wonder if he's grinding too hard for the dollars. Just sit down with him to lunch sometime and you'll see all the digital hardware come unclipped from his belt and onto the table, the pager and cell phone and electronic notepad and memo-to-self recorder. At least my father and uncles had the twin angels of innocence and ignorance to guide them and the devil of hard times to keep working against. I merely inherited what they had already made fairly prosperous, and did what I could not to ruin anything, though my girlfriend Rita often pointed out that I had the least enviable position, given that I really had no choice in the matter, expected as I was to sustain something I never had a genuine interest in. This is mostly true. I had no great love for brick and mortar.

In all fairness, however, I'm Hank (The Tank) Battle's son, with the main difference between him and me being that I was never able to summon his first-strike arrogance, nor develop the necessary armature for the inevitable fallout from oneself. I made a fine living from Battle Brothers. I always worked hard, if not passionately. I never took what was given to me for granted, or thought anything or anyone was below me. I was not a quitter. In these regards, I have no regrets.

When I sold out my shares in Battle Brothers four years ago I hadn't fully realized that there was no place left for me to go, and decided, on the suggestion of my daughter Theresa, citing my extensive résumé as a "passenger," that I ought to try my hand at being a travel professional, which, it turns out, despite her snide deconstructive terminology, was just my calling. For long before I donned my travel agent's blazer I could speak to most every notable sight in every notable town in this shrinking touristical world, I knew the better ranks of inns and hotels and tour and cruise operators, and I knew which all-inclusives and play-and-stay packages offered good value or were just plain sorry and cheap.

1. The passage can best be described as primarily:
   - **A.** the reflections of a man considering the past and current state of the family business and his role in both.
   - **B.** an account of the rise and fall of a family business as told by one of its founders.
   - **C.** an attempt by a business owner to understand the falling-out he's had with his father over how the family business is run.
   - **D.** a father's tribute to a son who is taking over the family business at a difficult time.

2. Which of the following actions affecting the family business does the narrator NOT attribute to Jack?
   - **F.** Calling customers "clients"
   - **G.** Offering standby telephone operators
   - **H.** Changing the family name from Battaglia to Battle
   - **J.** Expanding the company into a publicly traded enterprise

3. The narrator explicitly declines to take a firm stand on which of the following issues?
   - **A.** Which family member or members will have faced the greatest challenges in running the business
   - **B.** Whether changing the family name from Battaglia to Battle was a reasonable thing to do
   - **C.** What the main difference is between his father and him
   - **D.** In what ways he served the company well

4. According to the passage, what is the narrator's father's attitude toward words?
   - **F.** The people who talk the most say the least.
   - **G.** Words distract people from action.
   - **H.** Words have an awesome power.
   - **J.** Advertising makes words meaningless.

5. As it is used in line 44, the word *out* most nearly means:
   - **A.** broken.
   - **B.** outdated.
   - **C.** on the job.
   - **D.** out of fuel.

6. What or who are the "twin angels" referred to in the passage?
   - **F.** Work and prosperity
   - **G.** Innocence and ignorance
   - **H.** The narrator's son and daughter
   - **J.** The narrator's father and uncle

7. What does the narrator state is his girlfriend's view of his role in the family business?
   - **A.** His contributions, though overshadowed by those of his predecessors, were still critical to the company's success.
   - **B.** He was lucky to inherit a business that others had already made successful.
   - **C.** More than anyone, he deserved credit for ensuring the company did not fall apart during hard times.
   - **D.** He had the least enviable position, in that he was expected to keep up a business he had little interest in.

8. According to the passage, who or what is "Hank (The Tank)"?
   - **F.** The narrator
   - **G.** The narrator's father
   - **H.** The company mascot
   - **J.** One of the company's original trucks

9. According to the passage, there was something snide about the narrator's daughter's suggestion that:
   - **A.** Jack was practically printing money.
   - **B.** the company's history is a form of world history.
   - **C.** the name Battle Brothers sounds patriotic.
   - **D.** the narrator should try a job in the travel profession.

10. As it is used in line 81, the phrase *speak to* most nearly means:
    - **F.** talk to directly.
    - **G.** contradict openly.
    - **H.** scold gently.
    - **J.** discuss knowledgeably.

Passage II

SOCIAL SCIENCE: This passage is adapted from the book *Tree Bark: A Color Guide* by Hugues Vaucher, translated and edited by James E. Eckenwalder (©2003 by Timber Press, Inc.).

Bark makes up 6–22% as much of the bulk of tree trunks as the wood. In many lumber mills, bark has often been discarded as waste or burned in the open air. This poses a big problem in terms of groundwater contamination and air pollution. The exploitation of bark takes advantage of its three most important properties: its energy content, which is about the same as that of wood; its low density; and the diverse cellular contents. These physical properties and the high concentration of chemical cell contents explain the diverse potential uses for bark.

Cork oak (*Quercus suber*) is virtually without parallel among trees. It is the only one that is exploited industrially and exclusively for its bark: cork, a raw material whose properties are nearly impossible to duplicate artificially. This tree of the Mediterranean countries and of the adjacent Atlantic coasts is cultivated principally in Portugal, which with 330–440 million pounds per year provides 50% of world production. Portugal has more than 1.8 million acres of cork oaks under cultivation. Next come Spain, Algeria, Morocco, France, Italy, and Tunisia.

A standardized procedure is used for harvesting cork. When the cork oak reaches the age of 20–25 years and its trunk measures about 12 inches in diameter, it can be debarked (or stripped) for the first time. The virgin cork from this harvest is of low quality and is generally only used for granulated cork. After another 8–10 years, the cork will have regrown to a thickness of 1¼–2 inches. The second harvest can then proceed, and thenceforth every 8–10 years to an age of 130–150 years if the tree holds up well and grows in favorable climatic conditions. Trees that are not subjected to this harvesting regime can live 300–400 years!

The uniqueness of the cork oak lies in the great ease with which the outer bark (cork and rhytidome) can be separated from the inner bark (bast), preserving the living part that produces the cork. The art of stripping, which is carried out from mid-June to mid-August (while the sap is rising), lies in making longitudinal and then horizontal cuts on the trunk in order to release strips or sheets without damaging the inner bark. Thus the growth of cork can resume without initiating faults in the new cork. The living bark, which is reddish yellow after debarking, gradually turns ochre thereafter, then brownish red over the course of weeks, and finally blackish gray after about a year.

Although cork is a dead bark, it should be considered a noble plant material since its intrinsic properties are numerous and irreplaceable by any single synthetic material of the same cost. The qualities of cork can be summarized as follows: lightness (density of 0.15–0.25 g/cm^3), good resistance to compression and bending, good elasticity, great capacity to absorb vibration, very high coefficient of friction, low coefficient of swelling, very low heat conduction, inertness to chemical agents and to boiling in water (212°F), very good resistance to absorption, impermeability to moisture, excellent durability and freedom from decay, nearly noninflammable, good coefficient of noise absorption, and handsome appearance, permitting its use for decorative articles.

The industrial and small-scale applications of cork are as varied as they are numerous. Its most familiar use is as stoppers (corks) for bottles. However, the largest volume of cork consumed by industry actually goes into the manufacture of cork aggregate soundproofing panels and cork tiles used as flooring in private homes, public buildings, factories, sports halls, etc. Significant quantities of cork are also used to make sheets of various thickness that are used in light carpentry and for interior decoration.

The list of products that are made wholly or partly of cork is impressive. We can cite, in no particular order: floats for fishnets; life preservers; antivibration blocks for machinery; insulation for appliances, including refrigerators; parts for toys; linings for carrying cases; blocks for printing on bags, fabrics, or wallpaper; tabletops, trays, and cork boards; model making by sculptors and architects; boxes and decorative objects sculpted from cork; insulating covers; polishing wheels for the glass industry; articles for sports, education, and handicrafts; protective packing material for fragile commodities; parts for footwear, clogs, and orthopedic devices; etc. One could also mention the aerospace industry, which uses cork for its qualities of lightness coupled with good thermal insulation.

11. Which of the following qualities does the author NOT attribute to cork?

- **A.** Good resistance to compression
- **B.** Excellent durability
- **C.** Handsome appearance
- **D.** Very good absorption of water

12. Which of the following phrases best describes what the last paragraph adds to the passage?

- **F.** A list of the ways the author's company has used cork over the last twenty years
- **G.** A summary of the information provided in the rest of the passage
- **H.** A list of cork products manufactured for use in a wide range of settings
- **J.** A list of the ways cork has been used, combined with a list of its potential uses

13. In the first paragraph, bark is described as being a part of the tree that is distinct from the tree's:

A. trunk.
B. wood.
C. bulk.
D. energy content.

14. According to the passage, the three most important qualities of bark are:

F. freedom from decay, inflammability, and high capacity for noise absorption.
G. color, thickness, and density.
H. energy content, low density, and diverse cellular contents.
J. sap content, age, and durability.

15. Which of the following statements about cork production in Portugal is supported by the passage?

A. Portugal has more than 440 million acres of cork oaks under cultivation.
B. Portugal produces as much cork as Algeria but not as much as Morocco.
C. Portugal is the biggest consumer of cork.
D. Portugal produces half the world's cork.

16. According to the passage, determining when to first harvest cork is a function of the:

F. age of a tree and the diameter of its trunk.
G. height of a tree and the thickness of its bark.
H. time of year and the health of the tree.
J. marketplace demand and the price of lumber.

17. According to the passage, which of the following is an accurate statement about the timing of cork harvesting?

A. After its first harvest, a healthy tree can be harvested every year.
B. The intervals between harvests of any given tree are approximately eight to ten years.
C. A tree should be harvested no more than six times in its lifetime.
D. Harvesting intervals vary from country to country depending on the local climate and soil conditions.

18. The passage indicates that a healthy cork oak tree harvested for its cork typically lives what amount of time compared to one that hasn't been harvested for its cork?

F. Significantly fewer years
G. The same amount of time
H. A few more years
J. Many more years

19. What does the passage state is the art involved in removing bark from the tree?

A. Cutting it in a way that makes what is removed from the tree particularly useful in art applications
B. Removing the outer bark in a way that causes no injury to the inner bark of the kind that would damage the next harvest
C. Slitting the outer bark in a way that allows for a layer of the inner bark to be extracted in one piece
D. Judging the precise time that the cork becomes the color for which there is the most demand in the industrial marketplace

20. The passage states that the largest volume of cork consumed by industry goes into the manufacture of:

F. stoppers, known as corks, used in bottling.
G. insulation for household appliances.
H. bulletin boards used in schools.
J. soundproofing panels and flooring tiles.

Passage III

HUMANITIES: This passage is adapted from the article "The Image Culture" by Christine Rosen (©2005 by Ethics and Public Policy Center).

The creator of one of the earliest technologies of the image named his invention, appropriately enough, for himself. Louis-Jacques-Mandé Daguerre, a Frenchman known for his elaborate and whimsical stage design in the Paris theater, began building on the work of Joseph Nicéphore Niepce to try to produce a fixed image. Daguerre called the image he created in 1837 the "daguerreotype." He made extravagant claims for his device. It is "not merely an instrument which serves to draw nature," he wrote in 1838, it "gives her the power to reproduce herself."

Despite its technological crudeness and often-spectral images, the daguerreotype was eerily effective at capturing glimmers of personality in its fixed portraits. The extant daguerreotypes of well-known Americans in the nineteenth century include: a young and serious Abraham Lincoln, sans beard; an affable Horace Greeley in stovepipe hat; and a dour picture of the suffragist Lucy Stone. A daguerreotype of Edgar Allan Poe, taken in 1848, depicts the writer with a baleful expression and crossed arms, and was taken not long before Poe was found delirious and near death on the streets of Baltimore.

But the daguerreotype did more than capture the posture of a poised citizenry. It also changed artists' perceptions of human nature. Nathaniel Hawthorne's 1851 Gothic romance, *The House of the Seven Gables*, has an ancient moral ("the wrong-doing of one generation lives into the successive ones") but made use of a modern technology, daguerreotyping, to unspool its story about the unmasking of festering, latent evil. In the story, Holgrave, the strange lodger living in the gabled house, is a daguerreotypist (as well as a political radical) who says of his art: "While we give it credit only for depicting the merest surface, it actually brings out the secret character with a truth no painter would ever venture upon, even could he detect it." It is Holgrave's silvery daguerreotypes that eventually reveal the nefarious motives of Judge Pyncheon—and in so doing suggest that the camera could expose human character more acutely than the eye.

Author Oliver Wendell Holmes called the photo the "mirror with a memory," and in 1859 predicted that the "image would become more important than the object itself and would in fact make the object disposable." But praise for the photograph was not universal.

In her elegant extended essay *On Photography*, the late Susan Sontag argues that images—particularly photographs—carry the risk of undermining true things and genuine experiences, as well as the danger of upending our understanding of art. "Knowing a great deal about what is in the world (art, catastrophe, the beauties of nature) through photographic images," Sontag notes, "people are frequently disappointed, surprised, unmoved when they see the real thing." This is not a new problem, of course; it plagued the art world when the printing process allowed the mass reproduction of great works of art, and its effects can still be seen whenever one overhears a museum-goer express disappointment that the Van Gogh he sees hanging on the wall is nowhere near as vibrant as the one on his coffee mug.

But Sontag's point is broader, and suggests that photography has forced us to consider that exposure to images does not necessarily create understanding of the things themselves. Images do not necessarily lead to meaning; the information they convey does not always lead to knowledge. This is due in part to the fact that photographic images must constantly be refreshed if one's attention is to continue to be drawn to them. "Photographs shock insofar as they show something novel," Sontag argues. "Unfortunately, the ante keeps getting raised—partly through the very proliferation of such images of horror." Images, Sontag concludes, have turned the world "into a department store or museum-without-walls," a place where people "become customers or tourists of reality."

Nevertheless, photographs still retain some of the magical allure that the earliest daguerreotypes inspired. As W. J. T. Mitchell observes in *What Do Pictures Want?*, "When students scoff at the idea of a magical relation between a picture and what it represents, ask them to take a photograph of their mother and blank out the eyes." Photographs remain powerful because they are reminders of the people and things we care about. They are surrogates carried into battle by a soldier or by a traveler on holiday. They exist to remind us of the absent, the beloved, and the dead.

21. The main idea of the passage is that:

- **A.** photographs frequently disappoint viewers used to seeing the real objects photos depict.
- **B.** photography is a powerful and sometimes controversial form of image making.
- **C.** daguerreotypes produced stilted portraits that were crude and ineffective.
- **D.** daguerreotypes replaced other art forms because they provided more realistic images.

22. Based on the passage, with which of the following statements would Sontag most likely agree?

- **F.** Photographs force us to examine more closely the subjects they depict.
- **G.** Photographs provide the best way to know about the world.
- **H.** The numerous images people see every day can desensitize them to real experiences.
- **J.** Museumgoers are disappointed by the quality of reproductions of original works of art.

23. How does the passage's author directly support her claim that the daguerreotype was more than a simple portrait?

- **A.** By portraying the whimsical nature of Daguerre
- **B.** By describing how Daguerre's work was built on the technology invented by someone else
- **C.** By giving examples of well-known Americans whose personalities were captured in daguerreotypes
- **D.** By mentioning famous authors who studied the history of the technological developments in photography

24. The passage's author most likely relates the plot of *The House of the Seven Gables* to:

- **F.** provide an entertaining interruption in an otherwise technical passage.
- **G.** suggest some artists' belief in the ability of daguerreotypes to expose truth.
- **H.** point out Hawthorne's doubts about the usefulness of new technology.
- **J.** encourage the reader to study the classic novels of the 1800s.

25. Which of the following people think or act in a way that is most similar to that of the museumgoers described in the fifth paragraph (lines 47–62)?

- **A.** Athletes who participate in more sporting events than they watch on television
- **B.** Readers who prefer current novels to those written prior to the 1900s
- **C.** Visitors to a zoo who enjoy viewing real animals rather than watching a documentary about them
- **D.** Music fans who would rather listen to recorded music than see a live performance

26. According to the passage, of the following, who was the earliest contributor to the technological development of fixed images?

- **F.** Hawthorne
- **G.** Daguerre
- **H.** Holmes
- **J.** Niepce

27. A journalist in 1839 had this to say about the daguerreotype:

> Talk no more of "holding the mirror up to nature"—she will hold it up to herself, and present you with a copy of her countenance for a penny.

Based on the passage, would Daguerre agree or disagree with this statement?

- **A.** Agree, because he felt that daguerreotypes should mostly be used to take pictures of the outdoors.
- **B.** Agree, because he believed daguerreotypes gave the power of reproduction to nature.
- **C.** Disagree, because his early daguerreotypes were technologically crude and ineffective.
- **D.** Disagree, because he recognized that photography was inferior to paintings in providing realistic reproductions.

28. Based on the passage, why might *The House of the Seven Gables* have been considered a modern story for its time?

- **F.** It revised an old theme to better suit readers of that era.
- **G.** Its two main characters had jobs that were just then becoming vital to the society of that era.
- **H.** It made a then-new technology, daguerreotyping, central to the plot.
- **J.** Its plot changed the way writers thought about daguerreotyping and in so doing created a new genre.

29. Based on the passage, when Holmes called the photograph a "mirror with a memory" (line 43), he most likely meant that a photograph:

- **A.** is an effective way to visualize and save a moment in time.
- **B.** portrays the subject from the photographer's point of view.
- **C.** makes the world around us seem unimportant to explore and remember.
- **D.** glosses over the ugly parts of life so people don't have to be reminded of them.

30. Based on the passage, Mitchell suggests asking students to blank out the eyes of a photograph of their mother in order to:

- **F.** show how physically fragile a picture can be.
- **G.** point out that they shouldn't take their parents for granted.
- **H.** force them to examine their family histories through photography.
- **J.** demonstrate the magical associations a picture can have.

Passage IV

NATURAL SCIENCE: This passage is adapted from *Chance in the House of Fate: A Natural History of Heredity* by Jennifer Ackerman (©2001 by Jennifer Ackerman).

I once chanced on a collection of brilliantly colored paintings of South American insects, some of them nightmarish—a giant cockroach scaling a pineapple, for example—but most of them showing the metamorphosis of moths and butterflies from egg to winged insect, the life stages presented as if they were happening all at once.

The paintings were the work of Maria Sybilla Merian, a naturalist and artist who left her home in Amsterdam in 1699 at the age of fifty-two and sailed to South America to paint the life cycles of insects in the jungles of Suriname. The journey would have been remarkable in any century, but was especially so in the late 1600s, when savants were still poking for answers to nature's riddles in the ruins of the classical world, quoting the authority of Pliny, the natural philosopher who had confidently proposed that butterflies were born from dew, and drawing their knowledge of animals from medieval bestiaries. Birds were categorized according to notions of nobility, from most noble (eagles and hawks), to wise (owls), to big (ostriches), and on down the line. Caterpillars, if they were considered at all, were classified apart from winged insects and lumped together with worms and serpents.

From the Suriname capital, Paramaribo, Merian sailed up the Suriname River, stopping along its banks to collect caterpillars, then watching them closely for signs of metamorphosis and painting them at the pivotal moment. Two years later, sick of heat and fever, she returned home, loaded with specimens and hundreds of paintings of iguanas and geckos, fighting snakes and frog-eating scorpions, and dozens of moths and butterflies in various life stages on their native cassava, guava, batata, and pawpaw plants.

If we are to believe her journal, Merian knew the details of metamorphosis perhaps more intimately than the savants. Her paintings and journals address the step-by-step transfiguration not just of Lepidoptera (butterflies and moths) but also of amphibians. In 1686 she had precociously noted the developmental odyssey of frogs from black grains that "fed on the white slime that surrounded them," to tiny creatures that grew little tails so that they could swim, then eyes, then, eight days later, two little feet "from the skin at the back and after a further eight days two little feet at the front . . . [like] small crocodiles. Thereafter the tail rotted away and they became proper frogs and jumped onto the land."

Just what was going on in this rotting away wasn't discovered until 1842, not long after the discovery of animal cells. That year a German biologist, Carl Vogt, peered through a microscope at a developing midwife toad, *Alytes obstetricans*. Vogt saw that the individual cells of the toad's notochord were being "resorbed," as he put it, swallowed up or sucked in. But he didn't think his observations important, and they slipped into oblivion.

Twenty years later, scientists observing metamorphosis in flies, ants, and beetles noted in the changing muscles and glands the wholesale death of cells. Later studies of developing bones, muscles, and other tissues in mammals suggested that the shaping of ear, eye, nose, tongue, intestinal tract, and trachea involves some removal of excess cells. By the turn of the century it was clear: to have shapely toads, butterflies, babies, one must have cell death.

The idea that death would chaperone growth was not easy to accept. But at least the role of cell death in the miracle of development seemed of minor importance. Then, in the early 1970s, a team of Scottish pathologists examined different kinds of tissue and discovered that cells have two radically different ways of expiring. Those that die accidentally, by injury or poisoning, swell up and pop like balloons—a visually obvious process the team called *necrosis*. But those that die naturally during development do so by quiet, efficient, nearly invisible means. This way of dying (which the team called *apoptosis* from the Greek for "a falling") may be inconspicuous, but it goes on all the time in every kind of tissue, in nearly every kind of animal.

Cell death is the night-side of growth. Cells die *en masse* at incredible speed, not just to sculpt our body structures before we are born, but throughout our life, about ten billion each day, to adjust cell numbers, eliminate the injured, and dispose of cells deemed obsolete. We don't diminish in the face of such massive, incessant loss for the simple reason that new cells are born in trade for those that die. The body precisely balances cell birth and cell death.

31. The passage can best be described as an exploration of the:

- **A.** natural processes observed by Merian and elaborated on by subsequent researchers.
- **B.** historical significance of Merian as a pioneering female naturalist.
- **C.** artistic merit of Merian's paintings of animal metamorphosis.
- **D.** developmental processes by which the frogs Merian observed grew their tails.

32. The author's overall tone when discussing Merian's work can best be described as:

- **F.** dismissive.
- **G.** neutral.
- **H.** admiring.
- **J.** skeptical.

33. The author makes clear that her encounter with a collection of Merian's paintings was:
    - **A.** unplanned.
    - **B.** in a museum.
    - **C.** in her youth.
    - **D.** brief.

34. The author characterizes the work of Pliny as an example of the kind of:
    - **F.** impressive authority that Merian consulted when conceptualizing her paintings.
    - **G.** outdated resource that many researchers in Merian's day were still relying on.
    - **H.** ancient wisdom that fortunately had survived the decline in knowledge during medieval times.
    - **J.** fraudulent work that seventeenth-century savants were exposing to public scorn.

35. It can reasonably be concluded that the quotations in the fourth paragraph (lines 35–48) are taken from:
    - **A.** Pliny's writings.
    - **B.** Merian's journal.
    - **C.** Vogt's analysis of *Alytes obstetricans*.
    - **D.** an anonymous seventeenth-century savant's research paper.

36. Based on the passage, what reaction, if any, did Vogt's peers have to his work with *Alytes obstetricans* ?
    - **F.** They remained unaware of Vogt's findings, as Vogt hadn't thought them worth sharing.
    - **G.** They applauded Vogt for studying animal cells, which were a recent discovery.
    - **H.** They labeled Vogt's approach an ineffective way to study organisms microscopically.
    - **J.** They encouraged Vogt to proceed to more advanced studies of toads.

37. The main point of the sixth paragraph (lines 58–66) is that:
    - **A.** many animals experience metamorphosis at some point in their life cycle.
    - **B.** cell death is critical to the proper development of insects and animals.
    - **C.** a wider array of animals needs to be studied in order to understand cell death.
    - **D.** animal organs undergo a complicated shaping process.

38. Which of the following claims does the author make about the rank of caterpillars in the medieval bestiaries?
    - **F.** Caterpillars were ranked just below ostriches.
    - **G.** Caterpillars were ranked with winged insects.
    - **H.** Caterpillars were ranked with worms and serpents when ranked at all.
    - **J.** Caterpillars weren't considered worthy of inclusion, let alone ranked.

39. It can reasonably be inferred that the phrase *pivotal moment* in lines 28–29 most nearly refers to a moment of:
    - **A.** transformation.
    - **B.** extinction.
    - **C.** birth.
    - **D.** observation.

40. According to the passage, the notion that "death would chaperone growth" (line 67) was initially met with:
    - **F.** relief.
    - **G.** awe.
    - **H.** curiosity.
    - **J.** resistance.

END OF TEST 3

STOP! DO NOT TURN THE PAGE UNTIL TOLD TO DO SO.

DO NOT RETURN TO A PREVIOUS TEST.

SCIENCE TEST

35 Minutes—40 Questions

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

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

Passage I

A muscle *twitch* (a stimulus-contraction-relaxation cycle) is divided into 3 phases (the *latent period*, the *contraction phase*, and the *relaxation phase*) based on the timing of the stimulus and changes in the force generated by the muscle. Table 1 shows when each phase starts and ends.

Table 1

Phase	Start	End
Latent period	Onset of stimulus occurs.	Force begins to increase.
Contraction phase	Force begins to increase.	Force begins to decrease.
Relaxation phase	Force begins to decrease.	Force stops decreasing.

Figure 1 shows the force generated by an *adductor pollicis* (a thumb muscle) undergoing an *isometric twitch* (a twitch that does not change the muscle's length). In Figure 1, force is given in newtons (N) and time is given in milliseconds (msec).

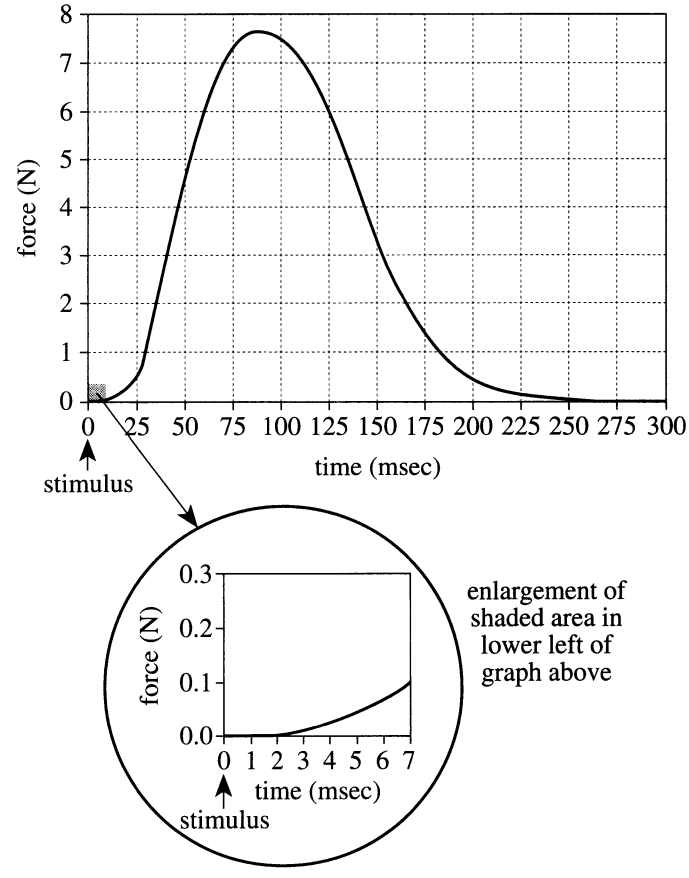


Figure 1

Figure 1 adapted from R. F. Schmidt, *Fundamentals of Neurophysiology*, 3rd ed. ©1985 by Springer-Verlag.

1. According to Figure 1, over which of the following time periods of the isometric twitch of the adductor pollicis does the force generated by the adductor pollicis both increase and decrease?

   A. 0–50 msec
   B. 50–100 msec
   C. 100–150 msec
   D. 150–200 msec

2. Based on Table 1 and Figure 1, what is the correct order of the 3 phases of the isometric twitch of the adductor pollicis, from the phase with the shortest duration to the phase with the longest duration?

   F. Latent period, contraction phase, relaxation phase
   G. Latent period, relaxation phase, contraction phase
   H. Contraction phase, relaxation phase, latent period
   J. Contraction phase, latent period, relaxation phase

3. According to Figure 1, during the isometric twitch of the adductor pollicis, the time that elapses from the start of the twitch until the muscle contracts with the greatest force is closest to which of the following?

   A. 30 msec
   B. 90 msec
   C. 150 msec
   D. 210 msec

4. If an adductor pollicis is stimulated multiple times at a high frequency, it can undergo a *tetanic contraction* (a sustained muscle contraction that prevents relaxation). In this state, the muscle generates a force that is about 2 times the maximum force generated during an isometric twitch. Based on Figure 1, during a tetanic contraction, the muscle would generate a force of about:

   F. 5 N.
   G. 15 N.
   H. 25 N.
   J. 35 N.

5. According to Figure 1, during the isometric twitch of the adductor pollicis, the muscle begins to generate force at approximately which of the following times?

   A. 2 msec before the stimulus occurs
   B. 10 msec before the stimulus occurs
   C. 2 msec after the stimulus occurs
   D. 10 msec after the stimulus occurs

Passage II

In August, the ozone (O_3) content of the stratosphere above Antarctica begins to decrease, reaching a minimum around October 15. Over this period, winds surrounding this *ozone hole* keep it isolated from adjacent areas where the air has greater O_3 content. In late October, the winds weaken, causing the O_3 content of the air in the ozone hole to increase again as this air mixes with the air from adjacent areas. Figures 1 and 2 show how the air temperature and *O_3 partial pressure* (a measure of O_3 content), respectively, changed with altitude in a portion of the stratosphere above a location in Antarctica on September 15, October 15, and November 15, 2000.

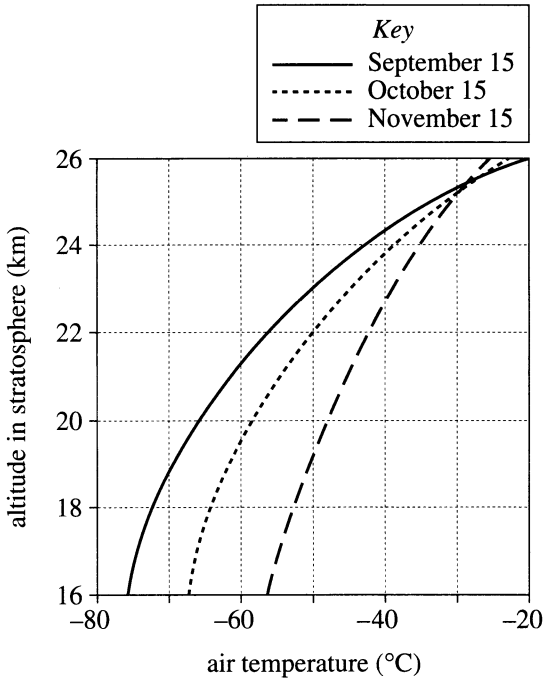
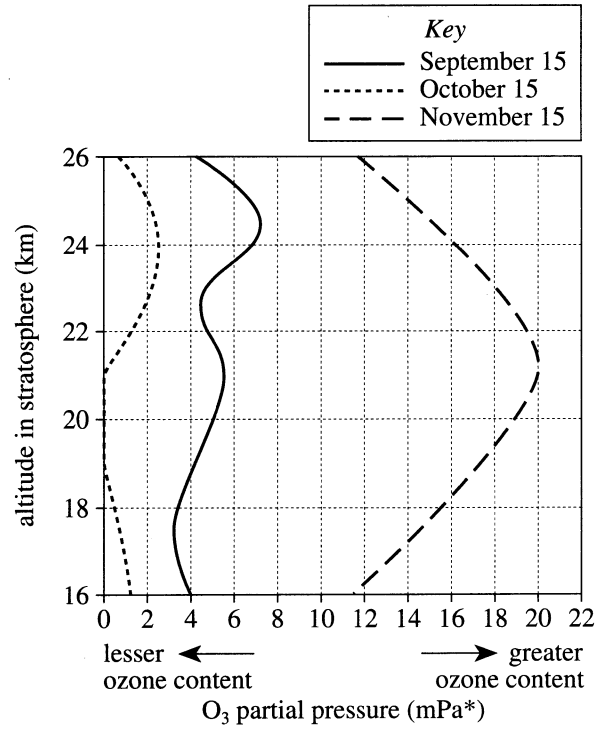


Figure 1



*mPa = millipascals

Figure 2

Figures adapted from O. Troshichev and I. Gabis, "Effects of Solar UV Irradiation on Dynamics of Ozone Hole in Antarctica." ©2005 by Elsevier, Ltd.

6. According to Figure 2, on October 15, 2000, the O_3 partial pressure was zero for all altitudes in which of the following ranges?

   F. 18 km–20 km
   G. 19 km–21 km
   H. 20 km–22 km
   J. 21 km–23 km

7. According to Figure 2, over the altitude range from 16 km to 26 km, what was the approximate maximum value of the O_3 partial pressure on September 15, 2000, and November 15, 2000, respectively?

	September 15	November 15
A.	2 mPa	7 mPa
B.	7 mPa	20 mPa
C.	20 mPa	2 mPa
D.	20 mPa	7 mPa

8. According to Figure 1, of the following altitudes, at which one did the air temperature vary the *least* from October 15, 2000, to November 15, 2000 ?

   F. 22 km
   G. 23 km
   H. 24 km
   J. 25 km

9. Consider the information in the passage about the annual changes in O_3 content in the stratosphere above Antarctica. Based on this information and Figure 2, on October 1, 2000, at an altitude of 18 km above the location in Antarctica, the O_3 partial pressure would most likely have been:

   A. less than 4 mPa.
   B. between 4 mPa and 5 mPa.
   C. between 6 mPa and 7 mPa.
   D. greater than 7 mPa.

10. Consider the ultraviolet radiation that reached the location in Antarctica on September 15, 2000, on October 15, 2000, and on November 15, 2000, after having passed through the stratosphere. Based on Figure 2, on which of the 3 dates was the intensity of the radiation greatest?

    F. September 15, because the O_3 partial pressure averaged over the altitudes from 16 km to 26 km was the least on that date.
    G. October 15, because the O_3 partial pressure averaged over the altitudes from 16 km to 26 km was the greatest on that date.
    H. October 15, because the O_3 partial pressure averaged over the altitudes from 16 km to 26 km was the least on that date.
    J. November 15, because the O_3 partial pressure averaged over the altitudes from 16 km to 26 km was the greatest on that date.

Passage III

In a chemistry class, the teacher placed a beaker containing a clear green liquid on a heat source. Over the next 12 min, the volume of the liquid steadily decreased and the liquid darkened in color. At 12 min, a white solid appeared that floated on top of the remaining liquid. At 16 min, all of the liquid was gone and only the white solid remained.

The teacher asked 4 students to provide explanations for what occurred over the 16 min.

Student 1

The beaker initially contained a solution made by dissolving a white solid in a pure, green solvent. Over the first 12 min, the solvent evaporated, causing the concentration of the dissolved solid to increase. At 12 min, the volume of solvent had decreased to a point at which the solid was no longer soluble, so it started to exit the solution. At 16 min, all of the solvent had evaporated.

Student 2

The beaker initially contained a solution made by dissolving a white solid in a pure, colorless solvent. Each molecule of the dissolved solid paired with (but did not react with) a solvent molecule to form a green-colored *solute-solvent complex* (SSC). Over the first 12 min, the solvent evaporated, causing the concentration of the SSC to increase. At 12 min, the volume of solvent had decreased to a point at which the solid was no longer soluble, so it started to exit the solution. At 16 min, all of the solvent had evaporated.

Student 3

The beaker initially contained a solution made by dissolving a green solid in a pure, colorless solvent. Over the first 12 min, the solvent evaporated, causing the concentration of the dissolved solid to increase. At 12 min, the high concentration and heat caused all of the dissolved solid to instantly react with some of the solvent to form an insoluble white solid. At 16 min, all of the remaining solvent had evaporated.

Student 4

The beaker initially contained a pure, green liquid. Over the first 12 min, the liquid slowly decomposed, but did not evaporate. At 12 min, the volume of liquid had decreased to a point at which the product of the decomposition was no longer soluble, so it started to exit the solution. At 16 min, all of the green liquid had decomposed.

11. Which of the students would agree that, before heating, the liquid in the beaker was a mixture of substances?

A. Student 1 only
B. Student 4 only
C. Students 1, 2, and 3 only
D. Students 1, 2, and 4 only

12. Based on Student 1's explanation, why did the volume of the liquid decrease over the first 12 min of heating?

F. Heat caused an SSC to form.
G. Heat caused a liquid to decompose into a solid.
H. Heat caused a solid to be converted to a liquid.
J. Heat caused a liquid to be converted to a gas.

13. Based on the description of the teacher's demonstration, was the density of the white solid that formed at 12 min less than or greater than the density of the remaining green liquid?

A. Less, because the solid did not sink in the liquid.
B. Less, because the solid sank in the liquid.
C. Greater, because the solid did not sink in the liquid.
D. Greater, because the solid sank in the liquid.

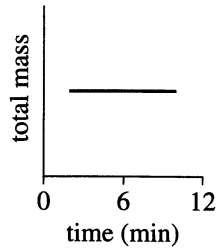
14. A chemist claimed that, in absence of a solute, NONE of the known liquids are green in color. This claim is *inconsistent* with the explanation(s) given by which of the students?

F. Student 4 only
G. Students 1 and 4 only
H. Students 2 and 3 only
J. Students 1, 2, and 3 only

15. Do Students 1 and 3 differ in their explanations of the source of the liquid's green color?

A. No; both students claim that the source is a dissolved solid.
B. No; both students claim that the source is a solvent.
C. Yes; Student 1 claims that the source is a dissolved solid, whereas Student 3 claims that the source is a solvent.
D. Yes; Student 1 claims that the source is a solvent, whereas Student 3 claims that the source is a dissolved solid.

16. Suppose the total mass of the beaker and contents was monitored from time = 2 min to time = 10 min during the heating and that the results were plotted in the graph shown below.



These results would have been most consistent with the explanation given by which student?

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

17. Suppose that after the demonstration, a colorless liquid had been mixed with the solid remaining in the beaker and the liquid then turned green. This observation would have been most consistent with the explanation given by which student?

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

Passage IV

Scientists investigated the effect of ultraviolet-B radiation (UV-B) on the eggs of 3 species of amphibians: *Hyla regilla*, *Rana cascadae*, and *Bufo boreas*. *H. regilla* populations are stable, but *R. cascadae* and *B. boreas* populations are declining.

Experiment 1

First, 1,800 newly laid eggs of *H. regilla* were collected from a high mountain lake. Next, 150 of the eggs were placed in each of 12 artificial enclosures: 4 that were covered with a filter, FB, that blocked UV-B; 4 that were covered with a filter, FT, that transmitted UV-B; and 4 that were not covered with any filter. Then, a set of these 3 types of enclosures was placed in the lake at each of 4 sites. All of the above procedures were repeated for the other 2 species. The enclosures were monitored until all the eggs had either hatched or died. The percent of total eggs that hatched for each species and type of enclosure is shown in Figure 1.

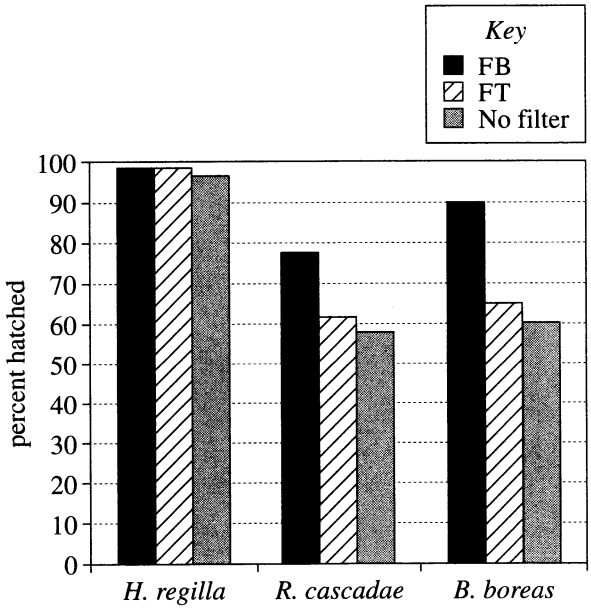


Figure 1

Experiment 2

Additional *B. boreas* eggs were collected and divided into 8 groups (Groups 1–8), each containing 30 eggs. Group 1 was not exposed to UV-B. Groups 2–8 were each exposed to a single dose of UV-B between 820 joules per square meter (J/m^2) and 4,100 J/m^2 (see Table 1). The percent of eggs that were surviving in each group was recorded each day for 10 days (see Figure 2).

Table 1

Group	UV-B dose (J/m^2)
1	0
2	820
3	1,368
4	1,915
5	2,460
6	2,730
7	3,550
8	4,100

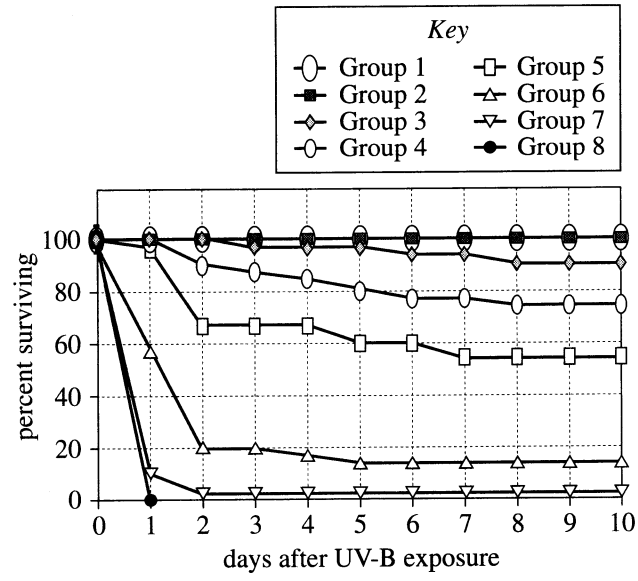
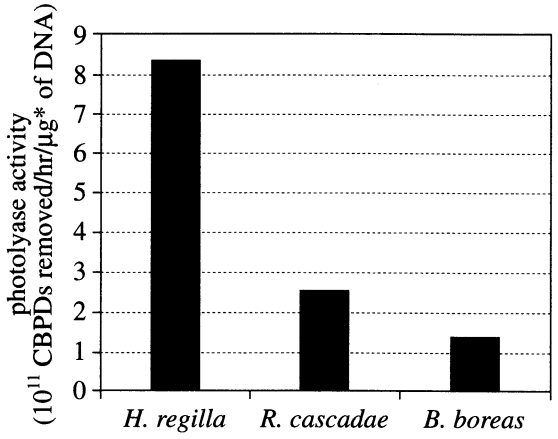


Figure 2

Table 1 and Figure 2 adapted from J. Herkovits, J. L. D'Eramo, and O. Fridman, "The Effect of UV-B Radiation on *Bufo arenarum* Embryos Survival and Superoxide Dismutase Activity." ©2006 by MDPI.

Experiment 3

UV-B damages cells by causing *cyclobutane pyrimidine dimers* (CBPDs) to be produced in their DNA. *Photolyase* is an enzyme found in some cells that repairs DNA by removing CBPDs. The *photolyase activity* (the rate at which CBPDs are removed from DNA) present in the eggs of each of the 3 species was recorded (see Figure 3).



*μg = microgram

Figure 3

Figures 1 and 3 adapted from Andrew R. Blaustein et al., "UV Repair and Resistance to Solar UV-B in Amphibian Eggs: A Link to Population Declines?" ©1994 by the National Academy of Sciences of the United States of America.

18. According to the results of Experiment 2, for which of the following groups did the percent of eggs surviving decrease more over the first day after exposure than over any subsequent day after exposure?

F. Group 2
G. Group 4
H. Group 5
J. Group 7

19. According to the results of Experiment 2, as the dose of UV-B increased from 820 J/m^2 to 4,100 J/m^2, how did the percent of *B. boreas* eggs that were surviving 10 days after UV-B exposure vary with dose?

A. Increased only
B. Decreased only
C. Increased, then decreased
D. Decreased, then increased

20. According to the results of Experiment 1, eggs of which of the 3 species suffered less than 5% mortality when exposed to UV-B ?

F. *H. regilla* only
G. *H. regilla* and *B. boreas* only
H. *R. cascadae* and *B. boreas* only
J. *H. regilla*, *R. cascadae*, and *B. boreas*

21. Based on the results of Experiment 3, did *H. regilla* or *B. boreas* exhibit a greater rate of removal of CBPDs ?

A. *H. regilla*, because the photolyase activity was lower for *H. regilla* than for *B. boreas*.
B. *H. regilla*, because the photolyase activity was higher for *H. regilla* than for *B. boreas*.
C. *B. boreas*, because the photolyase activity was lower for *B. boreas* than for *H. regilla*.
D. *B. boreas*, because the photolyase activity was higher for *B. boreas* than for *H. regilla*.

22. Following the experiment, the scientists wanted to calculate how many more *B. boreas* eggs hatched in enclosures with FBs than in enclosures with no filters. Based on the results of Experiment 1, which of the following expressions gives this number?

F. $(0.90 \div 600) + (0.60 \div 600)$
G. $(0.90 \times 600) - (0.60 \times 600)$
H. $(0.90 - 600) \times (0.60 - 600)$
J. $(0.90 + 600) \div (0.60 + 600)$

23. A scientist suggested that the decline in some amphibian populations is caused by an increase in UV-B exposure. Experiment 1 provided which of the following pieces of evidence in support of this hypothesis? For *R. cascadae* and *B. boreas* the percent hatched was:

A. greater for enclosures with FBs than for enclosures with FTs, whereas for *H. regilla* the percent hatched for enclosures with FBs was the same as for enclosures with FTs.
B. less for enclosures with FBs than for enclosures with FTs, whereas for *H. regilla* the percent hatched for enclosures with FBs was the same as for enclosures with FTs.
C. the same for enclosures with FBs as for enclosures with FTs, whereas for *H. regilla* the percent hatched was greater for enclosures with FBs than for enclosures with FTs.
D. the same for enclosures with FBs as for enclosures with FTs, whereas for *H. regilla* the percent hatched was less for enclosures with FBs than for enclosures with FTs.

Passage V

In an enclosed space, an aqueous salt solution produces an atmosphere that has a constant relative humidity (*RH*). Chemists did 3 experiments to study this phenomenon using 5 identical apparatuses. One of the 5 is shown in Figure 1.

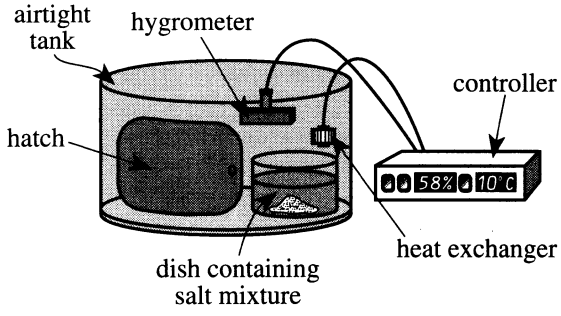


Figure 1

A hatch could be opened to place a dish containing a *salt mixture* (solid salt in an aqueous solution of the salt) in the airtight tank. A heat exchanger could increase or decrease the temperature in the tank. A *hygrometer* measured the *RH* in the tank and the *aqueous tension* (a measure of the tendency of the H_2O to evaporate from a solution) of the salt mixture in the tank. The controller regulated the temperature and recorded the hygrometer readings.

Experiment 1

On Day 1, in preparation for the experiment, a drying agent was placed in each tank. Then, 5 salt mixtures were made by placing an excess of a salt in H_2O. The mixtures were stirred overnight.

By Day 2, the *RH* in each tank was 0.0%, so the drying agent was removed from each tank. Then, 5 dishes, each containing 1 of the 5 salt mixtures, were placed in separate tanks. The temperature in each tank was adjusted to a constant 10°C. By Day 3, the *RH* and the aqueous tension had each reached a constant value in each tank (see Table 1).

Table 1

Tank	Salt in mixture	*RH* (%)	Aqueous tension (torr)
1	KOH	13	1.2
2	K_2SO_4	98	9.0
3	$MgCl_2$	34	3.1
4	$Mg(NO_3)_2$	57	5.2
5	NaCl	76	7.0

Experiment 2

Experiment 1 was repeated except that the temperature in each tank was maintained at 30°C (see Table 2).

Table 2

Tank	Salt in mixture	*RH* (%)	Aqueous tension (torr)
1	KOH	7	2.2
2	K_2SO_4	96	30
3	$MgCl_2$	33	11
4	$Mg(NO_3)_2$	52	17
5	NaCl	75	24

Experiment 3

Experiment 1 was repeated except that the temperature in each tank was maintained at 60°C (see Table 3).

Table 3

Tank	Salt in mixture	*RH* (%)	Aqueous tension (torr)
1	KOH	5	7.5
2	K_2SO_4	96	140
3	$MgCl_2$	30	45
4	$Mg(NO_3)_2$	43	64
5	NaCl	75	110

Tables adapted from James G. Speight, *Lange's Handbook of Chemistry*, 16th ed. ©2005 by McGraw-Hill, Inc.

24. When the results of Experiment 2 were recorded, the moisture content of the air was *lowest* in which tank?

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

25. Suppose another salt, KCl, had been tested in Experiment 3 and that the *RH* recorded for KCl was 81%. The aqueous tension for KCl would most likely have been:

A. less than 45 torr.
B. between 45 torr and 110 torr.
C. between 110 torr and 140 torr.
D. greater than 140 torr.

26. A student predicted that for a given salt in Experiments 1–3, *RH* would always *decrease* as temperature increased. This prediction was consistent with the results for which, if any, of the salts listed below?

I. $MgCl_2$
II. $Mg(NO_3)_2$
III. NaCl

F. I only
G. I and II only
H. II and III only
J. Neither I, II, nor III

27. A student predicted that under any of the conditions used in Experiments 1–3, if the *RH* in any 2 tanks was the same, then the aqueous tensions of the salt mixtures in the tanks would be the same. Do the results of Experiments 2 and 3 support this claim?

A. Yes; the *RH* in Tank 2 in Experiment 2 was equal to the *RH* in Tank 3 in Experiment 3, and the aqueous tensions were the same.
B. Yes; the *RH* in Tank 5 in Experiment 2 was equal to the *RH* in Tank 5 in Experiment 3, and the aqueous tensions were the same.
C. No; the *RH* in Tank 2 in Experiment 2 was equal to the *RH* in Tank 3 in Experiment 3, but the aqueous tensions were different.
D. No; the *RH* in Tank 5 in Experiment 2 was equal to the *RH* in Tank 5 in Experiment 3, but the aqueous tensions were different.

28. What was the purpose of the first procedure that was carried out on Day 1 ?

F. To remove any H_2O present in the tanks
G. To make different aqueous salt solutions to place in the tanks
H. To ensure that the temperature in each tank was constant
J. To ensure that the aqueous tension of the salt mixture in each tank was constant

29. In Experiments 1–3, was *RH* an independent variable or a dependent variable?

A. Independent, because *RH* was a factor established directly by the chemists.
B. Independent, because *RH* was a result measured by the chemists.
C. Dependent, because *RH* was a factor established directly by the chemists.
D. Dependent, because *RH* was a result measured by the chemists.

Passage VI

The pressure, P_L, exerted by a liquid varies with the depth, D, below the surface of the liquid and with the liquid's density, ρ. If a tank of liquid is open to the atmosphere, the total pressure, P_T, at D equals P_L at D plus the atmospheric pressure, P_A.

Table 1 lists ρ, in kilograms per cubic meter (kg/m^3), for 4 liquids at 25°C.

Table 1	
Liquid	ρ (kg/m^3)
Carbon tetrachloride	1,580
Ethanol	786
Ethylene glycol	1,130
Water	997

Figure 1 shows, for D = 10 m, a graph of P_L (in kilopascals, kPa) versus ρ (1 kPa = 10^3 Pa = 10^3 newtons/m^2). Figure 2 shows a graph of P_L versus D and a graph of P_T versus D for 25°C water in a tank that was open to the atmosphere on a particular day.

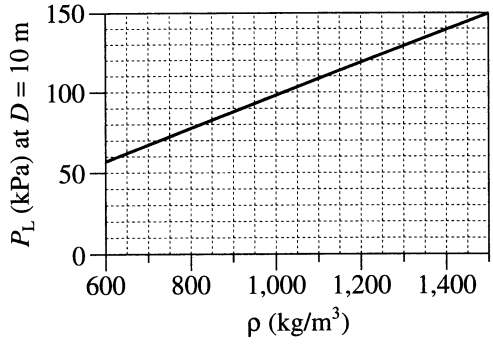


Figure 1

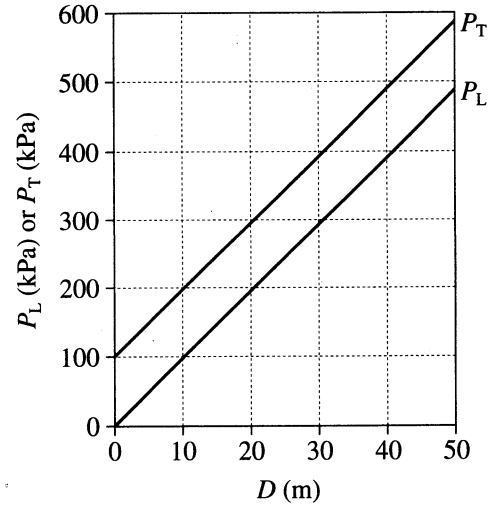


Figure 2

30. What is the correct ranking of the liquids listed in Table 1, from the liquid with the least density at 25°C to the liquid with the greatest density at 25°C ?

F. Carbon tetrachloride, ethanol, ethylene glycol, water
G. Carbon tetrachloride, ethylene glycol, water, ethanol
H. Water, ethanol, carbon tetrachloride, ethylene glycol
J. Ethanol, water, ethylene glycol, carbon tetrachloride

31. Based on Table 1 and Figure 1, compared to P_L at $D = 10$ m in 25°C ethanol, P_L at $D = 10$ m in 25°C carbon tetrachloride will be approximately:

A. $\frac{1}{4}$ as great.

B. $\frac{1}{2}$ as great.

C. 2 times as great.

D. 4 times as great.

32. Based on Table 1, the mass of 3 m^3 of ethylene glycol at 25°C would be closest to which of the following values?

F. 1,130 kg

G. 2,260 kg

H. 3,390 kg

J. 4,520 kg

33. Based on Figure 2, the relationship between P_L (in kPa) and D (in m) for the water in the tank is best represented by which of the following equations?

A. $P_L = 9.8 \times D$

B. $P_L = \frac{D}{9.8}$

C. $P_L = 19.6 \times D$

D. $P_L = \frac{D}{19.6}$

34. Based on Figure 2, on the particular day, 20 m below the surface of the water in the open tank, P_L plus P_A was closest to which of the following values?

F. 100 kPa

G. 200 kPa

H. 300 kPa

J. 400 kPa

Passage VII

In some locations, drainage water from agricultural areas contains *selenium* (Se), a substance that can be harmful to wildlife. Se can be removed from water by plant uptake or by adsorption onto soil and organic particles. Three studies were done to examine Se removal by human-made wetlands.

Study 1

Five open-water wetlands (Wetlands 1–5), each 15 m × 76 m in area, were constructed at a location in May 1997. At that time, 4 of the wetlands were planted with the same density of 1 or 2 types of wetland plants. From January 1998 through December 2000, drainage water containing an average Se concentration of 22 micrograms per liter (μg/L) was continuously fed into each wetland at a flow rate of 300 m^3/day. The average *residence time* (RT, how long a volume of water remained in the wetland) was determined for each wetland (see Table 1).

Table 1

Wetland	Type(s) of plants in wetland	Average RT (days)
1	bulrush	11
2	none	5
3	cordgrass	10
4	bulrush and cordgrass	19
5	cattail	13

Study 2

Every week from January 1998 through December 2000, the outflow water from each wetland was sampled and analyzed for Se. The average annual Se concentration of the outflow was determined for each year (see Figure 1).

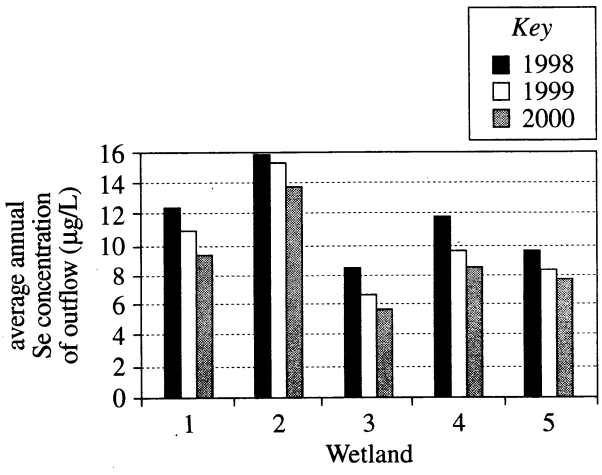


Figure 1

Study 3

In December 2000, samples of each of the following materials were collected from several locations in each wetland: fallen *plant litter* (dead but not decayed plant matter), *organic detritus* (decayed organic matter on top of the soil), and the top 5 cm of the soil. The samples of each material were analyzed for Se, and their average Se concentration, in milligrams per kilogram dry weight (mg/kg dw), was determined (see Figure 2).

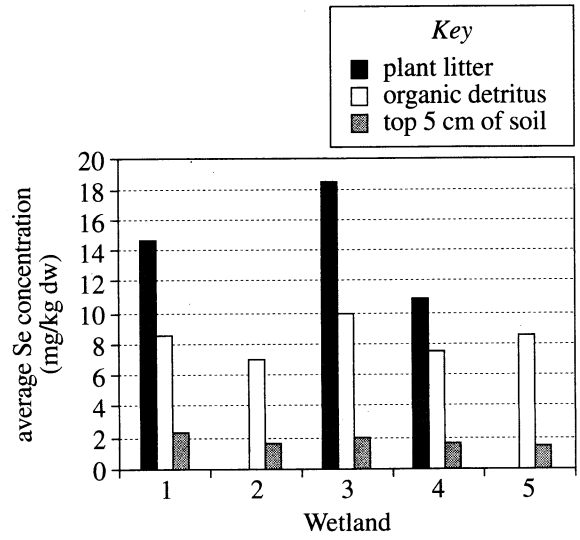


Figure 2

Table and figures adapted from S. Gao et al., "Selenium Removal and Mass Balance in a Constructed Flow-Through Wetland System." ©2003 by the American Society of Agronomy, the Crop Science Society of America, and the Soil Science Society of America.

35. Figure 2 indicates that the average Se concentration of organic detritus, averaged across all 5 wetlands, was closest to which of the following?

A. 2 mg/kg dw
B. 5 mg/kg dw
C. 8 mg/kg dw
D. 11 mg/kg dw

36. In the studies, which wetland served as the control for the effect of plants on Se removal?

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

37. Is the statement "The outflow having the least average annual Se concentration for 1999 was from the wetland having the greatest average RT" supported by the results of Studies 1 and 2 ?

- **A.** Yes; Wetland 4 had the greatest average RT, and the outflow from Wetland 4 had the least average annual Se concentration for 1999.
- **B.** Yes; Wetland 5 had the greatest average RT, and the outflow from Wetland 5 had the least average annual Se concentration for 1999.
- **C.** No; Wetland 4 had the greatest average RT, but the outflow from Wetland 4 did not have the least average annual Se concentration for 1999.
- **D.** No; Wetland 5 had the greatest average RT, but the outflow from Wetland 5 did not have the least average annual Se concentration for 1999.

38. Water having an Se concentration of 5 μg/L or greater is considered harmful to wetland wildlife. If Study 2 had been continued through December 2001, which wetland would most likely have produced outflow in 2001 having an average annual Se concentration no longer considered harmful to wetland wildlife?

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

39. Why was the unit of measurement for Se concentration different in Studies 2 and 3 ? In Study 2, the Se concentration:

- **A.** of a liquid was being determined, whereas in Study 3, the Se concentration of each of several solids was being determined.
- **B.** of each of several solids was being determined, whereas in Study 3, the Se concentration of a liquid was being determined.
- **C.** of a liquid was being determined, whereas in Study 3, the Se concentration of a different liquid was being determined.
- **D.** of a solid was being determined, whereas in Study 3, the Se concentration of a different solid was being determined.

40. Do the results of Study 3 for Wetlands 1, 3, and 4 indicate that in these wetlands, plant uptake reduced the Se concentration of the water more than did adsorption onto soil particles?

- **F.** Yes; in these wetlands, the average Se concentration of the plant litter was greater than the average Se concentration of the top 5 cm of soil.
- **G.** Yes; in these wetlands, the average Se concentration of the top 5 cm of soil was greater than the average Se concentration of the plant litter.
- **H.** No; in these wetlands, the average Se concentration of the plant litter was greater than the average Se concentration of the top 5 cm of soil.
- **J.** No; in these wetlands, the average Se concentration of the top 5 cm of soil was greater than the average Se concentration of the plant litter.

END OF TEST 4

STOP! DO NOT RETURN TO ANY OTHER TEST.

Explanation of Procedures Used to Obtain Scale Scores from Raw Scores

On each of the four tests on which you marked any responses, the total number of correct responses yields a raw score. Use the table below to convert your raw scores to scale scores. For each test, locate and circle your raw score or the range of raw scores that includes it in the table below. Then, read across to either outside column of the table and circle the scale score that corresponds to that raw score. As you determine your scale scores, enter them in the blanks provided on the right. The highest possible scale score for each test is 36. The lowest possible scale score for any test on which you marked any responses is 1.

Next, compute the Composite score by averaging the four scale scores. To do this, add your four scale scores and divide the sum by 4. If the resulting number ends in a fraction, round it off to the nearest whole number. (Round down any fraction less than one-half; round up any fraction that is one-half or more.) Enter this number in the blank. This is your Composite score. The highest possible Composite score is 36. The lowest possible Composite score is 1.

ACT Test 70G	**Your Scale Score**
English	_____
Mathematics	_____
Reading	_____
Science	_____
Sum of scores	_____
Composite score (sum ÷ 4)	_____

NOTE: If you left a test completely blank and marked no items, do not list a scale score for that test. If any test was completely blank, do not calculate a Composite score.

Scale Score	Raw Scores				Scale Score
	Test 1 English	Test 2 Mathematics	Test 3 Reading	Test 4 Science	
36	75	59-60	40	39-40	**36**
35	74	58	—	38	**35**
34	72-73	56-57	39	37	**34**
33	71	55	38	—	**33**
32	—	54	37	36	**32**
31	70	53	36	35	**31**
30	69	51-52	35	34	**30**
29	67-68	50	34	33	**29**
28	66	48-49	33	32	**28**
27	65	45-47	32	31	**27**
26	63-64	42-44	31	30	**26**
25	61-62	39-41	30	28-29	**25**
24	58-60	36-38	29	26-27	**24**
23	55-57	33-35	27-28	25	**23**
22	53-54	31-32	25-26	23-24	**22**
21	50-52	29-30	24	21-22	**21**
20	47-49	28	22-23	19-20	**20**
19	44-46	26-27	21	18	**19**
18	42-43	23-25	20	17	**18**
17	40-41	19-22	18-19	15-16	**17**
16	38-39	15-18	17	14	**16**
15	34-37	11-14	15-16	13	**15**
14	32-33	9-10	14	12	**14**
13	30-31	7-8	12-13	11	**13**
12	28-29	6	10-11	10	**12**
11	26-27	5	9	9	**11**
10	23-25	4	7-8	7-8	**10**
9	21-22	3	6	6	**9**
8	17-20	—	—	5	**8**
7	14-16	2	5	4	**7**
6	11-13	—	4	3	**6**
5	9-10	1	3	—	**5**
4	7-8	—	—	2	**4**
3	5-6	—	2	1	**3**
2	3-4	—	1	—	**2**
1	0-2	0	0	0	**1**

05/18/12

ACT ASSESSMENT TEST INFORMATION RELEASE REPORT

TEST DATE = 04/12 TEST FORM = 70G TEST CENTER = 21291

ITEM NUMBER	1 1111111112 2222222223 3333333334 4444444445 5555555556 6666666667 77777 1234567890 1234567890 1234567890 1234567890 1234567890 1234567890 1234567890 12345
ENGLISH CORRECT ANSWER	AGCFCJCGAG DHCGAHBJBF AGDJAJBHCF AFDFAHBGDH AJCFBJDHDH BHDGBFDGCJ DGCHDFAFAJ BJDGC
YOUR ANSWER	
SUBSCORE	
MATHEMATICS CORRECT ANSWER	BJCGEGCKCH AKCGCKDGDF AKDHEGCKCJ CFEFCGBGEJ CFEHAJDGAG AJDKAKDJAK
YOUR ANSWER	
SUBSCORE	
READING CORRECT ANSWER	AHAHCGDGDJ DHBHDFBFBJ BHCGDJBHAJ AHAGBFBHAJ
YOUR ANSWER	
SUBSCORE	
SCIENCE CORRECT ANSWER	BFBGCGBJAH CJAGDJBJBF BGAFCGDFDJ CHAHCGCHAF
YOUR ANSWER	

1st Row: Correct responses to the items on the ACT tests.

2nd Row: Your Responses:
- A plus (+) indicates your response was correct.
- A letter (A through K) is the response you chose, if your answer was incorrect.
- A dash (-) indicates you omitted the item.
- An asterisk (*) indicates you gridded more than one response.

3rd Row: If the test includes subscores, one of the letters below indicates the category to which each item belongs:

English:
- U = Usage/Mechanics
- R = Rhetorical Skills

Math:
- A = Pre-Algebra/Elementary Algebra
- G = Intermediate Algebra/Coordinate Geometry
- T = Plane Geometry/Trigonometry

Reading:
- S = Social Studies/Sciences
- L = Arts/Language

PLUS WRITING TEST FORM: 15H
1st RATER: 04 2nd RATER: 04