Form Code: ACTD65

Form 65D

(April 2008)

ACT Assessment®

2007–2008

In response to your recent request for test information release materials, this booklet contains the test questions and conversion tables used in determining your ACT scores. Enclosed with this booklet is a report listing your answers to the ACT Assessment tests and the answer key.

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.

We hope that you will find this information helpful.

©2008 by ACT, Inc. All rights reserved.
NOTE: This booklet is covered by Federal copyright laws that prohibit the reproduction of the test questions without the express, written permission of ACT, Inc.

P.O. BOX 168
IOWA CITY, IA 52243-0168

ACT®

ENGLISH TEST

45 Minutes—75 Questions

DIRECTIONS: In the five passages that follow, certain words and phrases are underlined and numbered. In the right-hand column, you will find alternatives for 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

The Hunt for Morel Mushrooms

[1]

When I close my eyes I see them. They pop up through dead leaves, emerge from under fallen logs, and sprout next to tree stumps. Even indoors, I think I spot them out of the corner of my eye. Basically, I spend <u>every free moment</u>[1] in search of them.

[2]

I'm not talking <u>about imaginary creatures but</u>[2] about deliciously real morel mushrooms—

<u>funny-looking, textured, edible</u>[3] fungi that appear in springtime. These homely ground dwellers inspire their fans to search the woods for hours, intent on finding enough to fry up for dinner. Would it be easier to buy mushrooms at the store? Absolutely. But it wouldn't be as much fun. Once you find your first morel, maybe by a dead

1. Which of the following alternatives to the underlined portion would be LEAST acceptable?
   A. all my free time
   B. appropriate vacation time slots
   C. every moment of my leisure time
   D. whatever time I can set aside

2. F. NO CHANGE
   G. about, imaginary creatures but
   H. about, imaginary creatures, but
   J. about imaginary creatures, but,

3. Given that all the choices are true, which one most specifically describes the appearance of a morel mushroom for readers who have never seen one?
   A. NO CHANGE
   B. earthy, oddly amusing, interesting-looking
   C. odorless and unusually shaped
   D. sand-colored, cone-shaped, spongelike

elm or in an old apple orchard, a person will be even more determined to find the next one. And the next. And so on.

[3]

Like many morel hunters, I learned from an expert. She invited me along to see firsthand how it's done. I learned even more by reading reputable, detailed field guides about wild mushrooms.

That's a crucial part of the preparation to get ready for morel hunting, because often the same woods that yield morels produce poisonous mushrooms, too.

[4]

[7] Every spring, there's a contest where I live in northern Minnesota to see who can find the most morels, this year, I'm going to enter. Last year, one participant found over 3,000 morels becoming my hero. And he's willing to talk with me about this hobby we are both passionate about. Luckily, I know what question *not* to ask. You never ask morel hunters where they made their biggest find. Keeping silent about your favorite spots, is part of the mystique of this glorious pastime.

4. F. NO CHANGE
   G. a morel hunter
   H. you
   J. DELETE the underlined portion.

5. Given that all the choices are true, which one provides the most relevant and specific information at this point in the essay?
   A. NO CHANGE
   B. in between trips to and from the woods.
   C. to gain the expertise I wanted and needed at this point.
   D. very carefully on the topic that pertains to the activity.

6. F. NO CHANGE
   G. to make oneself fit
   H. of someone planning to be ready
   J. DELETE the underlined portion.

7. Which of the following statements, if added here, would provide the most effective transition from Paragraph 3 to Paragraph 4?
   A. There were many field guides to choose from.
   B. I love the texture that morels add to a meal.
   C. Outdoor activities offer so many rewards.
   D. Now I want to put my knowledge to work.

8. F. NO CHANGE
   G. morels this
   H. morels. This
   J. morels, because this

9. A. NO CHANGE
   B. morels. He's my
   C. morels, what a
   D. morels, my

10. F. NO CHANGE
    G. silent, about your favorite spots
    H. silent, about your favorite spots,
    J. silent about your favorite spots

[5]

Mostly, finding morels requires two things in particular. Smaller and (11)

11. Given that all the choices are true, which one provides the most specific information?
    A. NO CHANGE
    B. demonstrating two skills.
    C. patience and concentration.
    D. expertise in this hobby.

paler then the average pinecone, a morel (12)

12. F. NO CHANGE
    G. more pale then
    H. paler than
    J. pale than

blends perfectly into its natural surroundings. (13)

13. A. NO CHANGE
    B. it's
    C. their
    D. there

However, you can look right at one and not see it. (14)

14. F. NO CHANGE
    G. You
    H. On the other hand, you
    J. Back and forth, you

Morels fool everyone, even the experts, that's probably why the saying goes that the best place to look for morels is directly behind you. (15)

15. A. NO CHANGE
    B. experts. That's
    C. experts say, that's
    D. experts and

PASSAGE II

The Amazing Monarch Migration

The orange and black monarch butterfly, which is (16)

16. F. NO CHANGE
    G. butterfly
    H. butterfly that
    J. butterfly,

the most easiest recognized and striking butterfly species in North America. Monarchs are particularly fascinating because they are one of the few migratory butterfly species in North America. (17)

17. A. NO CHANGE
    B. most easy
    C. easiest
    D. most easily

[1] In the fall, as daylight and temperatures decrease, migrating monarchs begin their long journey south, an extended flight. [2] Many (18)

18. F. NO CHANGE
    G. south, which is far-reaching.
    H. south.
    J. south, which encompasses many miles.

monarchs, west of the Rocky Mountains migrate (19)

to the southern California coast, where they (20)

overwinter in eucalyptus groves. [3] Besides, most (21)

monarchs, millions of them across the United States and (22)
Canada—migrate as many as three thousand miles to Oyamel fir forests near Mexico City. [4] Monarchs have smaller bodies and insufficiently developed nervous (23)
systems than migratory birds. [5] The features of birds that help them accomplish their long migrations are aerodynamic design, acute vision, and the ability to (24)
regulate their body temperature and maintain energy. (24)
[6] Monarchs lack these features, and yet, in a way that defies explanation, they travel up to eighty miles in a day. [25]

For decades, scientists have studied this phenomenon, hoping to learn how monarchs are able to fly such distances. Researchers have tagged migrating monarchs to study their flight patterns, and they've hiked to the overwintering sites on the Mexican Plateau, where (26)
twenty thousand monarchs are sometimes found clustered on a single Oyamel fir bough.

Scientists are starting to learn more about the monarch's life cycle. When monarchs that don't (27)

migrate to Mexico live only four to six weeks; the (28)
migrating generations live at least eight months.

www.crackab.com

19. A. NO CHANGE
B. monarchs west of the Rocky Mountains,
C. monarchs west, of the Rocky Mountains,
D. monarchs west of the Rocky Mountains

20. F. NO CHANGE
G. there
H. while
J. DELETE the underlined portion.

21. A. NO CHANGE
B. However,
C. Finally,
D. Therefore,

22. F. NO CHANGE
G. monarchs—
H. monarchs;
J. monarchs

23. A. NO CHANGE
B. less
C. more insufficient
D. inadequate

24. F. NO CHANGE
G. and regulating body temperature and maintaining energy with their ability.
H. with their body temperature regulation and energy maintenance ability.
J. and the regulation of body temperature and their ability to maintain energy.

25. The writer would like to divide this paragraph into two in order to signal the shift in focus from monarchs' migrating habits to the differences between monarchs and migratory birds. To accomplish this goal, the best place to start the new paragraph would be at the beginning of Sentence:
A. 2.
B. 3.
C. 4.
D. 5.

26. F. NO CHANGE
G. site's
H. sites'
J. sites,

27. A. NO CHANGE
B. If
C. While
D. So that

28. F. NO CHANGE
G. weeks and
H. weeks, and while
J. weeks,

After becoming reproductively active in the spring, monarchs that have migrated begin their return journey. They lay their eggs on milkweed plants along the way and then die. Their offspring hatch, feed on the milkweed, and the migration is eventually continued. [29]

Researchers know they have much to learn, but with the help of new tracking devices and Internet technology that makes data available worldwide, they are ready to move ahead. [30]

29. A. NO CHANGE
B. continuing the migration is eventual.
C. eventually continue the migration.
D. continuing eventually the migration.

30. Which choice would best conclude the sentence and support one of the main points of the essay?
F. NO CHANGE
G. they are excited about learning how to use these new research tools.
H. they hope to solve the mysteries of the monarch migration.
J. they look forward to collaborating with other researchers who are more knowledgeable in the mysteries of monarch migration.

PASSAGE III

> The following paragraphs may or may not be in the most logical order. Each paragraph is numbered in brackets, and question 45 will ask you to choose where Paragraph 3 should most logically be placed.

Yo-Yos Spinning through Time

[1]

Historians speculate that one of the world's oldest toys is the yo-yo, though they know for sure that the oldest toy is the doll. Drawings [31] of objects adorn ancient Greek vases and the walls of [32] Egyptian temples, if written mention of yo-yos goes back to the fifth century B.C. [33]

31. A. NO CHANGE
B. yo-yo, but it is hard to know for sure, considering the yo-yo's history.
C. yo-yo, though no one is certain why some ancient yo-yos were made out of terra cotta, a fragile clay.
D. yo-yo.

32. F. NO CHANGE
G. that call attention to objects that look something like the toy that I have just mentioned
H. that include objects that almost slightly resemble yo-yos
J. of objects resembling yo-yos

33. A. NO CHANGE
B. and
C. since
D. because

[2]

While many cultures had their variations of the yo-yo, the American version can be traced to the Philippines, where yo-yos have been a national pastime for centuries.[34] In fact, the name *yo-yo* is a Tagalog word that translates as "come back."[35] In the 1920s Pedro Flores, a Filipino immigrant, introduced the toy in the United States and[36] soon started a yo-yo manufacturing company in California. Flores's design was different because the yo-yo's string wasn't tied to the axle of the toy, but rather looped around it. This allowed a skilled handler to make the toy spin at the end of its string, or "sleep."

www.crackab.com

[3]

Yo-yo technology really progressed substantially by making[37] a leap forward in the 1970s when designers added weighted rims so the toy would spin for a longer time. In 1980, another innovation led to the development of the "yo-yo with a brain," which featured a spring-loaded mechanism that caused the yo-yo to return to its owner's hand.

34. Given that all the choices are true, which one provides the most effective evidence of the long history of enthusiasm for the yo-yo in the Philippines?

F. NO CHANGE
G. have been a popular hobby for years.
H. were carved out of fine wood or animal horns.
J. resembled a toy that was popular in ancient China.

35. **A.** NO CHANGE
B. by
C. with
D. from

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

F. States. Flores
G. States, and he
H. States; he
J. States he

37. **A.** NO CHANGE
B. advanced as a result of progressively making
C. jumped ahead and made
D. made

[4]

The American craze for the toy began (38) when the entrepreneur Donald Duncan saw a demonstration of Flores's new yo-yo. Noticing the large crowd who (39) watched, Duncan quickly realized the yo-yo's potential. Flores sold his yo-yo company and all rights to Duncan in 1932, after deciding (40) that he was more interested in teaching people how to handle yo-yos than he was in manufacturing them. Duncan immediately launched an elaborate national advertising campaign to promote the toy. He also sent Duncan Yo-Yo Professionals around the country, demonstrating (41) tricks and sponsoring contests. [42] Millions of the toys were sold.

[5]

In 1985, this most ancient of toys, went (43) into space. Astronauts aboard the space shuttle *Discovery* (44) demonstrated that while a yo-yo would spin in a near-zero gravity environment, it refused to sleep.

38. **F.** NO CHANGE
G. begins
H. begun
J. had began

39. **A.** NO CHANGE
B. whom
C. whose
D. who's

40. Which of the following alternatives to the underlined portion would NOT be acceptable?
F. 1932, after his decision
G. 1932. He had decided
H. 1932, upon deciding
J. 1932. Deciding

41. **A.** NO CHANGE
B. in order to demonstrate
C. who demonstrated
D. yet demonstrating

42. If the writer were to delete the preceding sentence, the essay would primarily lose information that:
F. proves Duncan was uncertain what would be the best way to promote the yo-yo.
G. reveals how quickly demonstrations by Duncan Yo-Yo Professionals gained popularity.
H. illustrates one creative strategy that Duncan used to promote the yo-yo.
J. suggests how Duncan Yo-Yo Professionals were chosen for the job.

43. **A.** NO CHANGE
B. toys went
C. toys had went
D. toys, had gone

44. **F.** NO CHANGE
G. shuttle, *Discovery;*
H. shuttle *Discovery,*
J. shuttle, *Discovery*

Question 45 asks about the preceding passage as a whole.

45. For the sake of the logic and coherence of this essay, Paragraph 3 should be placed:
A. where it is now.
B. before Paragraph 1.
C. before Paragraph 2.
D. before Paragraph 5.

www.actexam.net

PASSAGE IV

Swimming in Open Water

Immersed in the icy water off the Antarctic Peninsula, Lynne Cox wasn't sure if she could accomplish her goal to be the first person to swim a mile through the glacier-strewn sea. At forty-five, she would of been training for (46) two years for this event, which she hoped her preparations (47) would pay off.

Cox grew up swimming in the cold lakes of New Hampshire and Maine. When (48) she was fifteen, she broke the men's and women's record's for swimming the English Channel by finishing (49) the twenty-seven-mile swim in less than ten hours. [50]

She could swim in open water and had swum across (51) the Cook Strait in New Zealand, around the Cape of Good Hope at the southern tip of Africa, and across Lake Titicaca from Bolivia to Peru.

46. F. NO CHANGE
    G. had
    H. have
    J. had to of

47. A. NO CHANGE
    B. and
    C. then
    D. DELETE the underlined portion.

48. F. NO CHANGE
    G. cold, lakes of New Hampshire
    H. cold lakes, of New Hampshire
    J. cold, lakes of New Hampshire,

49. A. NO CHANGE
    B. records
    C. records'
    D. records,

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

    At its widest, the English Channel spans a distance of 150 miles.

    Should the writer make this addition here?

    F. Yes, because it reinforces the point that Cox swam a great distance across the English Channel.
    G. Yes, because it provides a logical transition to the rest of the paragraph.
    H. No, because the English Channel is only one place that Cox had swum before going to Antarctica.
    J. No, because it is irrelevant to the focus of the essay at this point.

51. Given that all the choices are true, which one best conveys Cox's attitude toward swimming and helps bring into focus the kind of swimming that appeals to her?

    A. NO CHANGE
    B. loved the challenge of
    C. had racked up many miles in
    D. astounded many by her swimming feats in

[1] Cox is fortunate that she has a natural tolerance for cold temperatures, but swimming the Antarctic—in water only slightly above freezing—demanded serious preparation. [2] This athlete studied how Antarctic animals adapt to the frigid environment. [3] Penguins' double layer of feathers acts as insulation, so she grew her hair long and piled it under her swim cap. [4] Antarctic seals rely on body fat for warmth, so Cox gained twelve pounds, it was weight (52) that she hoped would keep her warm in the icy water. [53]

In November 2002, a crew of (54) physicians, sailors, and expedition experts, Cox headed for Neko Harbor on the Antarctic Peninsula. There she dove into water chilled by melting glaciers and began to swim. Without proper training, she would have been in peril. (55)

Her initial fatigue and exhaustion (56) turned into exhilaration as she moved through water that was clearer and blue as (57) any she'd swum in before. For a moment at the end, she considered going even farther. Cox knew, however, that the longer she stayed in the water, the

52. F. NO CHANGE
G. she put on weight
H. she gained it so
J. weight

53. Which of the following sequences of sentences makes this paragraph most logical?
A. NO CHANGE
B. 1, 4, 2, 3
C. 3, 1, 4, 2
D. 4, 3, 2, 1

54. F. NO CHANGE
G. a crew made up of
H. with a crew of
J. DELETE the underlined portion.

55. The writer wants to end this paragraph with a physical detail about the swim that emphasizes that Cox was in a harsh environment. Given that all the choices are true, which one best accomplishes the writer's purpose?
A. NO CHANGE
B. Her amazing feat was described in a feature article in *The New Yorker* magazine.
C. Bits of ice brushed against her arms and legs.
D. Photographs of her in her goggles, swim cap, and bathing suit appeared in a national publication.

56. F. NO CHANGE
G. exhaustion
H. exhaustion that left her feeling fatigued
J. exhausting fatigue

57. A. NO CHANGE
B. more blue then
C. bluer than
D. bluer then

longer it would take to bring her body temperature—which fell to 95.5 degrees Fahrenheit by the end of the swim—back to normal. A mile was good enough as Cox closed in on the shore—and her goal—penguins splashed in the water with the great athlete.

58. F. NO CHANGE
G. back to a normal body temperature.
H. in other words, back to normal.
J. which was normal.

59. A. NO CHANGE
B. enough. As
C. enough, as
D. enough,

60. Given that all the choices are true, which one best concludes the essay with an image that emphasizes the location and indicates the completion of Cox's feat?
F. NO CHANGE
G. birds splashed in the water as if to cheer her on toward the goal of the entire expedition.
H. wildlife displayed their natural ability to swim in waters that truly tested Cox's ability to meet her goal.
J. a flock of penguins jumped into the water and joined her for the last thrilling strokes.

PASSAGE V

"All I Can Do Is Take a Picture"

[1]

Ernest C. Withers has been recording history with his camera for more than sixty years. For most of his life, Withers has lived and worked as a photojournalist in Memphis, Tennessee, where he covered newsworthy events, both local and national, over some six decades. [61]

61. The writer is thinking about deleting the phrase "over some six decades" from the preceding sentence (and replacing the comma after the word *national* with a period). Should that phrase be kept or deleted?
A. Kept, because it gives readers some idea of Withers's longevity.
B. Kept, because it helps readers to figure out when Withers began working as a photojournalist.
C. Deleted, because it repeats information presented earlier in the essay.
D. Deleted, because the length of Withers's career is not relevant to the focus of this essay.

www.crackab.com

As an African American intimately familiar with the geography and people of the South, he was often the first photographer present as historic moments took place. Using his hometown as his base and documenting (62) the key people and events of the world in which he grew up, observed, and learned. (63)

[2]

[1] When (64) his older sister's boyfriend showed no interest in using a camera that she had bought for him, Withers took it to school and photographed his classmates. [2] Years later, while serving as a jeep driver in World War II, he received permission from his company commander to train at the photography school at Camp Sutton, North Carolina. [3] Withers started taking pictures in (65) his youth. [4] In 1946, he left the Army and began working at a job that was (66) a self-employed photographer. [67]

[3]

Withers's profession gave him access to famous people. He has photographed seven of the last eight U.S. presidents and every major civil rights leader since the 1950s. Thus, he is well (68) known and well liked, Withers often traveled with and photographed

62. F. NO CHANGE
G. base. Withers documented
H. base, Withers documented
J. base, documenting

63. Given that all the choices are true, which one provides the most effective and most specific support for the statement made in the preceding sentence?
A. NO CHANGE
B. the Memphis music scene, baseball's Negro Leagues, and the civil rights movement.
C. his world, which have become memorable because of their significance.
D. this place that he thought would be important or newsworthy.

64. Which of the following alternatives to the underlined portion would be LEAST acceptable?
F. Whereas
G. Since
H. As if
J. After

65. A. NO CHANGE
B. with
C. of
D. at

66. F. NO CHANGE
G. for himself as
H. as
J. DELETE the underlined portion.

67. For the sake of the logic and coherence of this paragraph, Sentence 3 should be placed:
A. where it is now.
B. before Sentence 1.
C. after Sentence 1.
D. after Sentence 4.

68. F. NO CHANGE
G. In fact, he is well
H. He is well
J. Well

such historic figures as Martin Luther King Jr., Medgar
69

Evers, and James Meredith. For instance, his photos of
70

Memphis's Beale Street jazz and blues musicians includes
71

the likes of B. B. King, Aretha Franklin, and Elvis Presley.

[4]

In addition to capturing many public personages on film, Withers also photographed: waitresses, church
72

congregations, nightclub audiences, and Little League baseball games. "I can't play a piano, I can't play a guitar, all I can do is take a picture," Withers said in a recent interview. At long last, Ernest C. Withers had recorded
73

some five million photographic images.

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

A. such historical figures as
B. historical figures such as
C. such historic figures
D. historic figures like

70. **F.** NO CHANGE
G. As a result, his
H. However, his
J. His

71. **A.** NO CHANGE
B. does include
C. including
D. include

72. **F.** NO CHANGE
G. photographed waitresses,
H. photographed: waitresses
J. photographed waitresses

73. Which choice best expresses the fact that Withers is still taking photographs at the time this essay was written?

A. NO CHANGE
B. At last count,
C. To sum up,
D. All in all,

Questions 74 and 75 ask about the preceding passage as a whole.

74. Upon reviewing the essay and realizing that some information has been left out, the writer composes the following sentence incorporating that information:

> He immortalized his subjects in the middle of their performances as well as in quiet moments backstage.

This sentence would most logically be placed at the end of Paragraph:

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

75. Suppose the writer's goal had been to write a biographical sketch of a photojournalist that would portray the person in the context of the world he or she photographed. Does this essay successfully accomplish that goal?

A. Yes, because it describes Ernest Withers's career as a photojournalist and relates that career to his hometown of Memphis and the South.
B. Yes, because it explains how Ernest Withers first developed his interest in photography and photojournalism.
C. No, because it fails to make any connection between Ernest Withers and the world that he photographed.
D. No, because it doesn't sufficiently describe Ernest Withers's achievements, honors, and awards.

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. If $m = 4$, $n = -5$, and $p = 9$, what is the value of $mp - mn$?

A. 16
B. 31
C. 41
D. 56
E. 81

2. Vehicle A averages 19 miles per gallon of gasoline, and Vehicle B averages 37 miles per gallon of gasoline. At these rates, how many more gallons of gasoline does Vehicle A need than Vehicle B to make a 1,406-mile trip?

F. 28
G. 36
H. 38
J. 56
K. 74

3. If $\frac{x}{y} = \frac{1}{9}$ and $\frac{y}{z} = \frac{9}{8}$, then $\frac{z}{x} = ?$

A. $\frac{1}{648}$

B. $\frac{1}{8}$

C. $\frac{8}{81}$

D. $\frac{81}{8}$

E. 8

DO YOUR FIGURING HERE.

4. If $12(x-7) = -11$, then $x =$?

F. $-\frac{95}{12}$

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

H. $-\frac{11}{12}$

J. $-\frac{1}{3}$

K. $\frac{73}{12}$

5. The legs of a right triangle measure 18 m and 24 m, respectively. What is the length, in meters, of its hypotenuse?

A. 21
B. 30
C. 42
D. $\sqrt{252}$
E. $\sqrt{432}$

6. In the school cafeteria, students choose their lunch from 4 sandwiches, 2 soups, 2 salads, and 2 drinks. How many different lunches are possible for a student who chooses exactly 1 sandwich, 1 soup, 1 salad, and 1 drink?

F. 2
G. 4
H. 10
J. 16
K. 32

7. What is $\frac{1}{9}$ of 63% of \$6,000 ?

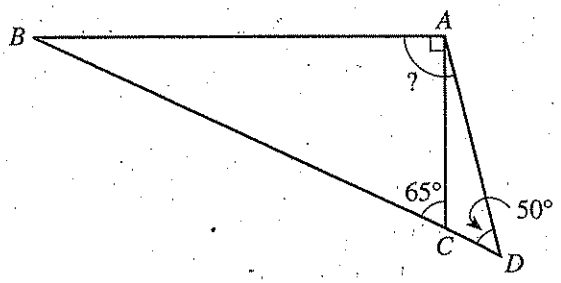
A. \$34,020
B. \$ 4,200
C. \$ 3,402
D. \$ 420
E. \$ 42

8. DMC Electronics Company builds 2 products: a DVD player and a VCR. Employees of the company can build a maximum of 150 DVD players per week and a maximum of 200 VCRs per week. No more than 250 products can be built per week. In the following inequalities, d represents the number of DVD players and v represents the number of VCRs. Which inequality expresses the constraint on the number of products built per week?

F. $d + v \leq 150$
G. $d + v \geq 200$
H. $d + v \leq 200$
J. $d + v \geq 250$
K. $d + v \leq 250$

DO YOUR FIGURING HERE.

9. In the figure below, $\angle ADC$ measures 50°, $\angle ACB$ measures 65°, and $\angle BAC$ measures 90°. What is the measure of $\angle BAD$?



A. 105°
B. 115°
C. 130°
D. 140°
E. 155°

10. Which of the following is equivalent to $(2x + 3)(x - 7)$?

F. $2x^2 - 21$
G. $2x^2 - 11x - 21$
H. $2x^2 + 11x - 21$
J. $2x^2 + 17x - 21$
K. $2x^2 + 17x + 21$

11. A baker has $4\frac{2}{3}$ cups of sugar in her pantry. Each cake she bakes requires $\frac{1}{2}$ cup sugar. Which of the following is the largest number of whole cakes for which she has enough sugar in her pantry?

A. 2
B. 3
C. 8
D. 9
E. 10

12. If $f(x) = 6x^2 + 4x - 11$, then $f(-5) = ?$

F. −181
G. −119
H. 61
J. 119
K. 159

13. Which of the following expressions is equivalent to $-x^2 - x$?

A. $-x(x + 1)$
B. $-x(x - 1)$
C. $-x(1 - x)$
D. $x(x + 1)$
E. $x(x - 1)$

www.actexam.net

DO YOUR FIGURING HERE.

14. The student body at Julian High School consists of sophomores, juniors, and seniors only. The ratio of sophomores to juniors to seniors on Julian High School's student council is 2:3:4. There are 15 juniors on the student council. How many students are on the entire student council?

F. 21
G. 24
H. 45
J. 60
K. 135

15. The second term of an arithmetic sequence is −14, and the third term is −34. What is the first term?

(Note: In an arithmetic sequence, consecutive terms differ by the same amount.)

A. $\frac{1}{14}$

B. 6

C. 14

D. 20

E. −20

16. Last year, Tom earned an annual salary of $\$S$ from which a total of $\$D$ was deducted for taxes and insurance. The balance was Tom's take-home pay. Tom's take-home pay represents what fraction of his annual salary?

F. $\frac{D}{S}$

G. $\frac{S}{D}$

H. $\frac{D-S}{D}$

J. $\frac{D-S}{S}$

K. $\frac{S-D}{S}$

17. Mara is the timer for a road race. She is 200 feet from the starting gun. Using 1,120 feet per second for the speed of sound, which of the following is closest to how many seconds after the starting gun is fired that Mara will hear the starting gun?

A. 0.1
B. 0.2
C. 0.6
D. 0.9
E. 1.3

DO YOUR FIGURING HERE.

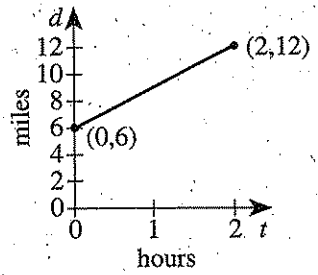
18. What is the slope of the line represented by the equation $6y - 18x = 6$?

F. 1
G. 3
H. 6
J. 18
K. −18

19. At a buffet restaurant, the price for dinner for an adult is \$6.95 and the price for dinner for a child is \$3.95. A group of 8 people went to the restaurant for dinner and paid a total of \$46.60, excluding tax and tip. How many adults were in the group?

A. 2
B. 3
C. 4
D. 5
E. 6

20. The graph below shows the distance, d miles, you are from home t hours following the start of a walk. Which of the following statements accurately describes your walk?



F. You start at home, and after 2 hours are 12 miles from home.
G. You start at home, and after 2 hours are 6 miles from home.
H. You start 12 miles from home, and after 2 hours are home.
J. You start 12 miles from home, and after 2 hours are 6 miles from home.
K. You start 6 miles from home, and after 2 hours are 12 miles from home.

21. In right triangle $\triangle XYZ$ below, $\cos Z = \frac{4}{7}$. Which of the following expressions is equal to $\cos X$?

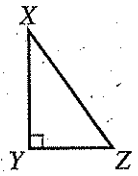
A. $\frac{7}{4}$

B. $\frac{\sqrt{65}}{4}$

C. $\frac{\sqrt{33}}{4}$

D. $\frac{\sqrt{65}}{7}$

E. $\frac{\sqrt{33}}{7}$



DO YOUR FIGURING HERE.

22. For any nonzero value of y, $(y^{-5})^3 = ?$

F. $\frac{1}{y^{15}}$

G. $\frac{1}{y^2}$

H. y^8

J. y^{15}

K. y^{125}

23. The ratio of the side lengths of 2 similar triangles is 3:5. The smaller triangle has sides that measure 5 centimeters, 7 centimeters, and 9 centimeters. What is the perimeter, in centimeters, of the larger triangle?

A. $12\frac{3}{5}$

B. 21

C. 35

D. 63

E. 105

www.crackab.com

24. Points $R(6,4)$ and $S(-4,5)$ lie in the standard (x,y) coordinate plane. What is the slope of $\overline{RS}$?

F. $-\frac{1}{10}$

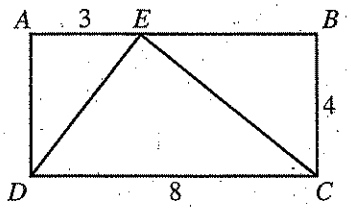
G. $\frac{1}{10}$

H. $-\frac{2}{9}$

J. $\frac{2}{9}$

K. $\frac{9}{2}$

25. In the figure below, E is a point on side $\overline{AB}$ of rectangle $ABCD$. The measures given are in inches. What is the area of $\triangle DEC$, in square inches?



A. 10
B. 12
C. 16
D. 20
E. 32

www.crackab.com

DO YOUR FIGURING HERE.

Use the following information to answer questions 26–28.

Fran is planning to fence a 10-foot-by-15-foot rectangular plot of ground to use as a garden. She intends to plant a 1-foot-wide border of flowers along the inside of the entire perimeter. The rectangular section surrounded by this border will be planted with vegetables in 11-foot-long rows parallel to the longer sides.

26. What is the minimum number of feet of fence Fran would need to enclose the garden if there will be a 3-foot-wide opening on one side of the plot for people to walk through?

F. 22
G. 25
H. 47
J. 50
K. 150

27. What is the area, in square feet, of the rectangular plot?

A. 50
B. 104
C. 126
D. 146
E. 150

28. When Fran plants the vegetables, she wants the center lines of adjacent rows to be at least 10 inches apart. She also wants the center lines of the outermost rows to be at least 10 inches from the inner edge of the flower border. According to these planting restrictions, what is the maximum number of 11-foot-long rows of vegetables that could be planted within this garden plot?

F. 8
G. 9
H. 10
J. 11
K. 12

---

29. If $|x + 9| = 19$, what are the possible values for x ?

A. −28 and 10
B. −10 and 10
C. −10 and 28
D. −9 and 9
E. 10 and 28

DO YOUR FIGURING HERE.

30. In the standard (x,y) coordinate plane, $M(9,-8)$ is the midpoint of $\overline{TW}$. If W has coordinates $(3,1)$, what are the coordinates of T?

F. $(15, -7)$
G. $(15,-17)$
H. $\left(6, -\frac{7}{2}\right)$
J. $(6, -9)$
K. $(6,-15)$

31. If the circumference of a circle is 96π centimeters, what is the radius of the circle, in centimeters?

A. $\sqrt{96}$
B. 24
C. 48
D. 96
E. 192

32. A rectangular tabletop is 14 inches wide and 48 inches long. Which of the following is closest to the length, in inches, of the diagonal of this tabletop?

F. 34
G. 50
H. 55
J. 62
K. 68

33. Rectangle $ABCD$ has vertices in the standard (x,y) coordinate plane at $A(-4,-2)$, $B(-4,3)$, $C(2,3)$, and $D(2,-2)$. A translation of rectangle $ABCD$ is a second rectangle, $A'B'C'D'$, with vertices $A'(4,-12)$, $B'(x,y)$, $C'(10,-7)$, and $D'(10,-12)$. What are the coordinates of B'?

A. $(3, -6)$
B. $(4, 3)$
C. $(4, -7)$
D. $(4,-13)$
E. $(6, -5)$

34. The solution set for x of the equation $x^2 + nx - 8 = 0$ is $\{-2, 4\}$. What does n equal?

F. -8
G. -6
H. -2
J. 2
K. 6

DO YOUR FIGURING HERE.

Use the following information to answer questions 35–37.

The Dow Jones Industrial Average (DJIA) is an index of stock values. The chart below gives the DJIA closing values from August 24 through September 30 of a certain year and the change in the closing value from the previous day. A minus sign indicates a *decline* (a closing value less than the previous day's closing value). A plus sign indicates an *advance* (a closing value greater than the previous day's closing value).

Dow Jones Industrial Average Closing Values

Date	Closing value	Change	Date	Closing value	Change
8/24	8,600		9/13	7,945	+150
8/25	8,515	−85	9/14	8,020	+75
8/26	8,160	−355	9/15	8,090	+70
8/27	8,050	−110	9/16	7,870	−220
8/30	7,540	−510	9/17	7,895	+25
8/31	7,825	+285	9/20	7,930	+35
9/01	7,780	−45	9/21	7,900	−30
9/02	7,680	−100	9/22	8,150	+250
9/03	7,640	−40	9/23	8,000	−150
9/07	8,020	+380	9/24	8,025	+25
9/08	7,860	−160	9/27	8,110	+85
9/09	8,045	+185	9/28	8,080	−30
9/10	7,795	−250	9/29	7,845	−235
			9/30	7,630	−215

35. Which of the following is closest to the percent of decrease from the August 24 closing value to the September 30 closing value?

A. 7.9%
B. 8.9%
C. 11.3%
D. 12.7%
E. 88.7%

36. The chart shows 4 more declines than advances. All of the following statements are true. Which one best explains why the decline from the August 24 closing value to the September 30 closing value was relatively large?

F. The greatest change in the chart was a decline.
G. The least change in the chart was an advance.
H. The greatest number of consecutive declines was greater than the greatest number of consecutive advances.
J. The first change was a decline.
K. The average of the declines was much greater than the average of the advances.

www.actexam.net

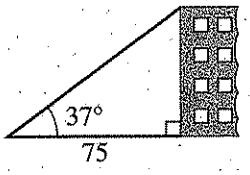
DO YOUR FIGURING HERE.

37. What is the average closing value for the 5-day period from September 13 through September 17 ?

A. 7,895
B. 7,920
C. 7,964
D. 7,980
E. 8,090

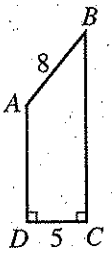
38. The angle of elevation from a point on the ground to the top of a building is 37°, as shown below. The point is 75 feet away from the building. Which of the following is closest to the height, in feet, of the building?

(Note: $\sin 37° \approx 0.602$, $\cos 37° \approx 0.799$, and $\tan 37° \approx 0.754$)



F. 45
G. 57
H. 60
J. 94
K. 125

39. For trapezoid *ABCD* shown below, $AB = 8$ m, $DC = 5$ m, and the perimeter is 39 m. What is the area, in square meters, of *ABCD* ?



A. $32\frac{1}{2}$
B. 52
C. 65
D. 130
E. 260

DO YOUR FIGURING HERE.

40. The average distance from Earth to the Sun, which is 9.3×10^7 miles, is about how many times the average distance from Earth to the Moon, which is 2.4×10^5 miles?

F. 4×10^2
G. 7×10^2
H. 4×10^{12}
J. 1×10^{13}
K. 2×10^{13}

41. Which of the following operations will produce the largest result when substituted for the blank in the expression 35 ____ $\left(-\frac{1}{56}\right)$?

A. Averaged with
B. Minus
C. Plus
D. Divided by
E. Multiplied by

42. A circle in the standard (x,y) coordinate plane has center $(7,-6)$ and radius 10 coordinate units. Which of the following is an equation of the circle?

F. $(x+7)^2 - (y-6)^2 = 100$
G. $(x+7)^2 - (y-6)^2 = 10$
H. $(x+7)^2 + (y-6)^2 = 10$
J. $(x-7)^2 + (y+6)^2 = 100$
K. $(x-7)^2 + (y+6)^2 = 10$

43. In $\triangle XYZ$, $\overline{XY} \cong \overline{XZ}$ and the measure of $\angle Y$ is 22°. What is the measure of $\angle X$?

A. 136°
B. 79°
C. 68°
D. 44°
E. 22°

44. What is the volume, in cubic centimeters, of a cube if the area of 1 square face is 144 square centimeters?

F. 36
G. 1,728
H. 20,736
J. 46,656
K. 373,248

DO YOUR FIGURING HERE.

45. If a number is chosen at random from the set $\{1, 2, 3, 4, \cdots, 12\}$, what is the probability that the chosen number is a factor of 12 ?

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

B. $\frac{5}{12}$

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

D. $\frac{5}{6}$

E. 1

46. Jamal invested \$1,000 on January 1. At the end of 9 months, during which time Jamal made no withdrawals and no other deposits, the investment has earned \$75 in interest. Jamal's \$1,000 investment returned an annual percentage yield closest to which of the following percents?

(Note: Interest can be estimated using $I = Prt$, where I is the amount of interest earned; P is the amount of money initially invested; r is the annual percentage yield that the money returned; and t is the time, in years, the money is invested.)

F. 12%
G. 11%
H. 10%
J. 8%
K. 7%

47. Consider the function $f(x) = 2x^2 + x$. What is the value of $f(f(3))$?

A. 75
B. 168
C. 465
D. 885
E. 903

48. What are the possible values of y such that $xy^2 = 54$, $x < 10$, $y < 10$, and x and y are integers?

F. −3, 3
G. 1, 3
H. 1, 9
J. 3
K. 6

www.actexam.net

DO YOUR FIGURING HERE.

49. Each side of a quadrilateral is 12 cm long. Which 2 of the following *must* also describe this quadrilateral?

I. Square (sides of equal length and 90° angles)
II. Rhombus (sides of equal length)
III. Rectangle (90° angles)
IV. Parallelogram (opposite sides parallel)

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

50. The points (–2,3) and (0,1) lie on a straight line. What is the slope-intercept equation of the line?

F. $y = 2x - 1$
G. $y = x + 5$
H. $y = x + 1$
J. $y = -x + 1$
K. $y = -2x + 3$

51. Each number on a list containing 100 numbers is divided by 10 to produce a second list containing 100 numbers. Each of the 100 numbers on the second list is decreased by 2 to produce a third list of 100 numbers. The median of the third list is x. Which of the following expressions gives the median of the original list?

A. $\frac{x}{10} - 2$

B. $\frac{x}{10}$

C. $x + 2$

D. $10x + 2$

E. $10(x + 2)$

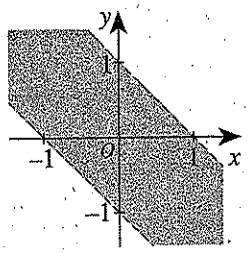
52. Whenever $(x + 4)(x - 3) < 0$, which of the following expressions *always* has a negative value?

F. $x - 5$
G. $x - 2$
H. $x + 5$
J. $2x$
K. $x^2 - 1$

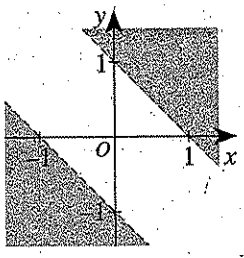
DO YOUR FIGURING HERE.

53. Which of the following graphs in the standard (x,y) coordinate plane represents the solution set of the inequality $|x + y| > 1$?

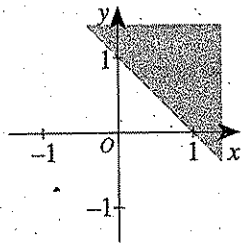
A.



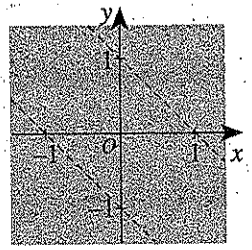
D.



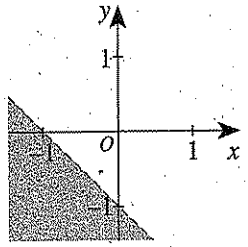
B.



E.



C.



54. The expression $4 \sin x \cos x$ is equivalent to which of the following?

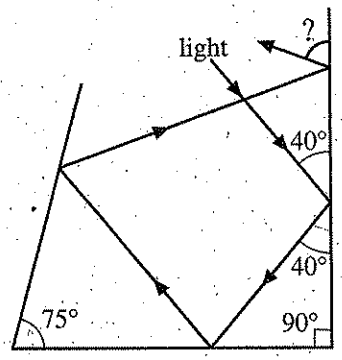
(Note: $\sin(x + y) = \sin x \cos y + \cos x \sin y$)

F. $2 \sin 2x$
G. $2 \cos 2x$
H. $2 \sin 4x$
J. $8 \sin 2x$
K. $8 \cos 2x$

www.crackab.com

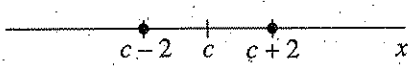
DO YOUR FIGURING HERE.

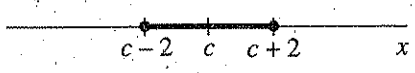
55. The angle at which light strikes a mirror is equal in measure to the angle at which it is reflected. In the hall of the mirrors below, what is the measure of the indicated angle?

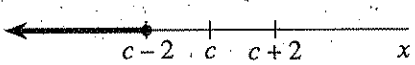


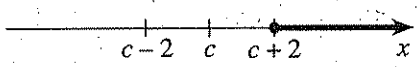
A. 50°
B. 55°
C. 70°
D. 80°
E. 90°

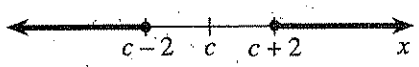
56. Which of the following is the graph of the solution set for $|x - c| \geq 2$?

F.


G.


H.


J.


K.


57. Square $ABCD$ is shown below in the standard (x,y) coordinate plane. The line $y = ax + 2$ divides the square into 2 congruent regions if $a = ?$

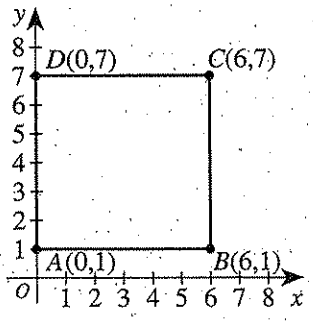
A. $\frac{2}{3}$

B. $\frac{1}{6}$

C. $\frac{5}{6}$

D. $\frac{6}{7}$

E. 1



DO YOUR FIGURING HERE.

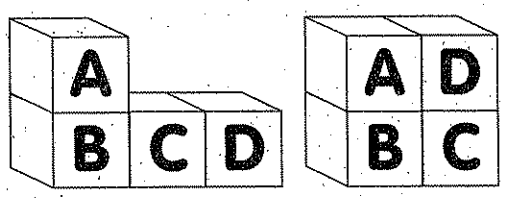
58. If $\log_3 2 = p$ and $\log_3 5 = q$, which of the following expressions is equal to 10 ?

F. 3^{p+q}
G. $3^p + 3^q$
H. 9^{p+q}
J. pq
K. $p + q$

59. The domain of the function $y(x) = 3\cos(5x - 4) + 1$ is all real numbers. Which of the following is the range of the function $y(x)$?

A. $-3 \le y(x) \le 3$
B. $-4 \le y(x) \le 3$
C. $-4 \le y(x) \le 2$
D. $-2 \le y(x) \le 4$
E. All real numbers

60. In the figure below, both solids consist of 4 cubes, each 1 unit on a side. In the solid on the right, the 4 cubes form a rectangular prism that is 2 units long, 1 unit wide, and 2 units high. The solid on the left is the result of moving Cube D from its position above Cube C to beside it so that Cubes B, C, and D form a rectangular prism 3 units long, 1 unit wide, and 1 unit high. To the nearest percent, the total surface area of the solid on the right is what percent less than the total surface area of the solid on the left?



F. 0%
G. 2%
H. 6%
J. 11%
K. 13%

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 *Toning the Sweep* by Angela Johnson (©1993 by Angela Johnson).

The narrator is visiting her grandmother, Ola, to help her prepare to move. Martha is Ola's friend and neighbor.

I think about how everybody Ola knows here has a story. Daddy says that everybody has one and their stories are all a part of us. If Ola loves these people, then they must be a part of me too. It must be true about all of us being a part of one another like Daddy says.

Ola hums on the porch while Mama eats an apple and labels boxes. I go over to the phone by the refrigerator and call Martha. When she picks up, her voice rings out and is so familiar. I tell her Ola's idea about making a movie.

Martha Jackson's hair is the color of coal and she must be about my grandmama's age. She cuts her hair short, and sometimes it sticks straight up, but she doesn't care.

She's probably one of the tallest people I know, and walks like she's swimming. Martha looks at you for a long time before she decides to speak.

She's leaning on a Joshua tree in Ola's front yard, saying, "It's like poetry and eating to me now. You let the camera become part of you. Like your head and your eyes. If the camera were to fall out of your hands, it should be like your head falling off in the middle of a conversation."

"I don't know if the camera can ever be that special to me, Martha," I say. "I just got used to the camera my dad gave me four years ago. I can remember to take off the lens cap sometimes."

Martha smiles. "This is a thing to get used to—that's all. No magic, no special real training. Turn the camera on and shoot."

I take the camera and start taping a crow that's landed on the back porch. I figure it's a start. The crow gets real interested in me filming him and stops pecking at the old apple core he's found near the garbage cans. He hops off the porch and checks me and the camera out till he sees something else off over by some brush.

Martha's watching me with a smirk when I turn back to her with the camera. "I guess you'll do okay by yourself now." She looks at me for a long time, then says, "Let's talk about Ola."

I start shooting and say to myself, "A part of me," and hope that the thing is going and the lens cap hasn't been on the whole time I've been taping the crow. I zoom in on Martha leaning against the Joshua tree. She stares into the camera.

"I met Ola in the late summer of 1964 'cause there was no other way around it."

A pot falls in the kitchen, and we can hear Ola laughing—then she stops. I keep the camera running.

"Like I was saying," Martha starts to whisper, but changes her mind and speaks even louder. "I couldn't help but meet her. There's about five hundred people that live out here, and she happens to be my closest neighbor. She was playing her music loud one night, and I was sitting out in my yard."

Ola comes out the screen door and sits down by Martha Jackson. Two people couldn't be more different in looks. I have them both in the frame.

Ola's short and delicate—like she'd break if you held her arm too tight. She wouldn't break, though. She hands Martha a glass of iced tea and sits cross-legged on the ground.

I press the pause button, then change my mind. I sit down on a lawn chair and ask, "What did you two think of each other when you first met?" It's easier to ask what I'd usually think of as a nosy question from behind a camera.

Martha whispers, "I thought she had the worst accent of anybody that I'd ever heard. It grew on me, though, and I got used to it. I liked her car and the way the fool painted the house yellow the day after she and Diane moved in."

www.actexam.net

Ola spills a little iced tea and says, "No, you didn't. You yelled from the road that this shade of yellow didn't look good from where you stood, and what was it called?" Ola looks at the camera and tells me, "Your mama was so embarrassed, Emmie, she begged me to stop painting it yellow and just make it gray or something. Your mama always took things so much to heart."

"What did you say to Martha then?"

"I told her I didn't know who she was, but if she had enough energy to yell from the road at a perfect stranger, she probably had enough strength to pick up a brush."

Martha tilts her head back and laughs. "So I did."

Ola gets up and goes into the house without making a sound. I don't think that Martha even knows she's gone, 'cause her eyes are closed.

I want to make this movie on my own. Martha makes me want to know all of Ola's friends. I want to know who they are and what they've done. I'll put them all in front of the camera, and when the movie's done, it can be my gift to Ola. The other gifts I've given her are things she could put on the wall or wear. I figure this will be better than all that. I'll give her memories of her people.

www.crackab.com

1. Based on the passage, Ola and Martha can reasonably be said to share all of the following traits EXCEPT a:
   - A. sense of humor.
   - B. capacity for brutal honesty.
   - C. great vitality and liveliness.
   - D. tendency to pause before speaking.

2. Which of the following statements does the passage support regarding the idea for the movie?
   - F. Though the original idea was Ola's, the narrator and Martha embraced it.
   - G. Although the narrator came up with the idea, she needed Martha's encouragement to continue.
   - H. Ola proposed the idea to Martha, who recruited the narrator to make the movie.
   - J. The narrator suggested the idea to Ola, who had to be talked into it by Martha.

3. The narrator's two references to a camera's lens cap (lines 27 and 42) primarily serve to suggest her:
   - A. expanding knowledge of camera terminology.
   - B. continuing desire to uncover her artistic vision.
   - C. ongoing insecurity about her skill with a camera.
   - D. growing eagerness to use a camera to tell stories.

4. Viewed in the context of the passage, Martha's smirk (line 37) most likely reflects a feeling of:
   - F. mild weariness.
   - G. sharp condescension.
   - H. profound relief.
   - J. slight amusement.

5. As presented by the participants, the initial meeting between Ola and Martha can best be described as:
   - A. a misunderstanding that escalates into harsh words until the two agree to keep their distance from each other.
   - B. a potentially bitter confrontation that, because of the personalities of the two people, turns into a cooperative effort.
   - C. a friendly, relaxed get-together between two families made even more enjoyable by music and a shared task.
   - D. an accidental encounter that slowly turns unpleasant due to a dispute that Ola's daughter helps resolve.

6. Martha clearly recommends that the narrator use a camera in which of the following ways?
   - F. Scientifically
   - G. Cautiously
   - H. Intuitively
   - J. Secretly

7. It can most reasonably be inferred that Diane is the name of:
   - A. the narrator.
   - B. the narrator's mother.
   - C. one of Ola's neighbors.
   - D. one of Martha's best friends.

8. In terms of the development of the narrator as a character, the last paragraph primarily serves to:
   - F. establish motivation for her actions.
   - G. provide background details about her past.
   - H. elaborate on her relationship with Martha.
   - J. undermine the reliability of her account.

9. In the first paragraph, the main conclusion the narrator reaches is that:
   - A. Daddy is usually right in his assessments of people.
   - B. Ola is a wonderful storyteller who entertains everyone she knows.
   - C. Ola shares a close bond with her neighbors.
   - D. people everywhere are connected to each other by stories and love.

10. The narrator's statement "She wouldn't break, though" (line 60) most nearly means that in the narrator's opinion, Ola is:
   - F. too stubborn to change her opinions very often.
   - G. too guarded to show her feelings.
   - H. stronger than she appears to be.
   - J. more active than many people half her age.

Passage II

SOCIAL SCIENCE: This passage is adapted from the article "The Trouble with Fries" by Malcolm Gladwell (©2001 by The Condé Nast Publications Inc.).

It is entirely possible, right now, to make a delicious French fry that does not carry with it a death sentence. A French fry can be much more than a delivery vehicle for fat.

Is it really that simple, though? Consider the cautionary tale of the efforts of a group of food scientists at Auburn University more than a decade ago to come up with a better hamburger. The Auburn team wanted to create a leaner beef that tasted as good as regular ground beef. They couldn't just remove the fat, because that would leave the meat dry and mealy. They wanted to replace the fat. The goal of the Auburn scientists was to cut about two-thirds of the fat from normal ground beef, which meant that they needed to find something to add to the beef that would hold an equivalent amount of water—and continue to retain that water even as the beef was being grilled. Their choice? Seaweed, or, more precisely, carrageenan. They also selected some basic flavor enhancers, designed to make up for the lost fat "taste." The result was a beef patty that was roughly three-quarters water, twenty per cent protein, five per cent or so fat, and a quarter of a per cent seaweed. They called it AU Lean.

It didn't take the Auburn scientists long to realize that they had created something special. They began doing blind taste comparisons of AU Lean burgers and traditional twenty-per-cent-fat burgers. Time after time, the AU Lean burgers won. Next, they took their invention into the field. They recruited a hundred families and supplied them with three kinds of ground beef for home cooking over consecutive three-week intervals—regular "market" ground beef with twenty per cent fat, ground beef with five per cent fat, and AU Lean. The families were asked to rate the different kinds of beef, without knowing which was which. Again, the AU Lean won hands down.

What the Auburn team showed was that, even though people love the taste and feel of fat—and naturally gravitate toward high-fat food—they can be fooled into thinking there is a lot of fat in something when there isn't. When the group tried to lower the fat in AU Lean below five per cent, people didn't like it anymore. But, within the relatively broad range of between five and twenty-five per cent, you can add water and some flavoring and most people can't tell the difference.

What's more, people appear to be more sensitive to the volume of food they consume than to its calorie content. Barbara Rolls, a nutritionist at Penn State, has demonstrated this principle with satiety studies. She feeds one group of people a high-volume snack and another group a low-volume snack. Even though the two snacks have the same calorie count, she finds that people who eat the high-volume snack feel more satisfied. Eating AU Lean, in short, isn't going to leave you with a craving for more calories; you'll feel just as full.

For anyone looking to improve the quality of fast food, all this is heartening news. It means that you should be able to put low-fat cheese and low-fat mayonnaise in a fast-food hamburger without anyone's complaining. It also means that there's no particular reason to use twenty-per-cent-fat ground beef in a fast-food burger. In 1990, using just this argument, the Auburn team suggested to McDonald's that it make a hamburger out of AU Lean. Shortly thereafter, McDonald's came out with the McLean Deluxe. Other fast-food houses scrambled to follow suit. Nutritionists were delighted. And fast food appeared on the verge of a revolution.

Only, it wasn't. The McLean was a flop, and four years later it was off the market. What happened? Part of the problem appears to have been that McDonald's rushed the burger to market before many of the production kinks had been worked out. More important, though, was the psychological handicap the burger faced. People liked AU Lean in blind taste tests because they didn't know it was AU Lean; they were fooled into thinking it was regular ground beef. But nobody was fooled when it came to the McLean Deluxe. It was sold as the healthy choice—and who goes to McDonald's for health food?

This is sobering news for those interested in improving the American diet. For years, the nutrition movement in this country has made transparency one of its principal goals: it has assumed that the best way to help people improve their diets is to tell them precisely what's in their food, to label certain foods good and certain foods bad. But transparency can backfire, because sometimes nothing is more deadly for our taste buds than the knowledge that what we are eating is good for us.

11. The author most nearly portrays the Auburn scientists as:

A. severe critics of the fast-food industry's practices.
B. enthusiastic promoters of their promising work.
C. diligent researchers uninterested in the practical application of their work.
D. clever innovators more interested in nutrition than in how food tastes.

12. It can reasonably be inferred from the passage that changing which of the following conditions of the experiment described in lines 28–36 would have had the biggest effect on the outcome?
    - F. Altering the order in which the families received the three kinds of ground beef
    - G. Using two hundred families instead of one hundred in the study
    - H. Telling the families which kind of ground beef they were getting each time
    - J. Lengthening the time the families used each type of ground beef

13. The statement in lines 61–63 most likely represents the view of all of the following groups EXCEPT:
    - A. McDonald's officials introducing the McLean Deluxe to the public.
    - B. the Auburn scientists, who had research to support these conclusions.
    - C. nutritionists who saw the potential health benefits of AU Lean.
    - D. fast-food company executives at the time this article was published.

14. According to the passage, carrageenan's role in AU Lean was as a:
    - F. flavor enhancer.
    - G. substitute for fat.
    - H. source of protein.
    - J. replacement for seaweed.

15. The author implies that for an AU Lean hamburger to seem as satisfying as a hamburger made from regular ground beef, the most important factor would be keeping which of the following the same?
    - A. Volume
    - B. Calorie content
    - C. Percent of fat
    - D. Method of cooking

16. The author indicates that the main cause of the failure of the McLean Deluxe was that:
    - F. McDonald's failed to promote it through advertising.
    - G. it was rushed to market before production problems were solved.
    - H. people believed that it was made from "market" hamburger.
    - J. people knew that it was supposed to be good for them.

17. The author most likely intends the question in lines 80–81 to be read:
    - A. rhetorically; he believes the answer is self-evident and negative.
    - B. ironically; he finds it surprising that people really wanted the healthy choice.
    - C. genuinely; he is unsure about whether people enjoy healthy fast food.
    - D. critically; he objects to fast-food restaurants selling AU Lean.

18. It can reasonably be inferred from the last paragraph that the author thinks that, in the future, the nutrition movement should:
    - F. make its goals more transparent.
    - G. reconsider its goal of transparency.
    - H. label foods as either good or bad.
    - J. tell people exactly what is in their food.

19. According to the passage, which of the following elements makes up the highest percent of AU Lean?
    - A. Fat
    - B. Seaweed
    - C. Water
    - D. Protein

20. According to information in the fourth paragraph (lines 37–46), which of the following comparisons between a 20-percent-fat hamburger and an 8-percent-fat hamburger with added water and flavorings would most people make?
    - F. The 20-percent-fat hamburger would taste slightly better.
    - G. The 8-percent-fat hamburger would taste slightly better.
    - H. The 8-percent-fat hamburger would taste significantly better.
    - J. The two hamburgers would taste the same.

www.crackab.com

Passage III

HUMANITIES: This passage is adapted from *The Piano Shop on the Left Bank* by Thad Carhart (©2001 by Thad Carhart).

No one knows exactly when the piano was invented. The generally accepted date is around 1700. There is little doubt, however, about its inventor, an instrument maker in Florence, Italy, named Bartolomeo Cristofori, who developed a way of making a struck string resound loudly. Before Cristofori, keyboard instruments were unsatisfactory for different reasons: clavichords, whose strings are struck, were small and delicate, and their greatly reduced volume made them suitable only for small gatherings. Harpsichords, while larger and therefore considerably louder, had one overriding limitation: since the string is plucked, the force with which the key is depressed is unrelated to the volume of the sound produced. Dynamic control of each note was not possible.

What was needed—and what Cristofori invented—was an instrument as large and robust as the big harpsichords that would also allow the dynamic range that before had only been available on the flimsy clavichords. The first piano was described by a contemporary musician in 1711 as a "*gravicembalo col piano e forte*," a "harpsichord with soft and loud." This was the essential breakthrough, but it took decades for the seed to find fertile ground, and it did so not in Italy but in eighteenth-century Germany.

German instrument makers incorporated Cristofori's breakthrough into a series of increasingly powerful keyboard instruments that were true pianos. Johann Sebastian Bach was impressed by the first piano he tried, but he pointed out limitations that still needed to be worked on: a heavy action and a treble that was not loud enough. Two of his sons, Carl Philipp Emanuel and Johann Christian, championed the instrument in the next generation; by the time Johann Christian Bach gave England's first solo piano performance in 1768, the triumph of this new keyboard instrument over the harpsichord was assured.

The role of the keyboard as a solo instrument came to the fore musically. It was no longer just another part of the ensemble, and its unique volume freed it from the confines of the drawing room to which the harpsichord had almost always been consigned. Haydn and Mozart both wrote masterful sonatas for the new instrument, its keyboard was greatly expanded, and its dynamic range—the single feature that most distinguished it from the harpsichord—was exploited fully. A whole new technique stressing fluidity was developed for the piano, and Mozart wrote: "It should flow like oil." Solo concerts became the norm rather than the exception, and a class of instrumentalists with technique and power arrived on the scene.

What had been a tinkerer's offshoot among harpsichord makers became an industry in its own right. London and Vienna were its focal points. The two capitals gave rise to distinct schools of piano building, the principal difference having to do with how the action—the intricate mechanism that activates the hammers to strike the strings—was conceived and assembled. Viennese pianos were generally softer, with a refined singing tone that allowed the melody to come to the fore; the pianos themselves had delicate cabinetry. English pianos, on the other hand, had a more robust tone, with a stronger action and greater tension in the strings; they had solid cases and sturdy frames. The great Viennese composers of the classical era—Haydn, Mozart, Beethoven—played Viennese pianos, but the transition to the stronger instruments of the English school can be seen in Beethoven's last piano sonatas.

Beethoven was known for the increasing dynamic contrasts in his works for piano, from whisper to thunder, and he sometimes destroyed the fragile Viennese pianos when playing his music. He had a strong influence on the direction of piano manufacture, and as early as 1796 he expressed his frustration with the overly delicate styles of playing that were a holdover from harpsichords.

In 1818, Broadwood, the pre-eminent English manufacturer of the day, offered him a grand piano that incorporated all of the latest features: stronger case and frame, trichord stringing, more responsive action. This piano, too, Beethoven damaged with the fervor of his playing (a contemporary reported that "the broken strings were jumbled up like a thorn bush in a storm"), but he remained attached to it until his death in 1827. He imagined music unlike anything his contemporaries were writing; the *Hammerklavier* sonata from this period still strikes many as a revelation of the piano's extreme limits of power and expressiveness.

21. Which of the following statements best describes how the second paragraph (lines 16–25) functions in relation to the first paragraph?

A. It moves further back in time to provide background for the circumstances described in the first paragraph.
B. It focuses on the general public's reaction to the developments described in the first paragraph.
C. It provides the other side of the argument presented in the first paragraph.
D. It describes the solution to the problem presented in the first paragraph.

22. Which of the following questions is NOT answered by the passage?

F. Who invented the piano?
G. What were keyboard instruments like before 1700?
H. What are the beginning and ending dates of the classical era?
J. What is *action* as it relates to keyboard instruments?

www.actexam.net

23. Based on the passage, the author would most likely agree that both Beethoven and Cristofori were:
   A. tremendous innovators in ways that dramatically affected the music world.
   B. world-class musicians who gained recognition in their time.
   C. contributors to the advancement of the piano who were appreciated only after their deaths.
   D. musicians who found more fame outside their native countries than inside.

24. For purposes of the passage, the significance of eighteenth-century Germany is that it was there:
   F. Cristofori had his breakthrough.
   G. instrument makers improved upon ideas of piano making that had originated in Italy.
   H. the best harpsichords and clavichords were originally produced.
   J. the first major split occurred among piano makers over the best way to design keyboards.

25. As it is used in line 27, the phrase *Cristofori's breakthrough* most nearly refers to the:
   A. instrument maker's decision to let leading musicians initiate changes to standard piano design.
   B. creation of pianos whose strings could be plucked loudly or softly, depending on the effect desired.
   C. piano's release from the confines of the drawing room to larger performance spaces.
   D. development of a keyboard instrument that offered the dynamic range of the clavichord and the loudness of the harpsichord.

26. It can most reasonably be inferred from the passage that which of the following was a direct expression of others' deep respect for Beethoven?
   F. The grand piano manufactured by Broadwood whose strings the composer damaged
   G. The way Viennese pianos were built before the classical era
   H. The sonatas written and performed by Haydn and Mozart
   J. The piano schools established in London and Vienna

27. As it is used in line 88, the phrase *extreme limits* most nearly means:
   A. harsh rules.
   B. far reaches.
   C. high notes.
   D. drastic shortcomings.

28. According to the passage, Johann Sebastian Bach's reaction to the first piano he played was:
   F. disapproval of its loudness, accompanied by appreciation of its fluidity.
   G. mild irritation over the singing quality of the notes.
   H. genuine respect, accompanied by observations about problems.
   J. amusement that the fervor of his playing damaged the strings.

29. According to the passage, the piano was better suited than the harpsichord to:
   A. solo performances.
   B. drawing room concerts.
   C. delicate cabinetry.
   D. church music.

30. According to the passage, the *Hammerklavier* sonata is a composition by Beethoven that:
   F. sounds as dramatic on the clavichord as on the piano.
   G. reveals the composer's remarkable awareness and use of the piano's full capacities.
   H. gained more favor in England than in Vienna until Vienna imported English pianos.
   J. first inspired Mozart to compose for piano.

Passage IV

NATURAL SCIENCE: This passage is adapted from *Great Waters: An Atlantic Passage* by Deborah Cramer (©2001 by Deborah Cramer).

Relative newcomers to the marine world, bluefin tuna and swordfish have evolved into some of the sea's most highly developed fishes. While the cod, haddock, flounder, and plaice who dwell year-round in the North Sea and the Gulf of Mexico are cold-blooded, their body temperatures rising and falling in synchrony with the surrounding water, thus limiting their geographic range, swordfish and bluefin, exquisitely adapted to live in the vastness of the sea, are free from the boundaries imposed by temperature. The swordfish who surface at the shelf edge have swum up from the depths, rising hundreds of feet through the water each evening as the sun sets, following their prey of fish and squid. A temperature difference of 36 degrees Fahrenheit, as great as the swing between winter and summer, night and day, separates cold deep from warm surface. Swordfish exit one realm and swim into the other in under an hour.

Moving between such extremes would stun the nervous system of a cold-blooded fish, but these ocean princes make their own heat, warming themselves in the deep cold. The burner of the swordfish lies behind its eyes, below its brain, a dark mass of tissue surrounded by insulating fat, heavy with blood, and loaded with energy-producing mitochondria. With warm brain and eyes, swordfish can chase their food in waters deep and shallow, near and distant. By night, they feed at the surface, at the edge of the deep water. By day, they move onto shallow banks, like Georges or the Grand Banks, and dive down to feed, slashing through schools of menhaden and mackerel with their long, sharp swords.

Bluefin tuna thrive in waters as cold as 40 degrees Fahrenheit and as warm as 75 degrees Fahrenheit but unlike swordfish, they do not possess organs whose chief function is to produce heat. Instead they retain the heat they generate swimming. Other bony fish quickly lose their heat to the sea, for their red muscle lies near their skin, close to the cold water. In bluefin, who can weigh as much as 1,000 pounds, red muscles are housed deep within the body, near the backbone. Warm venous blood flowing away from muscles heats cold blood coming in through the arteries, enabling bluefin to retain 98 percent of their body heat, giving them free rein to forage in cold waters and to dip in and out of the Gulf Stream, where sea temperatures plummet as much as 27 degrees Fahrenheit across one nautical mile. In cold water, the bluefin, separated from the chill by only a taut skin, maintains an internal temperature of 80 degrees Fahrenheit.

Coincident with the relocation of its red muscle, bluefin developed the unique style of swimming for which they are so aptly named (*Thunnus thynnus*, from the Greek meaning to dart or lunge forward). While the bodies of other fish undulate through the water as they swim, the crescent-shaped tail of the bluefin propels its rigid body forward. Retractable fins, small scales, and recessed eyes further enable bluefin to thrust quickly through thick and heavy seas, easily overcoming water's drag and resistance. With their warm bodies, rapid metabolism, and sleek design, bluefin excel at both short sprints and long-distance travel. They zoom in on prey in short, quick bursts of speed, and they can cruise at two body lengths per second, easily making long-distance endurance swims along an entire ocean basin. Engineers who design underwater robotics dream of replicating the sleek body of this 8-foot-long, 700-pound fish who rushes without ceasing through the breadth and depth of the sea.

Swordfish and bluefin travel throughout the Atlantic with tremendous speed, but from moment to moment, day to day, month to month, their migrations are not well charted. In the winter of 1997, when the warm Gulf Stream edged shoreward toward the coast of Cape Hatteras, pressing against cold water rushing south in the Labrador Current, giant bluefin gathered in the warmth along the boundary. The following year, when the Gulf Stream moved offshore and the chilly Labrador Current filled the waters of coastal Cape Hatteras, bluefin wintered in waters unknown to people. Some bluefin, fattened in American coastal waters during the summer and fall, follow the currents across the sea during the winter. How they navigate, no one really knows. They could be guided by internal compasses of magnetite chips embedded in their skulls, by the warmth, salinity, or motion of the current, by patterns of polarized light received by the pineal window in their heads, or by prey leaving their scent as an oily, odorous slick in the water.

31. The main purpose of the passage is to:

- **A.** propose that research be conducted to confirm which navigational method swordfish and bluefin actually use.
- **B.** persuade the reader that swordfish are superior to bluefin in their adaptation to ocean life.
- **C.** speculate on the reasons why two fish have developed certain specialized traits.
- **D.** describe two fishes' adaptations to the ocean environment, including specialized traits and physical features.

32. The author's attitude regarding swordfish and bluefin can best be described as one of:

- **F.** appreciation for the advanced, unique abilities of the two fish.
- **G.** concern that their adaptations put other fish at a disadvantage.
- **H.** confusion over how their adaptations evolved so quickly beyond other fish.
- **J.** neutrality when comparing their abilities to those of other fish.

33. The passage indicates that the body temperature of a cold-blooded fish is primarily determined by the:

A. limits of its geographic range.
B. speed at which it swims.
C. type of prey it consumes.
D. temperature of its surrounding water.

34. According to the passage, the most significant difference between the temperature-regulation systems of swordfish and bluefin is that swordfish:

F. generate heat from a specialized organ, while bluefin retain heat generated from swimming.
G. have a heat-producing organ located behind their eyes, while the bluefin's is near its backbone.
H. retain heat generated by mitochondria, while bluefin retain heat generated by ocean currents.
J. retain most of the heat they generate, while bluefin lose most of the heat they generate.

35. It can reasonably be concluded from the passage that the body of a bluefin remaining rigid while swimming is related to the fact that its red muscles are:

A. moved sparingly in order to conserve body heat.
B. frozen stiff from the icy-cold water of the ocean.
C. restricted from movement by its super-tight skin.
D. located deep within its body near the backbone.

36. It can most reasonably be inferred from the passage that the waters in and near the Gulf Stream pose a challenge to most species of fish primarily because these waters:

F. are home to a large number and variety of predators.
G. represent a wide range of temperatures.
H. contain strong and swirling currents.
J. force fish into unfamiliar ocean regions.

37. According to the passage, the Greek-derived name for bluefin refers to the:

A. bluefin's constant internal temperature.
B. powerful crescent-shaped tail of the bluefin.
C. bluefin's lunging swimming style.
D. sound the bluefin produces while swimming.

38. The main purpose of the last paragraph is to:

F. explain that charting the Gulf Stream would help accurately predict the migration patterns of swordfish and bluefin.
G. highlight the fact that researchers do not yet fully understand the migrations of swordfish and bluefin.
H. reiterate that the territory of swordfish and bluefin is the entire Atlantic Ocean.
J. remind the reader of the speed and depth at which swordfish and bluefin travel.

39. The passage supports the idea that all of the following fish dwell in the North Sea and the Gulf of Mexico year round EXCEPT:

A. cod.
B. haddock.
C. plaice.
D. bluefin.

40. According to the passage, the heat a swordfish generates is primarily intended to:

F. attract cold-blooded prey seeking warmth.
G. maintain the warmth of its eyes and brain.
H. increase its speed by keeping large muscles warm.
J. strengthen its long, sharp sword with warm blood.

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

Figure 1 adapted from Susan Offner, "Human Chromosomes." ©1992 by Susan Offner.

Diploid human cells contain 46 chromosomes. Genes residing on the same chromosome are *linked*. Figure 1 shows the location of some genes in humans.

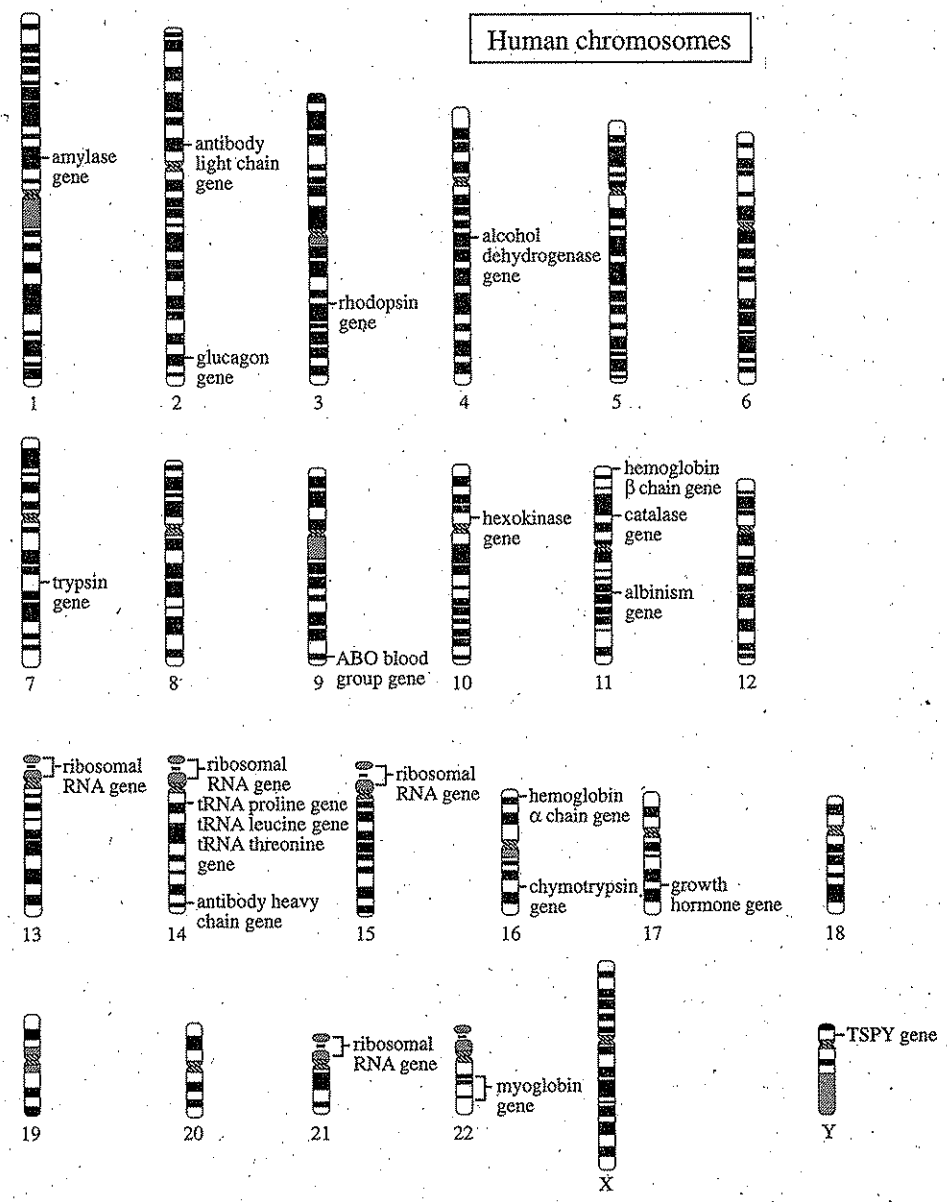


Figure 1

Table 1 lists the biological process associated with some of the genes in Figure 1.

Table 1	
Biological process	Gene
Digestion	amylase gene trypsin gene chymotrypsin gene
Immune response	antibody light chain gene antibody heavy chain gene
Respiration	hemoglobin α chain gene hemoglobin β chain gene myoglobin gene
Protein synthesis	ribosomal RNA gene tRNA proline gene tRNA leucine gene tRNA threonine gene

Table 2 lists 7 genetic diseases, the chromosome associated with each disease, and the mode of inheritance for each disease.

Table 2		
Genetic disease	Chromosome	Mode of inheritance
Tay-Sachs disease	15	autosomal recessive
Neurofibromatosis	17	autosomal dominant
Familial hypercholesterolemia	19	autosomal dominant
Duchenne muscular dystrophy	X	X-linked recessive
Incontinentia pigmenti	X	X-linked dominant
Red-green color blindness	X	X-linked recessive
Hemophilia A	X	X-linked recessive

1. According to Figure 1 and Table 1, Chromosome 13 contains a gene associated with which of the following biological activities?
   - **A.** Digestion
   - **B.** Immune response
   - **C.** Respiration
   - **D.** Protein synthesis

2. Is the statement "The tRNA proline gene is linked to the hexokinase gene" supported by the information in Figure 1 ?
   - **F.** No; the 2 genes are found on the same chromosome.
   - **G.** No; the 2 genes are found on different chromosomes.
   - **H.** Yes; the 2 genes are found on the same chromosome.
   - **J.** Yes; the 2 genes are found on different chromosomes.

3. Table 1 lists 3 genes as being associated with digestion. According to Figure 1, these 3 genes are:
   - **A.** on different chromosomes.
   - **B.** on the same chromosome.
   - **C.** linked to genes associated with immune response.
   - **D.** linked to genes associated with respiration.

4. Based on the information presented, which of the following genes is linked to the neurofibromatosis gene?
   - **F.** Amylase gene
   - **G.** Growth hormone gene
   - **H.** Myoglobin gene
   - **J.** Rhodopsin gene

5. Based on the information presented, which of the following genes is typically present in human males, but not in human females?
   - **A.** Amylase gene
   - **B.** Hexokinase gene
   - **C.** Ribosomal RNA gene
   - **D.** TSPY gene

Passage II

G. soja (a wild soybean) produces *γ-tocopherol* (a type of vitamin E). It then converts some γ-tocopherol into *α-tocopherol* (another type of vitamin E). In *G. soja*, the enzyme *TMT* catalyzes this reaction:

$$\gamma\text{-tocopherol} \xrightarrow{\text{TMT}} \alpha\text{-tocopherol}$$

A. thaliana (a mustard plant) produces γ-tocopherol, but lacks TMT, so it produces only a small amount of α-tocopherol.

Because α-tocopherol is more effective at reducing cellular damage than is γ-tocopherol, a scientist tried to transfer *G. soja*'s TMT gene into *A. thaliana*.

Experiment 1

Four versions of *G. soja*'s TMT gene (TMT1–TMT4) were cloned. Each gene was incorporated into a *vector* (a biological structure that carries a gene and transfers it into the cells of an organism).

Six genetically identical lines of *A. thaliana* were developed (L1–L6). As shown in Table 1, L1–L4 were each exposed to a vector carrying 1 of the 4 cloned genes; L5 was exposed only to the vector; and L6 was left untreated.

Next, 10 plants from each line were grown. Table 1 gives the tocopherol concentration and the percent (%) by mass of the 2 types of tocopherol in the plants.

Experiment 2

Four genetically different strains of *A. thaliana* were grown (S1–S4). S1–S4 were each exposed to a vector carrying TMT1.

Next, 10 plants from each strain were grown. Table 2 shows the tocopherol concentration and the percent by mass of the 2 types of tocopherol in the plants.

Table 1

Line	Treatment	Tocopherol concentration (mg/kg)	γ-tocopherol (%)	α-tocopherol (%)
L1	vector + TMT1	360	3	97
L2	vector + TMT2	360	3	97
L3	vector + TMT3	360	51	49
L4	vector + TMT4	360	2	98
L5	vector	360	99	1
L6	untreated	360	99	1

Table 2

Strain	Treatment	Tocopherol concentration (mg/kg)	γ-tocopherol (%)	α-tocopherol (%)
S1	vector + TMT1	390	1	99
S2	vector + TMT1	360	3	97
S3	vector + TMT1	320	9	91
S4	vector + TMT1	310	99	1

Tables adapted from D. Shintani and D. DellaPenna, "Elevating the Vitamin E Content of Plants Through Metabolic Engineering." ©1998 by the American Association for the Advancement of Science.

6. At the end of Experiment 2, which of the 4 strains had the greatest amount of γ-tocopherol per kilogram of plant material?

   F. S1
   G. S2
   H. S3
   J. S4

7. One of the *A. thaliana* strains used in Experiment 2 was genetically identical to the *A. thaliana* used in Experiment 1. Based on the results of Experiments 1 and 2, this strain was most likely:

   A. S1.
   B. S2.
   C. S3.
   D. S4.

8. To determine whether exposure to the vector alone affected tocopherol concentration in Experiment 1, one should compare the results from which 2 lines?

   F. L1 and L2
   G. L2 and L4
   H. L3 and L4
   J. L5 and L6

9. The scientist believed that 1 of the 4 cloned genes in Experiment 1 produced an enzyme that was less efficient than the enzyme produced by the other 3 genes. Based on the results, this gene was most likely:

   A. TMT1.
   B. TMT2.
   C. TMT3.
   D. TMT4.

10. After reviewing the data from Experiment 2, the scientist concluded that the transfer of the TMT gene to 1 of the strains was unsuccessful. This strain was most likely:

    F. S1.
    G. S2.
    H. S3.
    J. S4.

11. Which of the following best explains why the scientist wanted to transfer the TMT gene from one organism to another?

    A. To increase the amount of α-tocopherol produced by some of the *G. soja* plants
    B. To increase the amount of α-tocopherol produced by some of the *A. thaliana* plants
    C. To decrease the amount of α-tocopherol produced by some of the *G. soja* plants
    D. To decrease the amount of α-tocopherol produced by some of the *A. thaliana* plants

Passage III

An elevated inclined plane makes an angle, θ, with a floor. Points A and B on the inclined plane are 0.50 m apart. Point B is at a height H above the floor (see Figure 1).

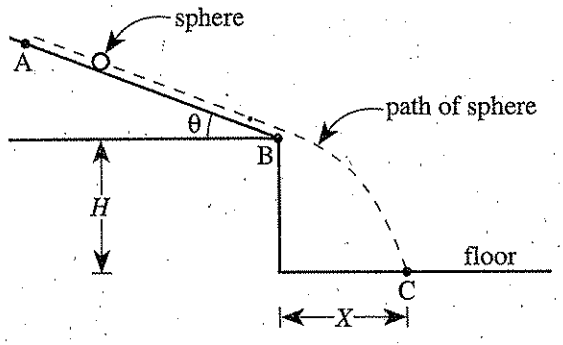


Figure 1

A solid metal sphere is released from rest at Point A and travels down the inclined plane to Point B. The sphere is in free fall between Points B and C and first hits the floor at Point C, a horizontal distance X from the bottom of the inclined plane.

Figure 2 shows how X varies with θ for different H if the sphere *rolls* from Point A to Point B. Figure 3 shows how X varies with θ for different H if the sphere *slides* from Point A to Point B.

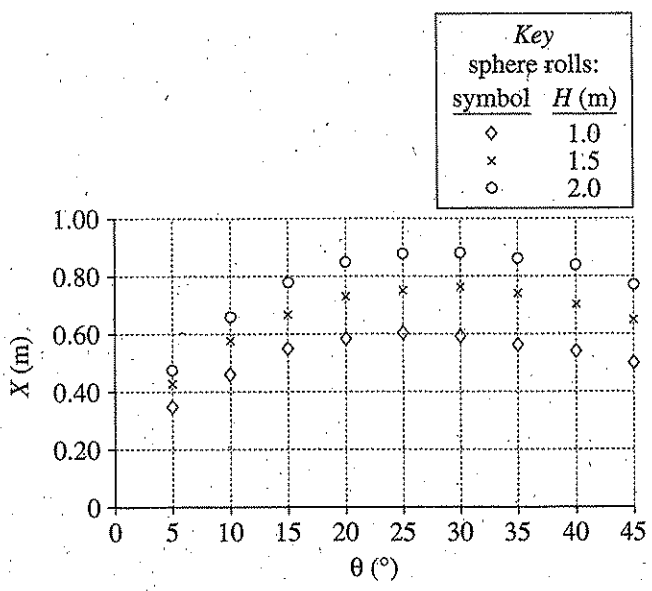


Figure 2

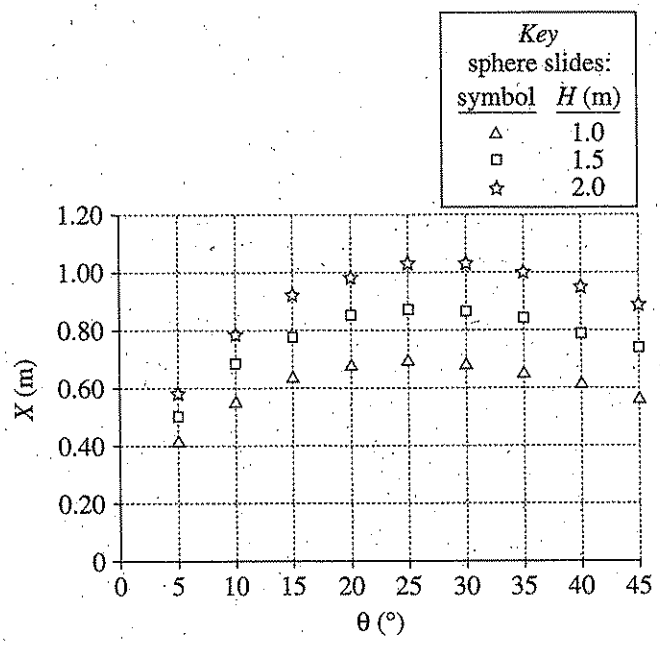


Figure 3

12. Based on Figures 2 and 3, for the sphere either sliding or rolling down the inclined plane and for $H = 1.5$ m, as θ increases from 5° to 45°, X :

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

13. For the sliding sphere at θ = 10°, if $H = 0.5$ m, X would most likely be:

A. less than 0.56 m.
B. between 0.56 m and 0.68 m.
C. between 0.68 m and 0.79 m.
D. greater than 0.79 m.

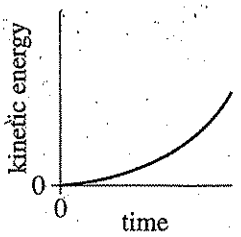
14. For the sphere sliding down the inclined plane and $H = 2.0$ m, if X had been plotted every 2.5° instead of every 5° between $\theta = 5°$ and $\theta = 45°$, X would most likely have been greatest at which of the following θ ?

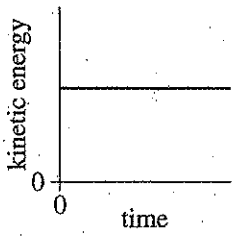
F. 17.5°
G. 22.5°
H. 27.5°
J. 32.5°

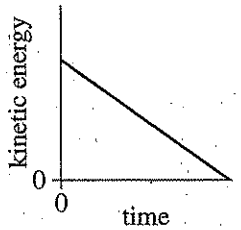
15. If $H = 2.0$ m for the rolling sphere and $\theta = 50°$, X will most likely be closest to which of the following?

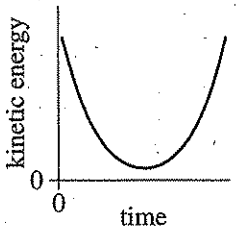
A. 0.50 m
B. 0.65 m
C. 0.80 m
D. 0.95 m

16. Which of the following figures best shows how the sphere's kinetic energy varies with time as the sphere travels down the incline?

F.


H.


G.


J.


Passage IV

Using the circuit shown in Figure 1, students studied the variables that affect the electrical resistance, R, of a wire.

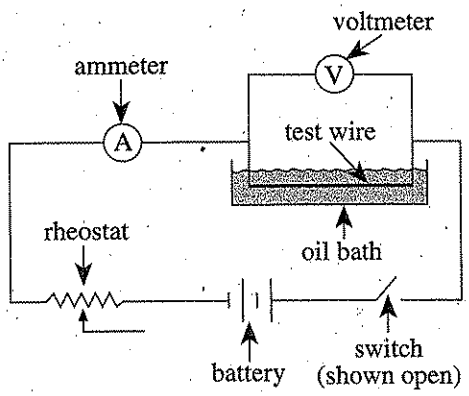


Figure 1

The students used the following procedure to find R for each test wire. They immersed the test wire in an oil bath and allowed the test wire to come to the temperature of the oil. Keeping the test wire in the oil bath (to control the temperature of the test wire), they then closed the switch and, using the *rheostat* (a variable resistor), adjusted the electrical current through the test wire until the ammeter indicated 0.80 amp. As soon as the ammeter indicated 0.80 amp, they measured the voltage, V, across the test wire. Finally, they used V and the current (0.80 amp) to calculate R.

Study 1

The students found R for test wires made of different metals. Each wire was at the same temperature and was 100 cm long and 0.130 mm^2 in cross-sectional area (see Table 1).

Table 1

Metal	V (volts)	R (ohms)
Copper	0.11	0.14
Lead	1.36	1.7
Platinum	0.66	0.83
Tungsten	0.35	0.44

Study 2

The students found R for copper test wires of different lengths. Each wire was at the temperature of the test wires in Study 1 and was 0.130 mm^2 in cross-sectional area (see Table 2).

Table 2

Length (cm)	V (volts)	R (ohms)
50	0.05	0.06
100	0.11	0.14
150	0.17	0.21
200	0.22	0.28

Study 3

The students found R for copper test wires of different cross-sectional areas. Each wire was at the temperature of the test wires in Study 1 and was 100 cm long (see Table 3).

Table 3

Cross-sectional area (mm^2)	V (volts)	R (ohms)
0.065	0.22	0.28
0.130	0.11	0.14
0.195	0.07	0.09
0.260	0.05	0.06

Study 4

The students varied the temperature of the oil. At each temperature, they found R for the copper test wire used in Study 1 (see Table 4).

Table 4

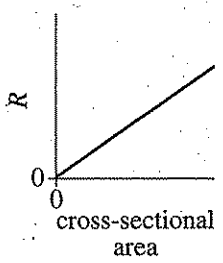
Temperature (°C)	V (volts)	R (ohms)
20	0.11	0.14
60	0.13	0.16
100	0.14	0.18
140	0.16	0.20

17. Based on the results of Studies 1 and 4, the temperature of the test wire in Study 1 was most likely closest to which of the following?

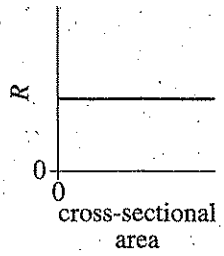
A. 5°C
B. 10°C
C. 20°C
D. 60°C

18. The results of Study 3 are best represented by which of the following figures?

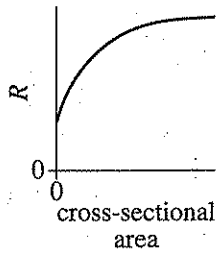
F.



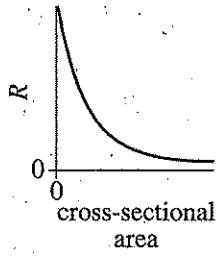
H.



G.



J.



19. Which of the following correctly lists the wires tested in Study 1 in order of increasing electrical resistance?

A. Copper wire, lead wire, platinum wire, tungsten wire
B. Copper wire, lead wire, tungsten wire, platinum wire
C. Copper wire, tungsten wire, lead wire, platinum wire
D. Copper wire, tungsten wire, platinum wire, lead wire

20. Suppose that the length of the copper wire tested in Study 4 had been 200 cm instead of 100 cm. Based on the results of Study 2, when the temperature of the copper test wire was 60°C in Study 4, V would most likely have been closest to which of the following?

F. 0.06 volt
G. 0.16 volt
H. 0.26 volt
J. 0.36 volt

21. Based on Studies 2 and 3, a copper test wire at the temperature of the test wires in Studies 2 and 3 will have the greatest electrical resistance if the test wire has which of the following lengths and cross-sectional areas?

	Length (cm)	Cross-sectional area (mm^2)
A.	20	0.15
B.	20	0.30
C.	40	0.15
D.	40	0.30

22. Given the position of the ammeter in the circuit shown in Figure 1, which of the following assumptions about the electrical current were the students most likely making?

F. Nearly all of the current went through the voltmeter.
G. Nearly all of the current went through the test wire.
H. Almost none of the current went through the test wire.
J. Almost none of the current went through the rheostat.

Passage V

Rock types can often be differentiated by the rare earth elements (REEs) they contain. Table 1 shows the average concentration of 2 REEs, neodymium and samarium, in 4 igneous rock types (oceanic basalt, continental basalt, andesite, and granite) and also in 3 sedimentary rock types (shale, sandstone, and dolomite).

Table 1

Rock type	Average concentration (ppm*) of: neodymium	samarium
Igneous rocks		
oceanic basalt	10	3
continental basalt	50	8
andesite	30	7
granite	50	9
Sedimentary rocks		
shale	30	6
sandstone	15	3
dolomite	1	0.2

*ppm = parts per million

Figure 1 shows the *relative concentration* of REEs in various igneous rock types and in sedimentary rocks taken as a group. Relative concentration is calculated using the following formula:

$$\text{relative concentration of REE in rock type} = \frac{\text{average concentration of REE in rock type}}{\text{average concentration of REE in meteorites}}$$

Meteorites, taken as a group, are used to calculate the relative concentration because their composition is distinctly different from any Earth rock.

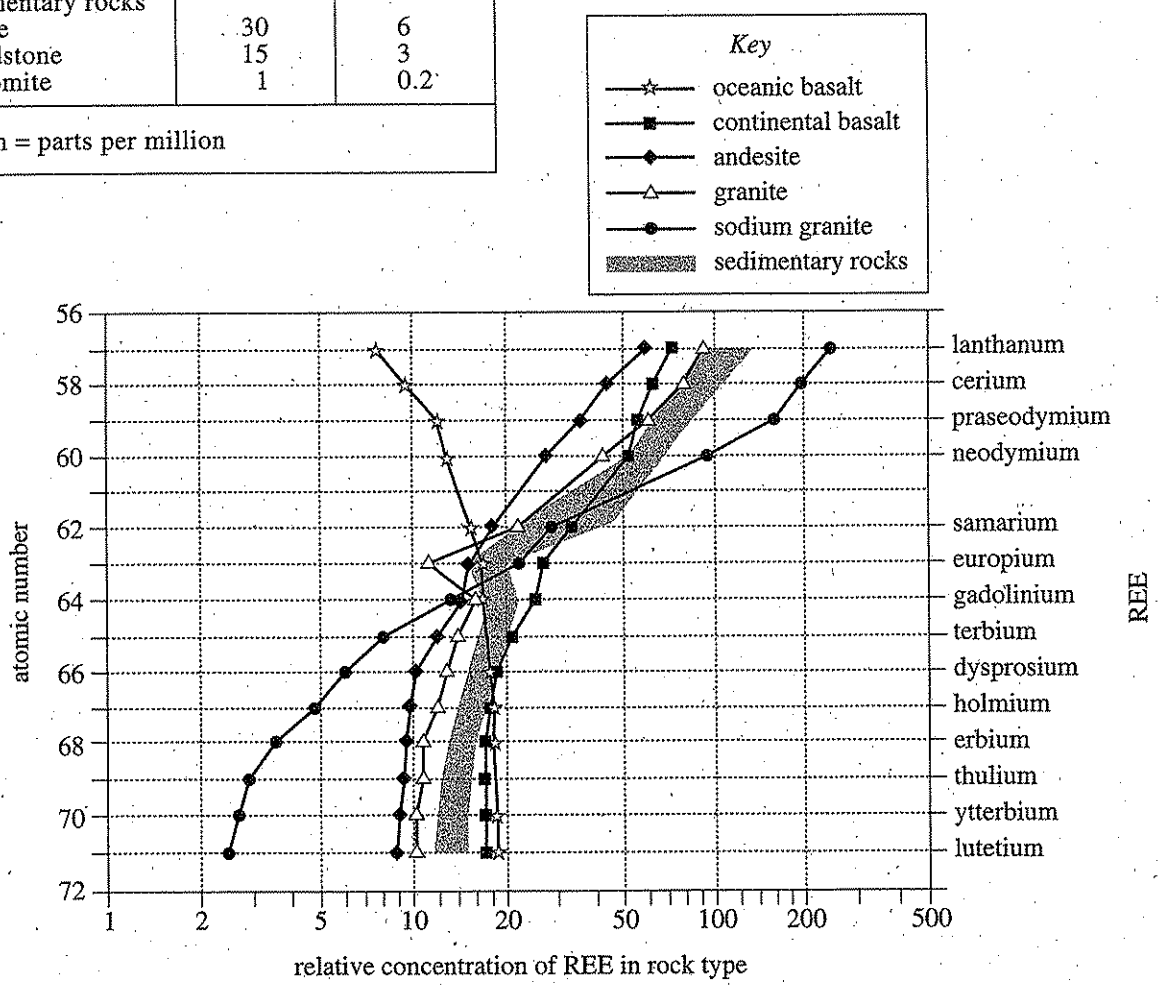


Figure 1

Figure adapted from S. Ross Taylor and Scott McLennan, "The Evolution of Continental Crust." ©1996 by Scientific American, Inc.

23. According to Figure 1, oceanic basalt and continental basalt differ the most in their relative concentrations of which of the following REEs ?

A. Cerium
B. Samarium
C. Holmium
D. Lutetium

24. A chemical analysis of another group of samples of 1 of the igneous rock types listed in Figure 1 revealed the following relative concentrations for 3 of its REEs:

REE	Relative concentration
Lanthanum	91
Europium	11
Ytterbium	10

According to Figure 1, to which rock type do these samples most likely belong?

F. Oceanic basalt
G. Andesite
H. Granite
J. Sodium granite

25. Which of the following statements comparing the average concentrations of neodymium and samarium in the rock types listed in Table 1 is true?

A. In each rock type, the average neodymium concentration is lower than the average samarium concentration.
B. In each rock type, the average neodymium concentration is higher than the average samarium concentration.
C. In some rock types, the average neodymium concentration is lower than the average samarium concentration; in other rock types, the average neodymium concentration is equal to the average samarium concentration.
D. In some rock types, the average neodymium concentration is higher than the average samarium concentration; in other rock types, the average neodymium concentration is equal to the average samarium concentration.

26. Based on Figure 1, the relative concentration of terbium for *limestone*, another rock type, would most likely be:

F. less than 10.
G. between 10 and 14.
H. between 15 and 20.
J. greater than 20.

27. In Figure 1, the plot of relative concentration versus atomic number covers the smallest range of relative concentrations for which of the following rock types?

A. Oceanic basalt
B. Continental basalt
C. Sodium granite
D. Sedimentary rocks

Passage VI

Four billion years ago (4 BYA), the Sun was only 70% as bright as it is today. With sunlight that faint, Earth's average surface temperature should have been −15°C and all surface water would have been frozen. However, isotope evidence from certain sedimentary rocks (rocks made of sediments deposited in liquid water) formed around that time indicates that Earth's surface temperature was well above freezing.

Scientists believe that 1 of 2 greenhouse gases, either ammonia (NH_3) or carbon dioxide (CO_2), was present in Earth's atmosphere at a concentration well above that of the respective gas in the atmosphere today. This gas trapped enough heat radiating from Earth's surface to keep the surface temperature above freezing.

Two scientists present their viewpoints.

Scientist 1

Four BYA, large quantities of NH_3 continuously entered Earth's atmosphere from ocean-floor hydrothermal vents and by other processes. NH_3 is a more efficient greenhouse gas than is CO_2, so a lower concentration of NH_3 is required to warm the atmosphere a given amount. Any NH_3 molecule entering the atmosphere would have been broken down in 5–10 days by UV radiation. However, methane (CH_4), another gas that was abundant in the atmosphere 4 BYA, combined with molecular nitrogen gas to produce organic compounds that blocked much of the incoming UV radiation and kept NH_3 molecules intact for much longer than 10 days. Continuous removal of CO_2 from the atmosphere by ocean water prevented CO_2 from accumulating in the atmosphere.

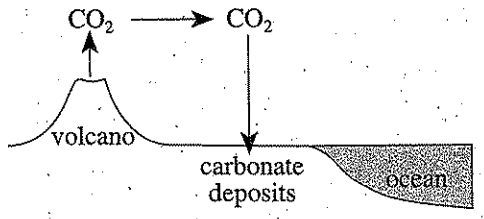
Scientist 2

Two carbon isotopes found in sedimentary rocks indicate a 75% higher concentration of CO_2 in Earth's atmosphere 4 BYA than the 360 parts per million (ppm) present today. Four BYA, large quantities of CO_2 continuously entered the atmosphere through widespread, long-term volcanic activity. Today, as in the past, much CO_2 is removed from the atmosphere as CO_2 becomes part of carbonates in rock and sediment on land. However, 4 BYA, there was 80% less dry land area on which to form and store carbonates, so CO_2 accumulated in the atmosphere.

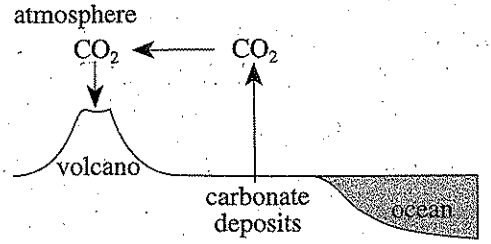
The vast amounts of CH_4 that would be required to help preserve atmospheric NH_3 did not exist on Earth 4 BYA. Thus, atmospheric NH_3 was too short-lived to have been an effective greenhouse gas.

28. Which of the following diagrams is most consistent with Scientist 2's description of how CO_2 enters and is removed from Earth's atmosphere?

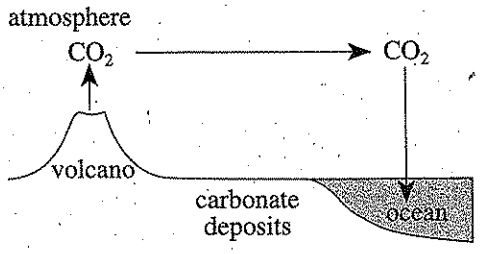
F.



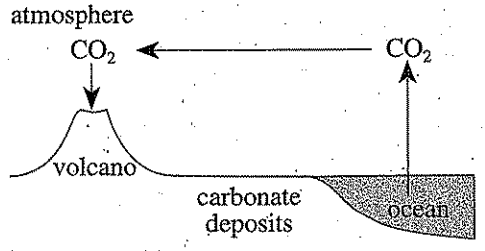
G.



H.



J.



29. CH_4 is also a greenhouse gas. Scientist 1 would most likely agree that the presence of CH_4 in Earth's atmosphere 4 BYA:

A. helped warm Earth's surface.
B. helped cool Earth's surface.
C. reduced the quantity of NH_3 present.
D. increased the quantity of CO_2 present.

30. A given concentration of NH_3 in Earth's atmosphere can trap as much heat radiating from Earth's surface as can a CO_2 concentration 3 times higher. Given this information and Scientist 2's viewpoint, the present-day concentration of NH_3 that would trap an amount of heat equivalent to that trapped by the present-day concentration of CO_2 would be approximately:

F. 50 ppm.
G. 80 ppm.
H. 120 ppm.
J. 360 ppm.

31. The Sun was 30% dimmer 4 BYA than it is today. Assuming the relative proportions of all greenhouse gases in Earth's atmosphere have stayed constant, both scientists would most likely agree that the minimum total concentration of all greenhouse gases necessary to keep Earth's surface temperature above freezing 4 BYA was:

A. more than the minimum total concentration necessary today.
B. the same as the minimum total concentration necessary today.
C. less than the minimum total concentration necessary today, but not zero.
D. zero.

32. Suppose volcanic activity 4 BYA produced large quantities of CH_4. Which scientist would most likely use this information to support his/her viewpoint?

F. Scientist 1, because it would explain how CH_4 entered Earth's atmosphere 4 BYA.
G. Scientist 1, because it would explain how NH_3 entered Earth's atmosphere 4 BYA.
H. Scientist 2, because it would explain how CH_4 entered Earth's atmosphere 4 BYA.
J. Scientist 2, because it would explain how NH_3 entered Earth's atmosphere 4 BYA.

33. In order to protect NH_3 from incoming UV radiation, the organic compounds had to be located:

A. below the elevation in the atmosphere where NH_3 was present.
B. at or above the elevation in the atmosphere where NH_3 was present.
C. on the ocean floor near where NH_3 was produced in hydrothermal vents.
D. on land near where NH_3 was produced from carbonate deposits.

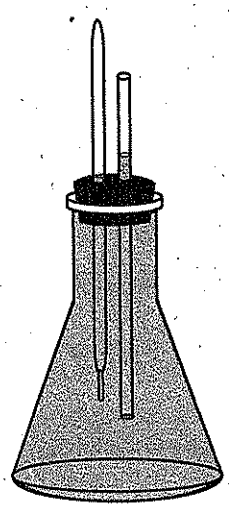
34. Scientist 2 would most likely agree that the concentration of CO_2 in Earth's atmosphere 4 BYA was closest to which of the following?

F. 75 ppm
G. 180 ppm
H. 360 ppm
J. 630 ppm

Passage VII

Students conducted experiments to study the effects of temperature on density.

In the experiments, each flask was filled to the top with either distilled water or salt (NaCl) water at 20°C. A rubber stopper with 2 holes—one fitted with a thermometer and the other fitted with glass tubing—was placed in the neck of the flask (see figure of apparatus).



The initial height of the liquid in the tubing was adjusted to 25 mm above the top of the stopper.

Experiment 1

A flask filled with distilled water was slowly heated. As the temperature of the water increased, the height of the water in the tubing increased. At 100°C, water and steam squirted out the top of the tubing.

Experiment 2

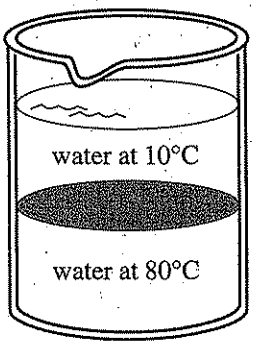
The body of a flask filled with distilled water was submerged in a cold bath at –6°C. As the temperature of the water in the apparatus decreased, the height of the water in the tubing decreased. At 4°C, the height of the water in the tubing stopped decreasing, and then began to increase. At 0°C, water and ice were forced out the top of the tubing. Eventually, the flask cracked in several places.

Experiment 3

Two saltwater solutions were prepared. Solution I had a lower salt concentration (in g/mL) than did Solution II. Two flasks containing Solutions I and II, respectively, were slowly heated. In both flasks, the salt water in the tubing rose and then squirted out the top of the tubing (at 102°C for Solution I and at 104°C for Solution II).

Two flasks containing Solutions I and II, respectively, were cooled as in Experiment 2. In both flasks, the height of the salt water in the tubing decreased until the temperature reached –6°C and then remained level (no freezing occurred).

35. Water in the upper part of a hypothetical 2-compartment container is at 10°C, and water in the lower part is at 80°C, as shown in the figure below.



If the barrier separating the 2 compartments could be removed without disturbing the water, what mixing, if any, would occur?

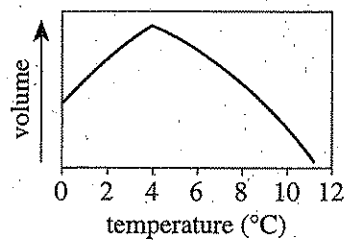
A. No mixing would occur, because the water in the upper part of the container is more dense than the water in the lower part of the container.
B. No mixing would occur, because the water in the upper part of the container is less dense than the water in the lower part of the container.
C. Mixing would occur, because the water in the lower part of the container is more dense than the water in the upper part of the container.
D. Mixing would occur, because the water in the lower part of the container is less dense than the water in the upper part of the container.

36. Based on the results of Experiments 1 and 3, 1 L of distilled water with which of the following quantities of NaCl added to it would most likely boil at the *lowest* temperature?

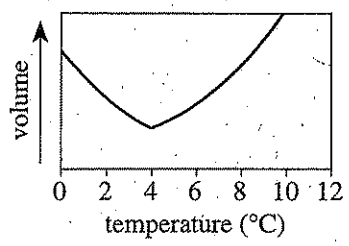
F. 0 g
G. 1 g
H. 20 g
J. 30 g

37. Which of the following graphs best shows how the volume of the liquid H_2O changed with temperature in Experiment 2 ?

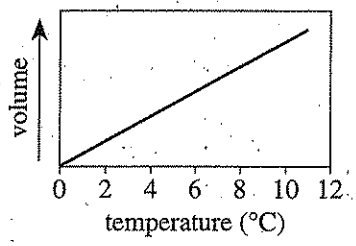
A.



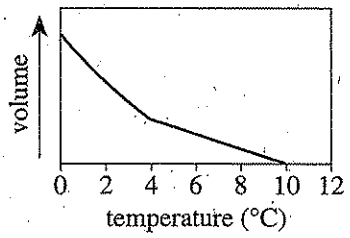
B.



C.



D.



38. Which of the following changes in the procedure of Experiment 3 would have provided the most information about the effect of decreasing temperature on the density of salt water?

F. Using a bath at −13°C to cool the flask
G. Using a bath at −3°C to cool the flask
H. Using a larger flask
J. Using a smaller flask

39. Suppose that equal volumes of Solutions I and II from Experiment 3 were mixed and the resulting solution was then tested as in Experiment 1. Salt water would most likely have started to squirt out of the top of the tubing when the temperature was:

A. less than 100°C.
B. between 100°C and 102°C.
C. between 102°C and 104°C.
D. greater than 104°C.

40. As the height of the water in the glass tubing decreased in Experiment 2, which of the following properties of the water in the apparatus also changed?

I. Volume
II. Mass
III. Density

F. I only
G. I and II only
H. I and III only
J. I, II, and III

END OF TEST 4

STOP! DO NOT RETURN TO ANY OTHER TEST.

Form 13N
ACT Assessment® Writing Test Prompt
(April 2008)

In some high schools, students are limited to participating in only one school-related extracurricular activity or sport each school year. Some parents support such a limit because they think involvement in multiple activities leaves little time for schoolwork and family responsibilities. Other parents do not support such a limit because they think students need many opportunities to explore their interests and talents if they are to make decisions about their futures. In your opinion, should high school students be limited to participating in only one extracurricular activity or sport each school year?

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

Form 65D (April 2008)
The Hunt for Morel Mushrooms

English

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

Math

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

Reading

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

Science

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

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 65D	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	73-74	57-58	—	38	**35**
34	71-72	55-56	39	37	**34**
33	70	54	38	36	**33**
32	69	53	37	35	**32**
31	68	51-52	36	34	**31**
30	67	50	35	33	**30**
29	65-66	48-49	34	32	**29**
28	64	46-47	33	31	**28**
27	62-63	44-45	32	30	**27**
26	60-61	41-43	31	29	**26**
25	57-59	39-40	30	27-28	**25**
24	55-56	37-38	29	26	**24**
23	52-54	35-36	27-28	25	**23**
22	49-51	33-34	26	23-24	**22**
21	45-48	31-32	24-25	22	**21**
20	42-44	29-30	23	20-21	**20**
19	39-41	27-28	21-22	18-19	**19**
18	37-38	24-26	20	17	**18**
17	35-36	21-23	18-19	16	**17**
16	32-34	18-20	17	14-15	**16**
15	29-31	14-17	15-16	13	**15**
14	27-28	11-13	13-14	12	**14**
13	25-26	09-10	11-12	11	**13**
12	23-24	07-08	10	10	**12**
11	21-22	06	08-09	08-09	**11**
10	18-20	05	07	07	**10**
9	16-17	04	06	06	**9**
8	14-15	03	05	05	**8**
7	11-13	—	04	04	**7**
6	09-10	02	—	03	**6**
5	07-08	—	03	—	**5**
4	05-06	01	02	02	**4**
3	04	—	—	01	**3**
2	02-03	—	01	—	**2**
1	00-01	00	00	00	**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

The Hunt for Morel Mushrooms

[1]

When I close my eyes I see them. They pop up through dead leaves, emerge from under fallen logs, and sprout next to tree stumps. Even indoors, I think I spot them out of the corner of my eye. Basically, I spend <u>every free moment</u>[1] in search of them.

[2]

I'm not talking <u>about imaginary creatures but</u>[2] about deliciously real morel mushrooms—

<u>funny-looking, textured, edible</u>[3] fungi that appear in springtime. These homely ground dwellers inspire their fans to search the woods for hours, intent on finding enough to fry up for dinner. Would it be easier to buy mushrooms at the store? Absolutely. But it wouldn't be as much fun. Once you find your first morel, maybe by a dead

1. Which of the following alternatives to the underlined portion would be LEAST acceptable?
   A. all my free time
   B. appropriate vacation time slots
   C. every moment of my leisure time
   D. whatever time I can set aside

2. F. NO CHANGE
   G. about, imaginary creatures but
   H. about, imaginary creatures, but
   J. about imaginary creatures, but,

3. Given that all the choices are true, which one most specifically describes the appearance of a morel mushroom for readers who have never seen one?
   A. NO CHANGE
   B. earthy, oddly amusing, interesting-looking
   C. odorless and unusually shaped
   D. sand-colored, cone-shaped, spongelike

elm or in an old apple orchard, a person will be even more determined to find the next one. And the next. And so on.

[3]

Like many morel hunters, I learned from an expert. She invited me along to see firsthand how it's done. I learned even more by reading reputable, detailed field guides about wild mushrooms.

That's a crucial part of the preparation to get ready for morel hunting, because often the same woods that yield morels produce poisonous mushrooms, too.

[4]

[7] Every spring, there's a contest where I live in northern Minnesota to see who can find the most morels, this year, I'm going to enter. Last year, one participant found over 3,000 morels becoming my hero. And he's willing to talk with me about this hobby we are both passionate about. Luckily, I know what question *not* to ask. You never ask morel hunters where they made their biggest find. Keeping silent about your favorite spots, is part of the mystique of this glorious pastime.

4. F. NO CHANGE
   G. a morel hunter
   H. you
   J. DELETE the underlined portion.

5. Given that all the choices are true, which one provides the most relevant and specific information at this point in the essay?
   A. NO CHANGE
   B. in between trips to and from the woods.
   C. to gain the expertise I wanted and needed at this point.
   D. very carefully on the topic that pertains to the activity.

6. F. NO CHANGE
   G. to make oneself fit
   H. of someone planning to be ready
   J. DELETE the underlined portion.

7. Which of the following statements, if added here, would provide the most effective transition from Paragraph 3 to Paragraph 4?
   A. There were many field guides to choose from.
   B. I love the texture that morels add to a meal.
   C. Outdoor activities offer so many rewards.
   D. Now I want to put my knowledge to work.

8. F. NO CHANGE
   G. morels this
   H. morels. This
   J. morels, because this

9. A. NO CHANGE
   B. morels. He's my
   C. morels, what a
   D. morels, my

10. F. NO CHANGE
    G. silent, about your favorite spots
    H. silent, about your favorite spots,
    J. silent about your favorite spots

[5]

Mostly, finding morels requires two things in particular. Smaller and (11)

11. Given that all the choices are true, which one provides the most specific information?
    A. NO CHANGE
    B. demonstrating two skills.
    C. patience and concentration.
    D. expertise in this hobby.

paler then the average pinecone, a morel (12)

12. F. NO CHANGE
    G. more pale then
    H. paler than
    J. pale than

blends perfectly into its natural surroundings. (13)

13. A. NO CHANGE
    B. it's
    C. their
    D. there

However, you can look right at one and not see it. (14)

14. F. NO CHANGE
    G. You
    H. On the other hand, you
    J. Back and forth, you

Morels fool everyone, even the experts, that's probably (15) why the saying goes that the best place to look for morels is directly behind you.

15. A. NO CHANGE
    B. experts. That's
    C. experts say, that's
    D. experts and

PASSAGE II

The Amazing Monarch Migration

The orange and black monarch butterfly, which is (16)

16. F. NO CHANGE
    G. butterfly
    H. butterfly that
    J. butterfly,

the most easiest recognized and striking butterfly species (17) in North America. Monarchs are particularly fascinating because they are one of the few migratory butterfly species in North America.

17. A. NO CHANGE
    B. most easy
    C. easiest
    D. most easily

[1] In the fall, as daylight and temperatures decrease, migrating monarchs begin their long journey south, an extended flight. (18) [2] Many

18. F. NO CHANGE
    G. south, which is far-reaching.
    H. south.
    J. south, which encompasses many miles.

monarchs, west of the Rocky Mountains migrate (19)

to the southern California coast, where they (20)

overwinter in eucalyptus groves. [3] Besides, most (21)

monarchs, millions of them across the United States and (22)
Canada—migrate as many as three thousand miles to Oyamel fir forests near Mexico City. [4] Monarchs have smaller bodies and insufficiently developed nervous (23)
systems than migratory birds. [5] The features of birds that help them accomplish their long migrations are aerodynamic design, acute vision, and the ability to (24)
regulate their body temperature and maintain energy. (24)
[6] Monarchs lack these features, and yet, in a way that defies explanation, they travel up to eighty miles in a day. [25]

For decades, scientists have studied this phenomenon, hoping to learn how monarchs are able to fly such distances. Researchers have tagged migrating monarchs to study their flight patterns, and they've hiked to the overwintering sites on the Mexican Plateau, where (26)
twenty thousand monarchs are sometimes found clustered on a single Oyamel fir bough.

Scientists are starting to learn more about the monarch's life cycle. When monarchs that don't (27)

migrate to Mexico live only four to six weeks; the (28)
migrating generations live at least eight months.

19. A. NO CHANGE
B. monarchs west of the Rocky Mountains,
C. monarchs west, of the Rocky Mountains,
D. monarchs west of the Rocky Mountains

20. F. NO CHANGE
G. there
H. while
J. DELETE the underlined portion.

21. A. NO CHANGE
B. However,
C. Finally,
D. Therefore,

22. F. NO CHANGE
G. monarchs—
H. monarchs;
J. monarchs

23. A. NO CHANGE
B. less
C. more insufficient
D. inadequate

24. F. NO CHANGE
G. and regulating body temperature and maintaining energy with their ability.
H. with their body temperature regulation and energy maintenance ability.
J. and the regulation of body temperature and their ability to maintain energy.

25. The writer would like to divide this paragraph into two in order to signal the shift in focus from monarchs' migrating habits to the differences between monarchs and migratory birds. To accomplish this goal, the best place to start the new paragraph would be at the beginning of Sentence:
A. 2.
B. 3.
C. 4.
D. 5.

26. F. NO CHANGE
G. site's
H. sites'
J. sites,

27. A. NO CHANGE
B. If
C. While
D. So that

28. F. NO CHANGE
G. weeks and
H. weeks, and while
J. weeks,

After becoming reproductively active in the spring, monarchs that have migrated begin their return journey. They lay their eggs on milkweed plants along the way and then die. Their offspring hatch, feed on the milkweed, and the migration is eventually continued. [29]

Researchers know they have much to learn, but with the help of new tracking devices and Internet technology that makes data available worldwide, they are ready to move ahead. [30]

29. A. NO CHANGE
B. continuing the migration is eventual.
C. eventually continue the migration.
D. continuing eventually the migration.

30. Which choice would best conclude the sentence and support one of the main points of the essay?
F. NO CHANGE
G. they are excited about learning how to use these new research tools.
H. they hope to solve the mysteries of the monarch migration.
J. they look forward to collaborating with other researchers who are more knowledgeable in the mysteries of monarch migration.

PASSAGE III

> The following paragraphs may or may not be in the most logical order. Each paragraph is numbered in brackets, and question 45 will ask you to choose where Paragraph 3 should most logically be placed.

Yo-Yos Spinning through Time

[1]

Historians speculate that one of the world's oldest toys is the yo-yo, though they know for sure that the oldest toy is the doll. Drawings [31] of objects adorn ancient Greek vases and the walls of [32] Egyptian temples, if written mention of yo-yos goes back to the fifth century B.C. [33]

31. A. NO CHANGE
B. yo-yo, but it is hard to know for sure, considering the yo-yo's history.
C. yo-yo, though no one is certain why some ancient yo-yos were made out of terra cotta, a fragile clay.
D. yo-yo.

32. F. NO CHANGE
G. that call attention to objects that look something like the toy that I have just mentioned
H. that include objects that almost slightly resemble yo-yos
J. of objects resembling yo-yos

33. A. NO CHANGE
B. and
C. since
D. because

[2]

While many cultures had their variations of the yo-yo, the American version can be traced to the Philippines, where yo-yos have been a national pastime for centuries.[34] In fact, the name *yo-yo* is a Tagalog word that translates as "come back."[35] In the 1920s Pedro Flores, a Filipino immigrant, introduced the toy in the United States and[36] soon started a yo-yo manufacturing company in California. Flores's design was different because the yo-yo's string wasn't tied to the axle of the toy, but rather looped around it. This allowed a skilled handler to make the toy spin at the end of its string, or "sleep."

[3]

Yo-yo technology really progressed substantially by making[37] a leap forward in the 1970s when designers added weighted rims so the toy would spin for a longer time. In 1980, another innovation led to the development of the "yo-yo with a brain," which featured a spring-loaded mechanism that caused the yo-yo to return to its owner's hand.

34. Given that all the choices are true, which one provides the most effective evidence of the long history of enthusiasm for the yo-yo in the Philippines?

F. NO CHANGE
G. have been a popular hobby for years.
H. were carved out of fine wood or animal horns.
J. resembled a toy that was popular in ancient China.

35. **A.** NO CHANGE
B. by
C. with
D. from

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

F. States. Flores
G. States, and he
H. States; he
J. States he

37. **A.** NO CHANGE
B. advanced as a result of progressively making
C. jumped ahead and made
D. made

[4]

The American craze for the toy began[38] when the entrepreneur Donald Duncan saw a demonstration of Flores's new yo-yo. Noticing the large crowd who[39] watched, Duncan quickly realized the yo-yo's potential. Flores sold his yo-yo company and all rights to Duncan in 1932, after deciding[40] that he was more interested in teaching people how to handle yo-yos than he was in manufacturing them. Duncan immediately launched an elaborate national advertising campaign to promote the toy. He also sent Duncan Yo-Yo Professionals around the country, demonstrating[41] tricks and sponsoring contests. [42] Millions of the toys were sold.

[5]

In 1985, this most ancient of toys, went[43] into space. Astronauts aboard the space shuttle *Discovery*[44] demonstrated that while a yo-yo would spin in a near-zero gravity environment, it refused to sleep.

38. **F.** NO CHANGE
G. begins
H. begun
J. had began

39. **A.** NO CHANGE
B. whom
C. whose
D. who's

40. Which of the following alternatives to the underlined portion would NOT be acceptable?
F. 1932, after his decision
G. 1932. He had decided
H. 1932, upon deciding
J. 1932. Deciding

41. **A.** NO CHANGE
B. in order to demonstrate
C. who demonstrated
D. yet demonstrating

42. If the writer were to delete the preceding sentence, the essay would primarily lose information that:
F. proves Duncan was uncertain what would be the best way to promote the yo-yo.
G. reveals how quickly demonstrations by Duncan Yo-Yo Professionals gained popularity.
H. illustrates one creative strategy that Duncan used to promote the yo-yo.
J. suggests how Duncan Yo-Yo Professionals were chosen for the job.

43. **A.** NO CHANGE
B. toys went
C. toys had went
D. toys, had gone

44. **F.** NO CHANGE
G. shuttle, *Discovery;*
H. shuttle *Discovery,*
J. shuttle, *Discovery*

Question 45 asks about the preceding passage as a whole.

45. For the sake of the logic and coherence of this essay, Paragraph 3 should be placed:
A. where it is now.
B. before Paragraph 1.
C. before Paragraph 2.
D. before Paragraph 5.

PASSAGE IV

Swimming in Open Water

Immersed in the icy water off the Antarctic Peninsula, Lynne Cox wasn't sure if she could accomplish her goal to be the first person to swim a mile through the glacier-strewn sea. At forty-five, she would of been training for (46) two years for this event, which she hoped her preparations (47) would pay off.

Cox grew up swimming in the cold lakes of New Hampshire and Maine. When (48) she was fifteen, she broke the men's and women's record's for swimming the English Channel by finishing (49) the twenty-seven-mile swim in less than ten hours. [50]

She could swim in open water and had swum across (51) the Cook Strait in New Zealand, around the Cape of Good Hope at the southern tip of Africa, and across Lake Titicaca from Bolivia to Peru.

46. F. NO CHANGE
    G. had
    H. have
    J. had to of

47. A. NO CHANGE
    B. and
    C. then
    D. DELETE the underlined portion.

48. F. NO CHANGE
    G. cold, lakes of New Hampshire
    H. cold lakes, of New Hampshire
    J. cold, lakes of New Hampshire,

49. A. NO CHANGE
    B. records
    C. records'
    D. records,

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

    At its widest, the English Channel spans a distance of 150 miles.

    Should the writer make this addition here?

    F. Yes, because it reinforces the point that Cox swam a great distance across the English Channel.
    G. Yes, because it provides a logical transition to the rest of the paragraph.
    H. No, because the English Channel is only one place that Cox had swum before going to Antarctica.
    J. No, because it is irrelevant to the focus of the essay at this point.

51. Given that all the choices are true, which one best conveys Cox's attitude toward swimming and helps bring into focus the kind of swimming that appeals to her?

    A. NO CHANGE
    B. loved the challenge of
    C. had racked up many miles in
    D. astounded many by her swimming feats in

[1] Cox is fortunate that she has a natural tolerance for cold temperatures, but swimming the Antarctic—in water only slightly above freezing—demanded serious preparation. [2] This athlete studied how Antarctic animals adapt to the frigid environment. [3] Penguins' double layer of feathers acts as insulation, so she grew her hair long and piled it under her swim cap. [4] Antarctic seals rely on body fat for warmth, so Cox gained twelve pounds, it was weight (52) that she hoped would keep her warm in the icy water. [53]

In November 2002, a crew of (54) physicians, sailors, and expedition experts, Cox headed for Neko Harbor on the Antarctic Peninsula. There she dove into water chilled by melting glaciers and began to swim. Without proper training, she would have been in peril. (55)

Her initial fatigue and exhaustion (56) turned into exhilaration as she moved through water that was clearer and blue as (57) any she'd swum in before. For a moment at the end, she considered going even farther. Cox knew, however, that the longer she stayed in the water, the

52. F. NO CHANGE
G. she put on weight
H. she gained it so
J. weight

53. Which of the following sequences of sentences makes this paragraph most logical?
A. NO CHANGE
B. 1, 4, 2, 3
C. 3, 1, 4, 2
D. 4, 3, 2, 1

54. F. NO CHANGE
G. a crew made up of
H. with a crew of
J. DELETE the underlined portion.

55. The writer wants to end this paragraph with a physical detail about the swim that emphasizes that Cox was in a harsh environment. Given that all the choices are true, which one best accomplishes the writer's purpose?
A. NO CHANGE
B. Her amazing feat was described in a feature article in *The New Yorker* magazine.
C. Bits of ice brushed against her arms and legs.
D. Photographs of her in her goggles, swim cap, and bathing suit appeared in a national publication.

56. F. NO CHANGE
G. exhaustion
H. exhaustion that left her feeling fatigued
J. exhausting fatigue

57. A. NO CHANGE
B. more blue then
C. bluer than
D. bluer then

longer it would take to bring her body temperature—which fell to 95.5 degrees Fahrenheit by the end of the swim—back to normal. A mile was good
58

enough as Cox closed in on the shore—and her goal—
59

penguins splashed in the water with the great athlete.
60

58. **F.** NO CHANGE
G. back to a normal body temperature.
H. in other words, back to normal.
J. which was normal.

59. **A.** NO CHANGE
B. enough. As
C. enough, as
D. enough,

60. Given that all the choices are true, which one best concludes the essay with an image that emphasizes the location and indicates the completion of Cox's feat?

F. NO CHANGE
G. birds splashed in the water as if to cheer her on toward the goal of the entire expedition.
H. wildlife displayed their natural ability to swim in waters that truly tested Cox's ability to meet her goal.
J. a flock of penguins jumped into the water and joined her for the last thrilling strokes.

PASSAGE V

"All I Can Do Is Take a Picture"

[1]

Ernest C. Withers has been recording history with his camera for more than sixty years. For most of his life, Withers has lived and worked as a photojournalist in Memphis, Tennessee, where he covered newsworthy events, both local and national, over some six decades. [61]

61. The writer is thinking about deleting the phrase "over some six decades" from the preceding sentence (and replacing the comma after the word *national* with a period). Should that phrase be kept or deleted?

A. Kept, because it gives readers some idea of Withers's longevity.
B. Kept, because it helps readers to figure out when Withers began working as a photojournalist.
C. Deleted, because it repeats information presented earlier in the essay.
D. Deleted, because the length of Withers's career is not relevant to the focus of this essay.

As an African American intimately familiar with the geography and people of the South, he was often the first photographer present as historic moments took place. Using his hometown as his base and documenting (62) the key people and events of the world in which he grew up, observed, and learned. (63)

[2]

[1] When (64) his older sister's boyfriend showed no interest in using a camera that she had bought for him, Withers took it to school and photographed his classmates. [2] Years later, while serving as a jeep driver in World War II, he received permission from his company commander to train at the photography school at Camp Sutton, North Carolina. [3] Withers started taking pictures in (65) his youth. [4] In 1946, he left the Army and began working at a job that was (66) a self-employed photographer. [67]

[3]

Withers's profession gave him access to famous people. He has photographed seven of the last eight U.S. presidents and every major civil rights leader since the 1950s. Thus, he is well (68) known and well liked, Withers often traveled with and photographed

62. F. NO CHANGE
G. base. Withers documented
H. base, Withers documented
J. base, documenting

63. Given that all the choices are true, which one provides the most effective and most specific support for the statement made in the preceding sentence?
A. NO CHANGE
B. the Memphis music scene, baseball's Negro Leagues, and the civil rights movement.
C. his world, which have become memorable because of their significance.
D. this place that he thought would be important or newsworthy.

64. Which of the following alternatives to the underlined portion would be LEAST acceptable?
F. Whereas
G. Since
H. As if
J. After

65. A. NO CHANGE
B. with
C. of
D. at

66. F. NO CHANGE
G. for himself as
H. as
J. DELETE the underlined portion.

67. For the sake of the logic and coherence of this paragraph, Sentence 3 should be placed:
A. where it is now.
B. before Sentence 1.
C. after Sentence 1.
D. after Sentence 4.

68. F. NO CHANGE
G. In fact, he is well
H. He is well
J. Well

such historic figures as Martin Luther King Jr., Medgar
69

Evers, and James Meredith. For instance, his photos of
70

Memphis's Beale Street jazz and blues musicians includes
71

the likes of B. B. King, Aretha Franklin, and Elvis Presley.

[4]

In addition to capturing many public personages on film, Withers also photographed: waitresses, church
72

congregations, nightclub audiences, and Little League baseball games. "I can't play a piano, I can't play a guitar, all I can do is take a picture," Withers said in a recent interview. At long last, Ernest C. Withers had recorded
73

some five million photographic images.

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

A. such historical figures as
B. historical figures such as
C. such historic figures
D. historic figures like

70. **F.** NO CHANGE
G. As a result, his
H. However, his
J. His

71. **A.** NO CHANGE
B. does include
C. including
D. include

72. **F.** NO CHANGE
G. photographed waitresses,
H. photographed: waitresses
J. photographed waitresses

73. Which choice best expresses the fact that Withers is still taking photographs at the time this essay was written?

A. NO CHANGE
B. At last count,
C. To sum up,
D. All in all,

Questions 74 and 75 ask about the preceding passage as a whole.

74. Upon reviewing the essay and realizing that some information has been left out, the writer composes the following sentence incorporating that information:

> He immortalized his subjects in the middle of their performances as well as in quiet moments backstage.

This sentence would most logically be placed at the end of Paragraph:

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

75. Suppose the writer's goal had been to write a biographical sketch of a photojournalist that would portray the person in the context of the world he or she photographed. Does this essay successfully accomplish that goal?

A. Yes, because it describes Ernest Withers's career as a photojournalist and relates that career to his hometown of Memphis and the South.
B. Yes, because it explains how Ernest Withers first developed his interest in photography and photojournalism.
C. No, because it fails to make any connection between Ernest Withers and the world that he photographed.
D. No, because it doesn't sufficiently describe Ernest Withers's achievements, honors, and awards.

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. If $m = 4$, $n = -5$, and $p = 9$, what is the value of $mp - mn$?

A. 16
B. 31
C. 41
D. 56
E. 81

2. Vehicle A averages 19 miles per gallon of gasoline, and Vehicle B averages 37 miles per gallon of gasoline. At these rates, how many more gallons of gasoline does Vehicle A need than Vehicle B to make a 1,406-mile trip?

F. 28
G. 36
H. 38
J. 56
K. 74

3. If $\frac{x}{y} = \frac{1}{9}$ and $\frac{y}{z} = \frac{9}{8}$, then $\frac{z}{x} = ?$

A. $\frac{1}{648}$

B. $\frac{1}{8}$

C. $\frac{8}{81}$

D. $\frac{81}{8}$

E. 8

DO YOUR FIGURING HERE.

4. If $12(x-7) = -11$, then $x =$?

F. $-\frac{95}{12}$

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

H. $-\frac{11}{12}$

J. $-\frac{1}{3}$

K. $\frac{73}{12}$

5. The legs of a right triangle measure 18 m and 24 m, respectively. What is the length, in meters, of its hypotenuse?

A. 21
B. 30
C. 42
D. $\sqrt{252}$
E. $\sqrt{432}$

6. In the school cafeteria, students choose their lunch from 4 sandwiches, 2 soups, 2 salads, and 2 drinks. How many different lunches are possible for a student who chooses exactly 1 sandwich, 1 soup, 1 salad, and 1 drink?

F. 2
G. 4
H. 10
J. 16
K. 32

7. What is $\frac{1}{9}$ of 63% of \$6,000 ?

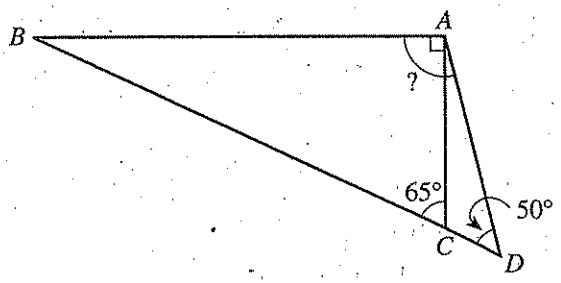
A. \$34,020
B. \$ 4,200
C. \$ 3,402
D. \$ 420
E. \$ 42

8. DMC Electronics Company builds 2 products: a DVD player and a VCR. Employees of the company can build a maximum of 150 DVD players per week and a maximum of 200 VCRs per week. No more than 250 products can be built per week. In the following inequalities, d represents the number of DVD players and v represents the number of VCRs. Which inequality expresses the constraint on the number of products built per week?

F. $d + v \leq 150$
G. $d + v \geq 200$
H. $d + v \leq 200$
J. $d + v \geq 250$
K. $d + v \leq 250$

DO YOUR FIGURING HERE.

9. In the figure below, $\angle ADC$ measures 50°, $\angle ACB$ measures 65°, and $\angle BAC$ measures 90°. What is the measure of $\angle BAD$?



A. 105°
B. 115°
C. 130°
D. 140°
E. 155°

10. Which of the following is equivalent to $(2x + 3)(x - 7)$?

F. $2x^2 - 21$
G. $2x^2 - 11x - 21$
H. $2x^2 + 11x - 21$
J. $2x^2 + 17x - 21$
K. $2x^2 + 17x + 21$

11. A baker has $4\frac{2}{3}$ cups of sugar in her pantry. Each cake she bakes requires $\frac{1}{2}$ cup sugar. Which of the following is the largest number of whole cakes for which she has enough sugar in her pantry?

A. 2
B. 3
C. 8
D. 9
E. 10

12. If $f(x) = 6x^2 + 4x - 11$, then $f(-5) = ?$

F. −181
G. −119
H. 61
J. 119
K. 159

13. Which of the following expressions is equivalent to $-x^2 - x$?

A. $-x(x + 1)$
B. $-x(x - 1)$
C. $-x(1 - x)$
D. $x(x + 1)$
E. $x(x - 1)$

DO YOUR FIGURING HERE.

14. The student body at Julian High School consists of sophomores, juniors, and seniors only. The ratio of sophomores to juniors to seniors on Julian High School's student council is 2:3:4. There are 15 juniors on the student council. How many students are on the entire student council?

F. 21
G. 24
H. 45
J. 60
K. 135

15. The second term of an arithmetic sequence is −14, and the third term is −34. What is the first term?

(Note: In an arithmetic sequence, consecutive terms differ by the same amount.)

A. $\frac{1}{14}$

B. 6

C. 14

D. 20

E. −20

16. Last year, Tom earned an annual salary of $\$S$ from which a total of $\$D$ was deducted for taxes and insurance. The balance was Tom's take-home pay. Tom's take-home pay represents what fraction of his annual salary?

F. $\frac{D}{S}$

G. $\frac{S}{D}$

H. $\frac{D-S}{D}$

J. $\frac{D-S}{S}$

K. $\frac{S-D}{S}$

17. Mara is the timer for a road race. She is 200 feet from the starting gun. Using 1,120 feet per second for the speed of sound, which of the following is closest to how many seconds after the starting gun is fired that Mara will hear the starting gun?

A. 0.1
B. 0.2
C. 0.6
D. 0.9
E. 1.3

DO YOUR FIGURING HERE.

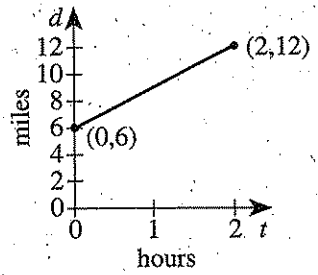
18. What is the slope of the line represented by the equation $6y - 18x = 6$?

F. 1
G. 3
H. 6
J. 18
K. −18

19. At a buffet restaurant, the price for dinner for an adult is \$6.95 and the price for dinner for a child is \$3.95. A group of 8 people went to the restaurant for dinner and paid a total of \$46.60, excluding tax and tip. How many adults were in the group?

A. 2
B. 3
C. 4
D. 5
E. 6

20. The graph below shows the distance, d miles, you are from home t hours following the start of a walk. Which of the following statements accurately describes your walk?



F. You start at home, and after 2 hours are 12 miles from home.
G. You start at home, and after 2 hours are 6 miles from home.
H. You start 12 miles from home, and after 2 hours are home.
J. You start 12 miles from home, and after 2 hours are 6 miles from home.
K. You start 6 miles from home, and after 2 hours are 12 miles from home.

21. In right triangle $\triangle XYZ$ below, $\cos Z = \frac{4}{7}$. Which of the following expressions is equal to $\cos X$?

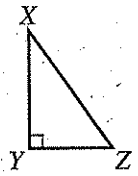
A. $\frac{7}{4}$

B. $\frac{\sqrt{65}}{4}$

C. $\frac{\sqrt{33}}{4}$

D. $\frac{\sqrt{65}}{7}$

E. $\frac{\sqrt{33}}{7}$



DO YOUR FIGURING HERE.

22. For any nonzero value of y, $(y^{-5})^3 = ?$

F. $\frac{1}{y^{15}}$

G. $\frac{1}{y^2}$

H. y^8

J. y^{15}

K. y^{125}

23. The ratio of the side lengths of 2 similar triangles is 3:5. The smaller triangle has sides that measure 5 centimeters, 7 centimeters, and 9 centimeters. What is the perimeter, in centimeters, of the larger triangle?

A. $12\frac{3}{5}$

B. 21

C. 35

D. 63

E. 105

24. Points $R(6,4)$ and $S(-4,5)$ lie in the standard (x,y) coordinate plane. What is the slope of $\overline{RS}$?

F. $-\frac{1}{10}$

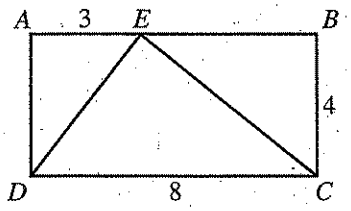
G. $\frac{1}{10}$

H. $-\frac{2}{9}$

J. $\frac{2}{9}$

K. $\frac{9}{2}$

25. In the figure below, E is a point on side $\overline{AB}$ of rectangle $ABCD$. The measures given are in inches. What is the area of $\triangle DEC$, in square inches?



A. 10
B. 12
C. 16
D. 20
E. 32

DO YOUR FIGURING HERE.

Use the following information to answer questions 26–28.

Fran is planning to fence a 10-foot-by-15-foot rectangular plot of ground to use as a garden. She intends to plant a 1-foot-wide border of flowers along the inside of the entire perimeter. The rectangular section surrounded by this border will be planted with vegetables in 11-foot-long rows parallel to the longer sides.

26. What is the minimum number of feet of fence Fran would need to enclose the garden if there will be a 3-foot-wide opening on one side of the plot for people to walk through?

F. 22
G. 25
H. 47
J. 50
K. 150

27. What is the area, in square feet, of the rectangular plot?

A. 50
B. 104
C. 126
D. 146
E. 150

28. When Fran plants the vegetables, she wants the center lines of adjacent rows to be at least 10 inches apart. She also wants the center lines of the outermost rows to be at least 10 inches from the inner edge of the flower border. According to these planting restrictions, what is the maximum number of 11-foot-long rows of vegetables that could be planted within this garden plot?

F. 8
G. 9
H. 10
J. 11
K. 12

---

29. If $|x + 9| = 19$, what are the possible values for x ?

A. −28 and 10
B. −10 and 10
C. −10 and 28
D. −9 and 9
E. 10 and 28

DO YOUR FIGURING HERE.

30. In the standard (x,y) coordinate plane, $M(9,-8)$ is the midpoint of $\overline{TW}$. If W has coordinates $(3,1)$, what are the coordinates of T?

F. $(15, -7)$
G. $(15,-17)$
H. $\left(6, -\frac{7}{2}\right)$
J. $(6, -9)$
K. $(6,-15)$

31. If the circumference of a circle is 96π centimeters, what is the radius of the circle, in centimeters?

A. $\sqrt{96}$
B. 24
C. 48
D. 96
E. 192

32. A rectangular tabletop is 14 inches wide and 48 inches long. Which of the following is closest to the length, in inches, of the diagonal of this tabletop?

F. 34
G. 50
H. 55
J. 62
K. 68

33. Rectangle $ABCD$ has vertices in the standard (x,y) coordinate plane at $A(-4,-2)$, $B(-4,3)$, $C(2,3)$, and $D(2,-2)$. A translation of rectangle $ABCD$ is a second rectangle, $A'B'C'D'$, with vertices $A'(4,-12)$, $B'(x,y)$, $C'(10,-7)$, and $D'(10,-12)$. What are the coordinates of B'?

A. $(3, -6)$
B. $(4, 3)$
C. $(4, -7)$
D. $(4,-13)$
E. $(6, -5)$

34. The solution set for x of the equation $x^2 + nx - 8 = 0$ is $\{-2, 4\}$. What does n equal?

F. -8
G. -6
H. -2
J. 2
K. 6

DO YOUR FIGURING HERE.

Use the following information to answer questions 35–37.

The Dow Jones Industrial Average (DJIA) is an index of stock values. The chart below gives the DJIA closing values from August 24 through September 30 of a certain year and the change in the closing value from the previous day. A minus sign indicates a *decline* (a closing value less than the previous day's closing value). A plus sign indicates an *advance* (a closing value greater than the previous day's closing value).

Dow Jones Industrial Average Closing Values

Date	Closing value	Change	Date	Closing value	Change
8/24	8,600		9/13	7,945	+150
8/25	8,515	−85	9/14	8,020	+75
8/26	8,160	−355	9/15	8,090	+70
8/27	8,050	−110	9/16	7,870	−220
8/30	7,540	−510	9/17	7,895	+25
8/31	7,825	+285	9/20	7,930	+35
9/01	7,780	−45	9/21	7,900	−30
9/02	7,680	−100	9/22	8,150	+250
9/03	7,640	−40	9/23	8,000	−150
9/07	8,020	+380	9/24	8,025	+25
9/08	7,860	−160	9/27	8,110	+85
9/09	8,045	+185	9/28	8,080	−30
9/10	7,795	−250	9/29	7,845	−235
			9/30	7,630	−215

35. Which of the following is closest to the percent of decrease from the August 24 closing value to the September 30 closing value?

A. 7.9%
B. 8.9%
C. 11.3%
D. 12.7%
E. 88.7%

36. The chart shows 4 more declines than advances. All of the following statements are true. Which one best explains why the decline from the August 24 closing value to the September 30 closing value was relatively large?

F. The greatest change in the chart was a decline.
G. The least change in the chart was an advance.
H. The greatest number of consecutive declines was greater than the greatest number of consecutive advances.
J. The first change was a decline.
K. The average of the declines was much greater than the average of the advances.

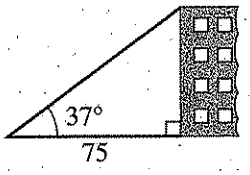
DO YOUR FIGURING HERE.

37. What is the average closing value for the 5-day period from September 13 through September 17 ?

A. 7,895
B. 7,920
C. 7,964
D. 7,980
E. 8,090

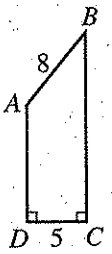
38. The angle of elevation from a point on the ground to the top of a building is 37°, as shown below. The point is 75 feet away from the building. Which of the following is closest to the height, in feet, of the building?

(Note: $\sin 37° \approx 0.602$, $\cos 37° \approx 0.799$, and $\tan 37° \approx 0.754$)



F. 45
G. 57
H. 60
J. 94
K. 125

39. For trapezoid *ABCD* shown below, $AB = 8$ m, $DC = 5$ m, and the perimeter is 39 m. What is the area, in square meters, of *ABCD* ?



A. $32\frac{1}{2}$
B. 52
C. 65
D. 130
E. 260

DO YOUR FIGURING HERE.

40. The average distance from Earth to the Sun, which is 9.3×10^7 miles, is about how many times the average distance from Earth to the Moon, which is 2.4×10^5 miles?

F. 4×10^2
G. 7×10^2
H. 4×10^{12}
J. 1×10^{13}
K. 2×10^{13}

41. Which of the following operations will produce the largest result when substituted for the blank in the expression 35 ____ $\left(-\frac{1}{56}\right)$?

A. Averaged with
B. Minus
C. Plus
D. Divided by
E. Multiplied by

42. A circle in the standard (x,y) coordinate plane has center $(7,-6)$ and radius 10 coordinate units. Which of the following is an equation of the circle?

F. $(x+7)^2 - (y-6)^2 = 100$
G. $(x+7)^2 - (y-6)^2 = 10$
H. $(x+7)^2 + (y-6)^2 = 10$
J. $(x-7)^2 + (y+6)^2 = 100$
K. $(x-7)^2 + (y+6)^2 = 10$

43. In $\triangle XYZ$, $\overline{XY} \cong \overline{XZ}$ and the measure of $\angle Y$ is 22°. What is the measure of $\angle X$?

A. 136°
B. 79°
C. 68°
D. 44°
E. 22°

44. What is the volume, in cubic centimeters, of a cube if the area of 1 square face is 144 square centimeters?

F. 36
G. 1,728
H. 20,736
J. 46,656
K. 373,248

DO YOUR FIGURING HERE.

45. If a number is chosen at random from the set $\{1, 2, 3, 4, \cdots, 12\}$, what is the probability that the chosen number is a factor of 12 ?

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

B. $\frac{5}{12}$

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

D. $\frac{5}{6}$

E. 1

46. Jamal invested \$1,000 on January 1. At the end of 9 months, during which time Jamal made no withdrawals and no other deposits, the investment has earned \$75 in interest. Jamal's \$1,000 investment returned an annual percentage yield closest to which of the following percents?

(Note: Interest can be estimated using $I = Prt$, where I is the amount of interest earned; P is the amount of money initially invested; r is the annual percentage yield that the money returned; and t is the time, in years, the money is invested.)

F. 12%
G. 11%
H. 10%
J. 8%
K. 7%

47. Consider the function $f(x) = 2x^2 + x$. What is the value of $f(f(3))$?

A. 75
B. 168
C. 465
D. 885
E. 903

48. What are the possible values of y such that $xy^2 = 54$, $x < 10$, $y < 10$, and x and y are integers?

F. −3, 3
G. 1, 3
H. 1, 9
J. 3
K. 6

DO YOUR FIGURING HERE.

49. Each side of a quadrilateral is 12 cm long. Which 2 of the following *must* also describe this quadrilateral?

I. Square (sides of equal length and 90° angles)
II. Rhombus (sides of equal length)
III. Rectangle (90° angles)
IV. Parallelogram (opposite sides parallel)

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

50. The points (–2,3) and (0,1) lie on a straight line. What is the slope-intercept equation of the line?

F. $y = 2x - 1$
G. $y = x + 5$
H. $y = x + 1$
J. $y = -x + 1$
K. $y = -2x + 3$

51. Each number on a list containing 100 numbers is divided by 10 to produce a second list containing 100 numbers. Each of the 100 numbers on the second list is decreased by 2 to produce a third list of 100 numbers. The median of the third list is x. Which of the following expressions gives the median of the original list?

A. $\frac{x}{10} - 2$

B. $\frac{x}{10}$

C. $x + 2$

D. $10x + 2$

E. $10(x + 2)$

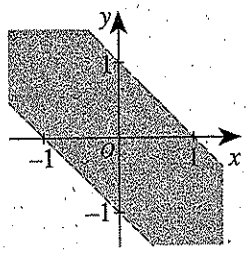
52. Whenever $(x + 4)(x - 3) < 0$, which of the following expressions *always* has a negative value?

F. $x - 5$
G. $x - 2$
H. $x + 5$
J. $2x$
K. $x^2 - 1$

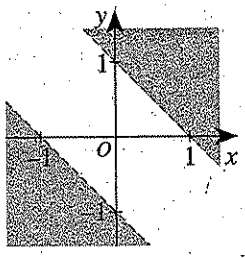
DO YOUR FIGURING HERE.

53. Which of the following graphs in the standard (x,y) coordinate plane represents the solution set of the inequality $|x + y| > 1$?

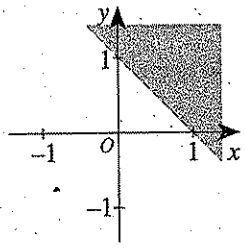
A.



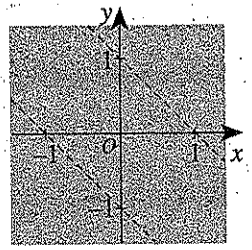
D.



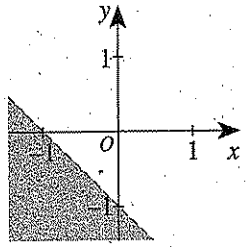
B.



E.



C.



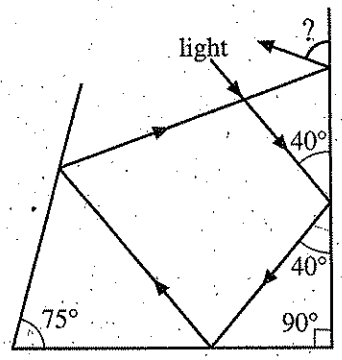
54. The expression $4 \sin x \cos x$ is equivalent to which of the following?

(Note: $\sin(x + y) = \sin x \cos y + \cos x \sin y$)

F. $2 \sin 2x$
G. $2 \cos 2x$
H. $2 \sin 4x$
J. $8 \sin 2x$
K. $8 \cos 2x$

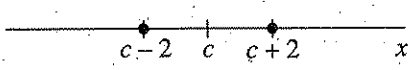
DO YOUR FIGURING HERE.

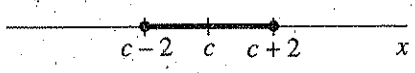
55. The angle at which light strikes a mirror is equal in measure to the angle at which it is reflected. In the hall of the mirrors below, what is the measure of the indicated angle?

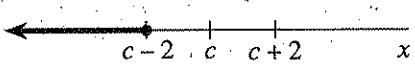


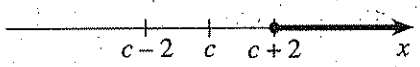
A. 50°
B. 55°
C. 70°
D. 80°
E. 90°

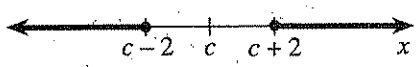
56. Which of the following is the graph of the solution set for $|x - c| \geq 2$?

F.


G.


H.


J.


K.


57. Square $ABCD$ is shown below in the standard (x,y) coordinate plane. The line $y = ax + 2$ divides the square into 2 congruent regions if $a = ?$

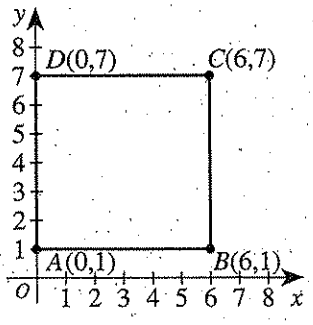
A. $\frac{2}{3}$

B. $\frac{1}{6}$

C. $\frac{5}{6}$

D. $\frac{6}{7}$

E. 1



DO YOUR FIGURING HERE.

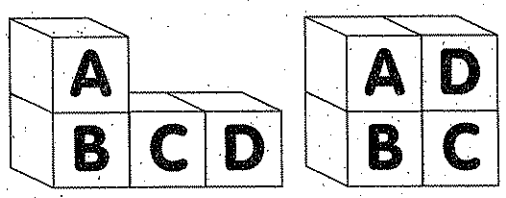
58. If $\log_3 2 = p$ and $\log_3 5 = q$, which of the following expressions is equal to 10 ?

F. 3^{p+q}
G. $3^p + 3^q$
H. 9^{p+q}
J. pq
K. $p + q$

59. The domain of the function $y(x) = 3\cos(5x - 4) + 1$ is all real numbers. Which of the following is the range of the function $y(x)$?

A. $-3 \le y(x) \le 3$
B. $-4 \le y(x) \le 3$
C. $-4 \le y(x) \le 2$
D. $-2 \le y(x) \le 4$
E. All real numbers

60. In the figure below, both solids consist of 4 cubes, each 1 unit on a side. In the solid on the right, the 4 cubes form a rectangular prism that is 2 units long, 1 unit wide, and 2 units high. The solid on the left is the result of moving Cube D from its position above Cube C to beside it so that Cubes B, C, and D form a rectangular prism 3 units long, 1 unit wide, and 1 unit high. To the nearest percent, the total surface area of the solid on the right is what percent less than the total surface area of the solid on the left?



F. 0%
G. 2%
H. 6%
J. 11%
K. 13%

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 *Toning the Sweep* by Angela Johnson (©1993 by Angela Johnson).

The narrator is visiting her grandmother, Ola, to help her prepare to move. Martha is Ola's friend and neighbor.

I think about how everybody Ola knows here has a story. Daddy says that everybody has one and their stories are all a part of us. If Ola loves these people, then they must be a part of me too. It must be true about all of us being a part of one another like Daddy says.

Ola hums on the porch while Mama eats an apple and labels boxes. I go over to the phone by the refrigerator and call Martha. When she picks up, her voice rings out and is so familiar. I tell her Ola's idea about making a movie.

Martha Jackson's hair is the color of coal and she must be about my grandmama's age. She cuts her hair short, and sometimes it sticks straight up, but she doesn't care.

She's probably one of the tallest people I know, and walks like she's swimming. Martha looks at you for a long time before she decides to speak.

She's leaning on a Joshua tree in Ola's front yard, saying, "It's like poetry and eating to me now. You let the camera become part of you. Like your head and your eyes. If the camera were to fall out of your hands, it should be like your head falling off in the middle of a conversation."

"I don't know if the camera can ever be that special to me, Martha," I say. "I just got used to the camera my dad gave me four years ago. I can remember to take off the lens cap sometimes."

Martha smiles. "This is a thing to get used to—that's all. No magic, no special real training. Turn the camera on and shoot."

I take the camera and start taping a crow that's landed on the back porch. I figure it's a start. The crow gets real interested in me filming him and stops pecking at the old apple core he's found near the garbage cans. He hops off the porch and checks me and the camera out till he sees something else off over by some brush.

Martha's watching me with a smirk when I turn back to her with the camera. "I guess you'll do okay by yourself now." She looks at me for a long time, then says, "Let's talk about Ola."

I start shooting and say to myself, "A part of me," and hope that the thing is going and the lens cap hasn't been on the whole time I've been taping the crow. I zoom in on Martha leaning against the Joshua tree. She stares into the camera.

"I met Ola in the late summer of 1964 'cause there was no other way around it."

A pot falls in the kitchen, and we can hear Ola laughing—then she stops. I keep the camera running.

"Like I was saying," Martha starts to whisper, but changes her mind and speaks even louder. "I couldn't help but meet her. There's about five hundred people that live out here, and she happens to be my closest neighbor. She was playing her music loud one night, and I was sitting out in my yard."

Ola comes out the screen door and sits down by Martha Jackson. Two people couldn't be more different in looks. I have them both in the frame.

Ola's short and delicate—like she'd break if you held her arm too tight. She wouldn't break, though. She hands Martha a glass of iced tea and sits cross-legged on the ground.

I press the pause button, then change my mind. I sit down on a lawn chair and ask, "What did you two think of each other when you first met?" It's easier to ask what I'd usually think of as a nosy question from behind a camera.

Martha whispers, "I thought she had the worst accent of anybody that I'd ever heard. It grew on me, though, and I got used to it. I liked her car and the way the fool painted the house yellow the day after she and Diane moved in."

Ola spills a little iced tea and says, "No, you didn't. You yelled from the road that this shade of yellow didn't look good from where you stood, and what was it called?" Ola looks at the camera and tells me, "Your mama was so embarrassed, Emmie, she begged me to stop painting it yellow and just make it gray or something. Your mama always took things so much to heart."

"What did you say to Martha then?"

"I told her I didn't know who she was, but if she had enough energy to yell from the road at a perfect stranger, she probably had enough strength to pick up a brush."

Martha tilts her head back and laughs. "So I did."

Ola gets up and goes into the house without making a sound. I don't think that Martha even knows she's gone, 'cause her eyes are closed.

I want to make this movie on my own. Martha makes me want to know all of Ola's friends. I want to know who they are and what they've done. I'll put them all in front of the camera, and when the movie's done, it can be my gift to Ola. The other gifts I've given her are things she could put on the wall or wear. I figure this will be better than all that. I'll give her memories of her people.

1. Based on the passage, Ola and Martha can reasonably be said to share all of the following traits EXCEPT a:
   - **A.** sense of humor.
   - **B.** capacity for brutal honesty.
   - **C.** great vitality and liveliness.
   - **D.** tendency to pause before speaking.

2. Which of the following statements does the passage support regarding the idea for the movie?
   - **F.** Though the original idea was Ola's, the narrator and Martha embraced it.
   - **G.** Although the narrator came up with the idea, she needed Martha's encouragement to continue.
   - **H.** Ola proposed the idea to Martha, who recruited the narrator to make the movie.
   - **J.** The narrator suggested the idea to Ola, who had to be talked into it by Martha.

3. The narrator's two references to a camera's lens cap (lines 27 and 42) primarily serve to suggest her:
   - **A.** expanding knowledge of camera terminology.
   - **B.** continuing desire to uncover her artistic vision.
   - **C.** ongoing insecurity about her skill with a camera.
   - **D.** growing eagerness to use a camera to tell stories.

4. Viewed in the context of the passage, Martha's smirk (line 37) most likely reflects a feeling of:
   - **F.** mild weariness.
   - **G.** sharp condescension.
   - **H.** profound relief.
   - **J.** slight amusement.

5. As presented by the participants, the initial meeting between Ola and Martha can best be described as:
   - **A.** a misunderstanding that escalates into harsh words until the two agree to keep their distance from each other.
   - **B.** a potentially bitter confrontation that, because of the personalities of the two people, turns into a cooperative effort.
   - **C.** a friendly, relaxed get-together between two families made even more enjoyable by music and a shared task.
   - **D.** an accidental encounter that slowly turns unpleasant due to a dispute that Ola's daughter helps resolve.

6. Martha clearly recommends that the narrator use a camera in which of the following ways?
   - **F.** Scientifically
   - **G.** Cautiously
   - **H.** Intuitively
   - **J.** Secretly

7. It can most reasonably be inferred that Diane is the name of:
   - **A.** the narrator.
   - **B.** the narrator's mother.
   - **C.** one of Ola's neighbors.
   - **D.** one of Martha's best friends.

8. In terms of the development of the narrator as a character, the last paragraph primarily serves to:
   - **F.** establish motivation for her actions.
   - **G.** provide background details about her past.
   - **H.** elaborate on her relationship with Martha.
   - **J.** undermine the reliability of her account.

9. In the first paragraph, the main conclusion the narrator reaches is that:
   - **A.** Daddy is usually right in his assessments of people.
   - **B.** Ola is a wonderful storyteller who entertains everyone she knows.
   - **C.** Ola shares a close bond with her neighbors.
   - **D.** people everywhere are connected to each other by stories and love.

10. The narrator's statement "She wouldn't break, though" (line 60) most nearly means that in the narrator's opinion, Ola is:
   - **F.** too stubborn to change her opinions very often.
   - **G.** too guarded to show her feelings.
   - **H.** stronger than she appears to be.
   - **J.** more active than many people half her age.

Passage II

SOCIAL SCIENCE: This passage is adapted from the article "The Trouble with Fries" by Malcolm Gladwell (©2001 by The Condé Nast Publications Inc.).

It is entirely possible, right now, to make a delicious French fry that does not carry with it a death sentence. A French fry can be much more than a delivery vehicle for fat.

Is it really that simple, though? Consider the cautionary tale of the efforts of a group of food scientists at Auburn University more than a decade ago to come up with a better hamburger. The Auburn team wanted to create a leaner beef that tasted as good as regular ground beef. They couldn't just remove the fat, because that would leave the meat dry and mealy. They wanted to replace the fat. The goal of the Auburn scientists was to cut about two-thirds of the fat from normal ground beef, which meant that they needed to find something to add to the beef that would hold an equivalent amount of water—and continue to retain that water even as the beef was being grilled. Their choice? Seaweed, or, more precisely, carrageenan. They also selected some basic flavor enhancers, designed to make up for the lost fat "taste." The result was a beef patty that was roughly three-quarters water, twenty per cent protein, five per cent or so fat, and a quarter of a per cent seaweed. They called it AU Lean.

It didn't take the Auburn scientists long to realize that they had created something special. They began doing blind taste comparisons of AU Lean burgers and traditional twenty-per-cent-fat burgers. Time after time, the AU Lean burgers won. Next, they took their invention into the field. They recruited a hundred families and supplied them with three kinds of ground beef for home cooking over consecutive three-week intervals—regular "market" ground beef with twenty per cent fat, ground beef with five per cent fat, and AU Lean. The families were asked to rate the different kinds of beef, without knowing which was which. Again, the AU Lean won hands down.

What the Auburn team showed was that, even though people love the taste and feel of fat—and naturally gravitate toward high-fat food—they can be fooled into thinking there is a lot of fat in something when there isn't. When the group tried to lower the fat in AU Lean below five per cent, people didn't like it anymore. But, within the relatively broad range of between five and twenty-five per cent, you can add water and some flavoring and most people can't tell the difference.

What's more, people appear to be more sensitive to the volume of food they consume than to its calorie content. Barbara Rolls, a nutritionist at Penn State, has demonstrated this principle with satiety studies. She feeds one group of people a high-volume snack and another group a low-volume snack. Even though the two snacks have the same calorie count, she finds that people who eat the high-volume snack feel more satisfied. Eating AU Lean, in short, isn't going to leave you with a craving for more calories; you'll feel just as full.

For anyone looking to improve the quality of fast food, all this is heartening news. It means that you should be able to put low-fat cheese and low-fat mayonnaise in a fast-food hamburger without anyone's complaining. It also means that there's no particular reason to use twenty-per-cent-fat ground beef in a fast-food burger. In 1990, using just this argument, the Auburn team suggested to McDonald's that it make a hamburger out of AU Lean. Shortly thereafter, McDonald's came out with the McLean Deluxe. Other fast-food houses scrambled to follow suit. Nutritionists were delighted. And fast food appeared on the verge of a revolution.

Only, it wasn't. The McLean was a flop, and four years later it was off the market. What happened? Part of the problem appears to have been that McDonald's rushed the burger to market before many of the production kinks had been worked out. More important, though, was the psychological handicap the burger faced. People liked AU Lean in blind taste tests because they didn't know it was AU Lean; they were fooled into thinking it was regular ground beef. But nobody was fooled when it came to the McLean Deluxe. It was sold as the healthy choice—and who goes to McDonald's for health food?

This is sobering news for those interested in improving the American diet. For years, the nutrition movement in this country has made transparency one of its principal goals: it has assumed that the best way to help people improve their diets is to tell them precisely what's in their food, to label certain foods good and certain foods bad. But transparency can backfire, because sometimes nothing is more deadly for our taste buds than the knowledge that what we are eating is good for us.

11. The author most nearly portrays the Auburn scientists as:

A. severe critics of the fast-food industry's practices.
B. enthusiastic promoters of their promising work.
C. diligent researchers uninterested in the practical application of their work.
D. clever innovators more interested in nutrition than in how food tastes.

12. It can reasonably be inferred from the passage that changing which of the following conditions of the experiment described in lines 28–36 would have had the biggest effect on the outcome?
    - F. Altering the order in which the families received the three kinds of ground beef
    - G. Using two hundred families instead of one hundred in the study
    - H. Telling the families which kind of ground beef they were getting each time
    - J. Lengthening the time the families used each type of ground beef

13. The statement in lines 61–63 most likely represents the view of all of the following groups EXCEPT:
    - A. McDonald's officials introducing the McLean Deluxe to the public.
    - B. the Auburn scientists, who had research to support these conclusions.
    - C. nutritionists who saw the potential health benefits of AU Lean.
    - D. fast-food company executives at the time this article was published.

14. According to the passage, carrageenan's role in AU Lean was as a:
    - F. flavor enhancer.
    - G. substitute for fat.
    - H. source of protein.
    - J. replacement for seaweed.

15. The author implies that for an AU Lean hamburger to seem as satisfying as a hamburger made from regular ground beef, the most important factor would be keeping which of the following the same?
    - A. Volume
    - B. Calorie content
    - C. Percent of fat
    - D. Method of cooking

16. The author indicates that the main cause of the failure of the McLean Deluxe was that:
    - F. McDonald's failed to promote it through advertising.
    - G. it was rushed to market before production problems were solved.
    - H. people believed that it was made from "market" hamburger.
    - J. people knew that it was supposed to be good for them.

17. The author most likely intends the question in lines 80–81 to be read:
    - A. rhetorically; he believes the answer is self-evident and negative.
    - B. ironically; he finds it surprising that people really wanted the healthy choice.
    - C. genuinely; he is unsure about whether people enjoy healthy fast food.
    - D. critically; he objects to fast-food restaurants selling AU Lean.

18. It can reasonably be inferred from the last paragraph that the author thinks that, in the future, the nutrition movement should:
    - F. make its goals more transparent.
    - G. reconsider its goal of transparency.
    - H. label foods as either good or bad.
    - J. tell people exactly what is in their food.

19. According to the passage, which of the following elements makes up the highest percent of AU Lean?
    - A. Fat
    - B. Seaweed
    - C. Water
    - D. Protein

20. According to information in the fourth paragraph (lines 37–46), which of the following comparisons between a 20-percent-fat hamburger and an 8-percent-fat hamburger with added water and flavorings would most people make?
    - F. The 20-percent-fat hamburger would taste slightly better.
    - G. The 8-percent-fat hamburger would taste slightly better.
    - H. The 8-percent-fat hamburger would taste significantly better.
    - J. The two hamburgers would taste the same.

Passage III

HUMANITIES: This passage is adapted from *The Piano Shop on the Left Bank* by Thad Carhart (©2001 by Thad Carhart).

No one knows exactly when the piano was invented. The generally accepted date is around 1700. There is little doubt, however, about its inventor, an instrument maker in Florence, Italy, named Bartolomeo Cristofori, who developed a way of making a struck string resound loudly. Before Cristofori, keyboard instruments were unsatisfactory for different reasons: clavichords, whose strings are struck, were small and delicate, and their greatly reduced volume made them suitable only for small gatherings. Harpsichords, while larger and therefore considerably louder, had one overriding limitation: since the string is plucked, the force with which the key is depressed is unrelated to the volume of the sound produced. Dynamic control of each note was not possible.

What was needed—and what Cristofori invented—was an instrument as large and robust as the big harpsichords that would also allow the dynamic range that before had only been available on the flimsy clavichords. The first piano was described by a contemporary musician in 1711 as a "*gravicembalo col piano e forte*," a "harpsichord with soft and loud." This was the essential breakthrough, but it took decades for the seed to find fertile ground, and it did so not in Italy but in eighteenth-century Germany.

German instrument makers incorporated Cristofori's breakthrough into a series of increasingly powerful keyboard instruments that were true pianos. Johann Sebastian Bach was impressed by the first piano he tried, but he pointed out limitations that still needed to be worked on: a heavy action and a treble that was not loud enough. Two of his sons, Carl Philipp Emanuel and Johann Christian, championed the instrument in the next generation; by the time Johann Christian Bach gave England's first solo piano performance in 1768, the triumph of this new keyboard instrument over the harpsichord was assured.

The role of the keyboard as a solo instrument came to the fore musically. It was no longer just another part of the ensemble, and its unique volume freed it from the confines of the drawing room to which the harpsichord had almost always been consigned. Haydn and Mozart both wrote masterful sonatas for the new instrument, its keyboard was greatly expanded, and its dynamic range—the single feature that most distinguished it from the harpsichord—was exploited fully. A whole new technique stressing fluidity was developed for the piano, and Mozart wrote: "It should flow like oil." Solo concerts became the norm rather than the exception, and a class of instrumentalists with technique and power arrived on the scene.

What had been a tinkerer's offshoot among harpsichord makers became an industry in its own right. London and Vienna were its focal points. The two capitals gave rise to distinct schools of piano building, the principal difference having to do with how the action—the intricate mechanism that activates the hammers to strike the strings—was conceived and assembled. Viennese pianos were generally softer, with a refined singing tone that allowed the melody to come to the fore; the pianos themselves had delicate cabinetry. English pianos, on the other hand, had a more robust tone, with a stronger action and greater tension in the strings; they had solid cases and sturdy frames. The great Viennese composers of the classical era—Haydn, Mozart, Beethoven—played Viennese pianos, but the transition to the stronger instruments of the English school can be seen in Beethoven's last piano sonatas.

Beethoven was known for the increasing dynamic contrasts in his works for piano, from whisper to thunder, and he sometimes destroyed the fragile Viennese pianos when playing his music. He had a strong influence on the direction of piano manufacture, and as early as 1796 he expressed his frustration with the overly delicate styles of playing that were a holdover from harpsichords.

In 1818, Broadwood, the pre-eminent English manufacturer of the day, offered him a grand piano that incorporated all of the latest features: stronger case and frame, trichord stringing, more responsive action. This piano, too, Beethoven damaged with the fervor of his playing (a contemporary reported that "the broken strings were jumbled up like a thorn bush in a storm"), but he remained attached to it until his death in 1827. He imagined music unlike anything his contemporaries were writing; the *Hammerklavier* sonata from this period still strikes many as a revelation of the piano's extreme limits of power and expressiveness.

21. Which of the following statements best describes how the second paragraph (lines 16–25) functions in relation to the first paragraph?

- **A.** It moves further back in time to provide background for the circumstances described in the first paragraph.
- **B.** It focuses on the general public's reaction to the developments described in the first paragraph.
- **C.** It provides the other side of the argument presented in the first paragraph.
- **D.** It describes the solution to the problem presented in the first paragraph.

22. Which of the following questions is NOT answered by the passage?

- **F.** Who invented the piano?
- **G.** What were keyboard instruments like before 1700?
- **H.** What are the beginning and ending dates of the classical era?
- **J.** What is *action* as it relates to keyboard instruments?

23. Based on the passage, the author would most likely agree that both Beethoven and Cristofori were:
   A. tremendous innovators in ways that dramatically affected the music world.
   B. world-class musicians who gained recognition in their time.
   C. contributors to the advancement of the piano who were appreciated only after their deaths.
   D. musicians who found more fame outside their native countries than inside.

24. For purposes of the passage, the significance of eighteenth-century Germany is that it was there:
   F. Cristofori had his breakthrough.
   G. instrument makers improved upon ideas of piano making that had originated in Italy.
   H. the best harpsichords and clavichords were originally produced.
   J. the first major split occurred among piano makers over the best way to design keyboards.

25. As it is used in line 27, the phrase *Cristofori's breakthrough* most nearly refers to the:
   A. instrument maker's decision to let leading musicians initiate changes to standard piano design.
   B. creation of pianos whose strings could be plucked loudly or softly, depending on the effect desired.
   C. piano's release from the confines of the drawing room to larger performance spaces.
   D. development of a keyboard instrument that offered the dynamic range of the clavichord and the loudness of the harpsichord.

26. It can most reasonably be inferred from the passage that which of the following was a direct expression of others' deep respect for Beethoven?
   F. The grand piano manufactured by Broadwood whose strings the composer damaged
   G. The way Viennese pianos were built before the classical era
   H. The sonatas written and performed by Haydn and Mozart
   J. The piano schools established in London and Vienna

27. As it is used in line 88, the phrase *extreme limits* most nearly means:
   A. harsh rules.
   B. far reaches.
   C. high notes.
   D. drastic shortcomings.

28. According to the passage, Johann Sebastian Bach's reaction to the first piano he played was:
   F. disapproval of its loudness, accompanied by appreciation of its fluidity.
   G. mild irritation over the singing quality of the notes.
   H. genuine respect, accompanied by observations about problems.
   J. amusement that the fervor of his playing damaged the strings.

29. According to the passage, the piano was better suited than the harpsichord to:
   A. solo performances.
   B. drawing room concerts.
   C. delicate cabinetry.
   D. church music.

30. According to the passage, the *Hammerklavier* sonata is a composition by Beethoven that:
   F. sounds as dramatic on the clavichord as on the piano.
   G. reveals the composer's remarkable awareness and use of the piano's full capacities.
   H. gained more favor in England than in Vienna until Vienna imported English pianos.
   J. first inspired Mozart to compose for piano.

Passage IV

NATURAL SCIENCE: This passage is adapted from *Great Waters: An Atlantic Passage* by Deborah Cramer (©2001 by Deborah Cramer).

Relative newcomers to the marine world, bluefin tuna and swordfish have evolved into some of the sea's most highly developed fishes. While the cod, haddock, flounder, and plaice who dwell year-round in the North Sea and the Gulf of Mexico are cold-blooded, their body temperatures rising and falling in synchrony with the surrounding water, thus limiting their geographic range, swordfish and bluefin, exquisitely adapted to live in the vastness of the sea, are free from the boundaries imposed by temperature. The swordfish who surface at the shelf edge have swum up from the depths, rising hundreds of feet through the water each evening as the sun sets, following their prey of fish and squid. A temperature difference of 36 degrees Fahrenheit, as great as the swing between winter and summer, night and day, separates cold deep from warm surface. Swordfish exit one realm and swim into the other in under an hour.

Moving between such extremes would stun the nervous system of a cold-blooded fish, but these ocean princes make their own heat, warming themselves in the deep cold. The burner of the swordfish lies behind its eyes, below its brain, a dark mass of tissue surrounded by insulating fat, heavy with blood, and loaded with energy-producing mitochondria. With warm brain and eyes, swordfish can chase their food in waters deep and shallow, near and distant. By night, they feed at the surface, at the edge of the deep water. By day, they move onto shallow banks, like Georges or the Grand Banks, and dive down to feed, slashing through schools of menhaden and mackerel with their long, sharp swords.

Bluefin tuna thrive in waters as cold as 40 degrees Fahrenheit and as warm as 75 degrees Fahrenheit but unlike swordfish, they do not possess organs whose chief function is to produce heat. Instead they retain the heat they generate swimming. Other bony fish quickly lose their heat to the sea, for their red muscle lies near their skin, close to the cold water. In bluefin, who can weigh as much as 1,000 pounds, red muscles are housed deep within the body, near the backbone. Warm venous blood flowing away from muscles heats cold blood coming in through the arteries, enabling bluefin to retain 98 percent of their body heat, giving them free rein to forage in cold waters and to dip in and out of the Gulf Stream, where sea temperatures plummet as much as 27 degrees Fahrenheit across one nautical mile. In cold water, the bluefin, separated from the chill by only a taut skin, maintains an internal temperature of 80 degrees Fahrenheit.

Coincident with the relocation of its red muscle, bluefin developed the unique style of swimming for which they are so aptly named (*Thunnus thynnus*, from the Greek meaning to dart or lunge forward). While the bodies of other fish undulate through the water as they swim, the crescent-shaped tail of the bluefin propels its rigid body forward. Retractable fins, small scales, and recessed eyes further enable bluefin to thrust quickly through thick and heavy seas, easily overcoming water's drag and resistance. With their warm bodies, rapid metabolism, and sleek design, bluefin excel at both short sprints and long-distance travel. They zoom in on prey in short, quick bursts of speed, and they can cruise at two body lengths per second, easily making long-distance endurance swims along an entire ocean basin. Engineers who design underwater robotics dream of replicating the sleek body of this 8-foot-long, 700-pound fish who rushes without ceasing through the breadth and depth of the sea.

Swordfish and bluefin travel throughout the Atlantic with tremendous speed, but from moment to moment, day to day, month to month, their migrations are not well charted. In the winter of 1997, when the warm Gulf Stream edged shoreward toward the coast of Cape Hatteras, pressing against cold water rushing south in the Labrador Current, giant bluefin gathered in the warmth along the boundary. The following year, when the Gulf Stream moved offshore and the chilly Labrador Current filled the waters of coastal Cape Hatteras, bluefin wintered in waters unknown to people. Some bluefin, fattened in American coastal waters during the summer and fall, follow the currents across the sea during the winter. How they navigate, no one really knows. They could be guided by internal compasses of magnetite chips embedded in their skulls, by the warmth, salinity, or motion of the current, by patterns of polarized light received by the pineal window in their heads, or by prey leaving their scent as an oily, odorous slick in the water.

31. The main purpose of the passage is to:

- **A.** propose that research be conducted to confirm which navigational method swordfish and bluefin actually use.
- **B.** persuade the reader that swordfish are superior to bluefin in their adaptation to ocean life.
- **C.** speculate on the reasons why two fish have developed certain specialized traits.
- **D.** describe two fishes' adaptations to the ocean environment, including specialized traits and physical features.

32. The author's attitude regarding swordfish and bluefin can best be described as one of:

- **F.** appreciation for the advanced, unique abilities of the two fish.
- **G.** concern that their adaptations put other fish at a disadvantage.
- **H.** confusion over how their adaptations evolved so quickly beyond other fish.
- **J.** neutrality when comparing their abilities to those of other fish.

33. The passage indicates that the body temperature of a cold-blooded fish is primarily determined by the:

A. limits of its geographic range.
B. speed at which it swims.
C. type of prey it consumes.
D. temperature of its surrounding water.

34. According to the passage, the most significant difference between the temperature-regulation systems of swordfish and bluefin is that swordfish:

F. generate heat from a specialized organ, while bluefin retain heat generated from swimming.
G. have a heat-producing organ located behind their eyes, while the bluefin's is near its backbone.
H. retain heat generated by mitochondria, while bluefin retain heat generated by ocean currents.
J. retain most of the heat they generate, while bluefin lose most of the heat they generate.

35. It can reasonably be concluded from the passage that the body of a bluefin remaining rigid while swimming is related to the fact that its red muscles are:

A. moved sparingly in order to conserve body heat.
B. frozen stiff from the icy-cold water of the ocean.
C. restricted from movement by its super-tight skin.
D. located deep within its body near the backbone.

36. It can most reasonably be inferred from the passage that the waters in and near the Gulf Stream pose a challenge to most species of fish primarily because these waters:

F. are home to a large number and variety of predators.
G. represent a wide range of temperatures.
H. contain strong and swirling currents.
J. force fish into unfamiliar ocean regions.

37. According to the passage, the Greek-derived name for bluefin refers to the:

A. bluefin's constant internal temperature.
B. powerful crescent-shaped tail of the bluefin.
C. bluefin's lunging swimming style.
D. sound the bluefin produces while swimming.

38. The main purpose of the last paragraph is to:

F. explain that charting the Gulf Stream would help accurately predict the migration patterns of swordfish and bluefin.
G. highlight the fact that researchers do not yet fully understand the migrations of swordfish and bluefin.
H. reiterate that the territory of swordfish and bluefin is the entire Atlantic Ocean.
J. remind the reader of the speed and depth at which swordfish and bluefin travel.

39. The passage supports the idea that all of the following fish dwell in the North Sea and the Gulf of Mexico year round EXCEPT:

A. cod.
B. haddock.
C. plaice.
D. bluefin.

40. According to the passage, the heat a swordfish generates is primarily intended to:

F. attract cold-blooded prey seeking warmth.
G. maintain the warmth of its eyes and brain.
H. increase its speed by keeping large muscles warm.
J. strengthen its long, sharp sword with warm blood.

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

Figure 1 adapted from Susan Offner, "Human Chromosomes." ©1992 by Susan Offner.

Diploid human cells contain 46 chromosomes. Genes residing on the same chromosome are *linked*. Figure 1 shows the location of some genes in humans.

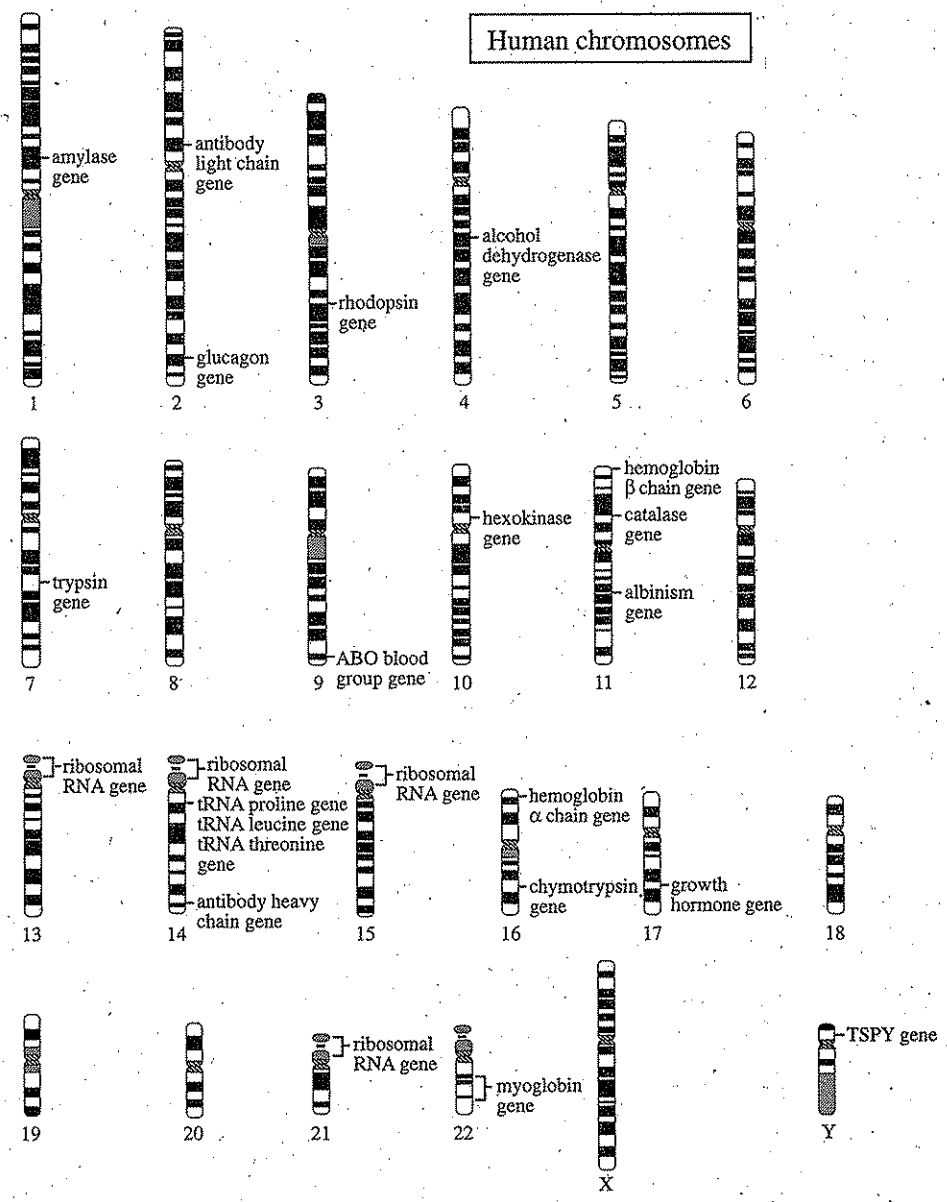


Figure 1

Table 1 lists the biological process associated with some of the genes in Figure 1.

Table 1	
Biological process	Gene
Digestion	amylase gene trypsin gene chymotrypsin gene
Immune response	antibody light chain gene antibody heavy chain gene
Respiration	hemoglobin α chain gene hemoglobin β chain gene myoglobin gene
Protein synthesis	ribosomal RNA gene tRNA proline gene tRNA leucine gene tRNA threonine gene

Table 2 lists 7 genetic diseases, the chromosome associated with each disease, and the mode of inheritance for each disease.

Table 2		
Genetic disease	Chromosome	Mode of inheritance
Tay-Sachs disease	15	autosomal recessive
Neurofibromatosis	17	autosomal dominant
Familial hypercholesterolemia	19	autosomal dominant
Duchenne muscular dystrophy	X	X-linked recessive
Incontinentia pigmenti	X	X-linked dominant
Red-green color blindness	X	X-linked recessive
Hemophilia A	X	X-linked recessive

1. According to Figure 1 and Table 1, Chromosome 13 contains a gene associated with which of the following biological activities?
   - **A.** Digestion
   - **B.** Immune response
   - **C.** Respiration
   - **D.** Protein synthesis

2. Is the statement "The tRNA proline gene is linked to the hexokinase gene" supported by the information in Figure 1 ?
   - **F.** No; the 2 genes are found on the same chromosome.
   - **G.** No; the 2 genes are found on different chromosomes.
   - **H.** Yes; the 2 genes are found on the same chromosome.
   - **J.** Yes; the 2 genes are found on different chromosomes.

3. Table 1 lists 3 genes as being associated with digestion. According to Figure 1, these 3 genes are:
   - **A.** on different chromosomes.
   - **B.** on the same chromosome.
   - **C.** linked to genes associated with immune response.
   - **D.** linked to genes associated with respiration.

4. Based on the information presented, which of the following genes is linked to the neurofibromatosis gene?
   - **F.** Amylase gene
   - **G.** Growth hormone gene
   - **H.** Myoglobin gene
   - **J.** Rhodopsin gene

5. Based on the information presented, which of the following genes is typically present in human males, but not in human females?
   - **A.** Amylase gene
   - **B.** Hexokinase gene
   - **C.** Ribosomal RNA gene
   - **D.** TSPY gene

Passage II

G. soja (a wild soybean) produces *γ-tocopherol* (a type of vitamin E). It then converts some γ-tocopherol into *α-tocopherol* (another type of vitamin E). In *G. soja*, the enzyme *TMT* catalyzes this reaction:

$$\gamma\text{-tocopherol} \xrightarrow{\text{TMT}} \alpha\text{-tocopherol}$$

A. thaliana (a mustard plant) produces γ-tocopherol, but lacks TMT, so it produces only a small amount of α-tocopherol.

Because α-tocopherol is more effective at reducing cellular damage than is γ-tocopherol, a scientist tried to transfer *G. soja*'s TMT gene into *A. thaliana*.

Experiment 1

Four versions of *G. soja*'s TMT gene (TMT1–TMT4) were cloned. Each gene was incorporated into a *vector* (a biological structure that carries a gene and transfers it into the cells of an organism).

Six genetically identical lines of *A. thaliana* were developed (L1–L6). As shown in Table 1, L1–L4 were each exposed to a vector carrying 1 of the 4 cloned genes; L5 was exposed only to the vector; and L6 was left untreated.

Next, 10 plants from each line were grown. Table 1 gives the tocopherol concentration and the percent (%) by mass of the 2 types of tocopherol in the plants.

Experiment 2

Four genetically different strains of *A. thaliana* were grown (S1–S4). S1–S4 were each exposed to a vector carrying TMT1.

Next, 10 plants from each strain were grown. Table 2 shows the tocopherol concentration and the percent by mass of the 2 types of tocopherol in the plants.

Table 1

Line	Treatment	Tocopherol concentration (mg/kg)	γ-tocopherol (%)	α-tocopherol (%)
L1	vector + TMT1	360	3	97
L2	vector + TMT2	360	3	97
L3	vector + TMT3	360	51	49
L4	vector + TMT4	360	2	98
L5	vector	360	99	1
L6	untreated	360	99	1

Table 2

Strain	Treatment	Tocopherol concentration (mg/kg)	γ-tocopherol (%)	α-tocopherol (%)
S1	vector + TMT1	390	1	99
S2	vector + TMT1	360	3	97
S3	vector + TMT1	320	9	91
S4	vector + TMT1	310	99	1

Tables adapted from D. Shintani and D. DellaPenna, "Elevating the Vitamin E Content of Plants Through Metabolic Engineering." ©1998 by the American Association for the Advancement of Science.

6. At the end of Experiment 2, which of the 4 strains had the greatest amount of γ-tocopherol per kilogram of plant material?

   F. S1
   G. S2
   H. S3
   J. S4

7. One of the *A. thaliana* strains used in Experiment 2 was genetically identical to the *A. thaliana* used in Experiment 1. Based on the results of Experiments 1 and 2, this strain was most likely:

   A. S1.
   B. S2.
   C. S3.
   D. S4.

8. To determine whether exposure to the vector alone affected tocopherol concentration in Experiment 1, one should compare the results from which 2 lines?

   F. L1 and L2
   G. L2 and L4
   H. L3 and L4
   J. L5 and L6

9. The scientist believed that 1 of the 4 cloned genes in Experiment 1 produced an enzyme that was less efficient than the enzyme produced by the other 3 genes. Based on the results, this gene was most likely:

   A. TMT1.
   B. TMT2.
   C. TMT3.
   D. TMT4.

10. After reviewing the data from Experiment 2, the scientist concluded that the transfer of the TMT gene to 1 of the strains was unsuccessful. This strain was most likely:

    F. S1.
    G. S2.
    H. S3.
    J. S4.

11. Which of the following best explains why the scientist wanted to transfer the TMT gene from one organism to another?

    A. To increase the amount of α-tocopherol produced by some of the *G. soja* plants
    B. To increase the amount of α-tocopherol produced by some of the *A. thaliana* plants
    C. To decrease the amount of α-tocopherol produced by some of the *G. soja* plants
    D. To decrease the amount of α-tocopherol produced by some of the *A. thaliana* plants

Passage III

An elevated inclined plane makes an angle, θ, with a floor. Points A and B on the inclined plane are 0.50 m apart. Point B is at a height H above the floor (see Figure 1).

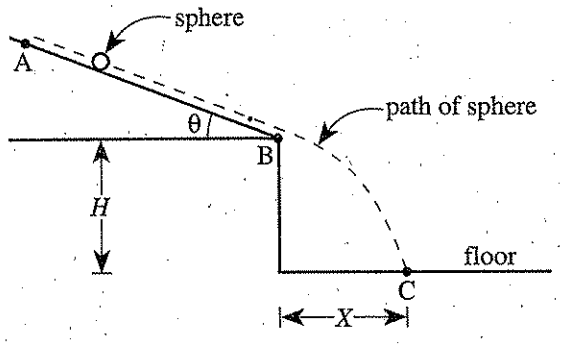


Figure 1

A solid metal sphere is released from rest at Point A and travels down the inclined plane to Point B. The sphere is in free fall between Points B and C and first hits the floor at Point C, a horizontal distance X from the bottom of the inclined plane.

Figure 2 shows how X varies with θ for different H if the sphere *rolls* from Point A to Point B. Figure 3 shows how X varies with θ for different H if the sphere *slides* from Point A to Point B.

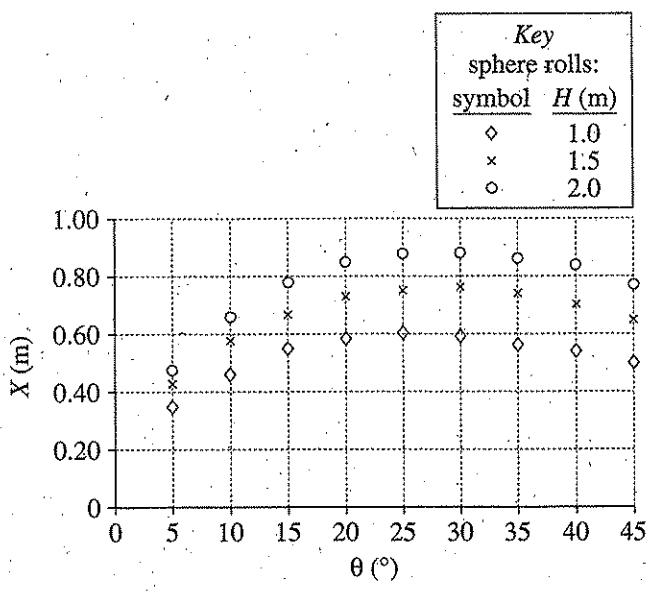


Figure 2

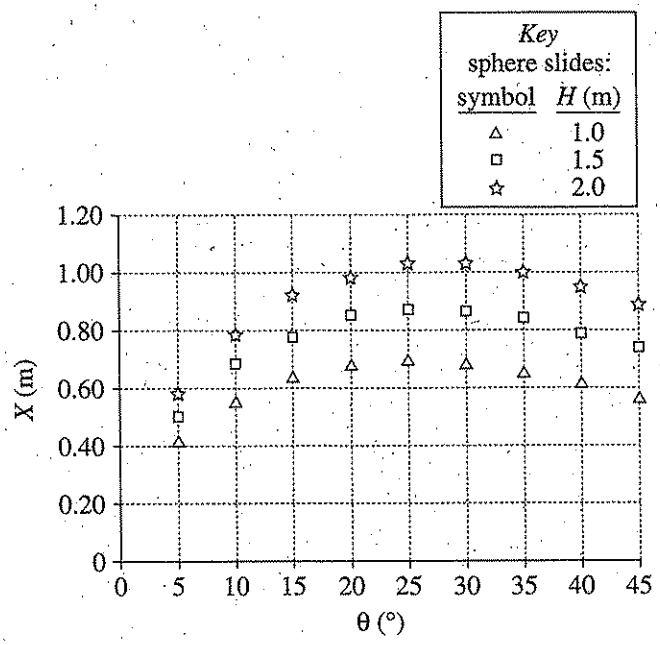


Figure 3

12. Based on Figures 2 and 3, for the sphere either sliding or rolling down the inclined plane and for $H = 1.5$ m, as θ increases from 5° to 45°, X :

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

13. For the sliding sphere at θ = 10°, if $H = 0.5$ m, X would most likely be:

A. less than 0.56 m.
B. between 0.56 m and 0.68 m.
C. between 0.68 m and 0.79 m.
D. greater than 0.79 m.

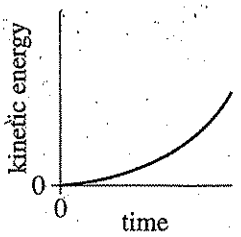
14. For the sphere sliding down the inclined plane and $H = 2.0$ m, if X had been plotted every 2.5° instead of every 5° between $\theta = 5°$ and $\theta = 45°$, X would most likely have been greatest at which of the following θ ?

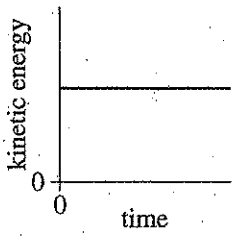
F. 17.5°
G. 22.5°
H. 27.5°
J. 32.5°

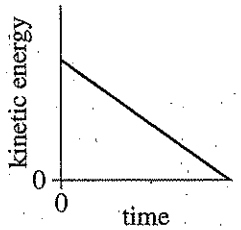
15. If $H = 2.0$ m for the rolling sphere and $\theta = 50°$, X will most likely be closest to which of the following?

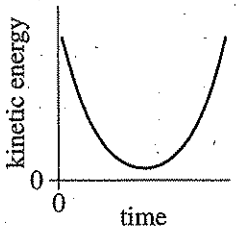
A. 0.50 m
B. 0.65 m
C. 0.80 m
D. 0.95 m

16. Which of the following figures best shows how the sphere's kinetic energy varies with time as the sphere travels down the incline?

F.


H.


G.


J.


Passage IV

Using the circuit shown in Figure 1, students studied the variables that affect the electrical resistance, R, of a wire.

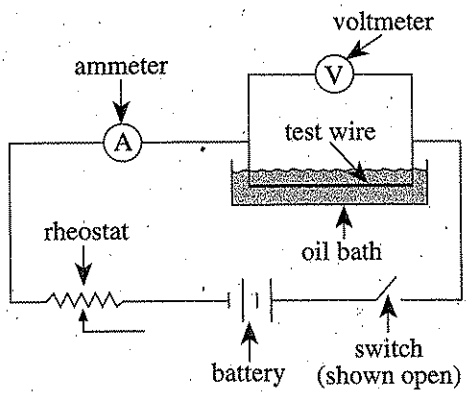


Figure 1

The students used the following procedure to find R for each test wire. They immersed the test wire in an oil bath and allowed the test wire to come to the temperature of the oil. Keeping the test wire in the oil bath (to control the temperature of the test wire), they then closed the switch and, using the *rheostat* (a variable resistor), adjusted the electrical current through the test wire until the ammeter indicated 0.80 amp. As soon as the ammeter indicated 0.80 amp, they measured the voltage, V, across the test wire. Finally, they used V and the current (0.80 amp) to calculate R.

Study 1

The students found R for test wires made of different metals. Each wire was at the same temperature and was 100 cm long and 0.130 mm^2 in cross-sectional area (see Table 1).

Table 1

Metal	V (volts)	R (ohms)
Copper	0.11	0.14
Lead	1.36	1.7
Platinum	0.66	0.83
Tungsten	0.35	0.44

Study 2

The students found R for copper test wires of different lengths. Each wire was at the temperature of the test wires in Study 1 and was 0.130 mm^2 in cross-sectional area (see Table 2).

Table 2

Length (cm)	V (volts)	R (ohms)
50	0.05	0.06
100	0.11	0.14
150	0.17	0.21
200	0.22	0.28

Study 3

The students found R for copper test wires of different cross-sectional areas. Each wire was at the temperature of the test wires in Study 1 and was 100 cm long (see Table 3).

Table 3

Cross-sectional area (mm^2)	V (volts)	R (ohms)
0.065	0.22	0.28
0.130	0.11	0.14
0.195	0.07	0.09
0.260	0.05	0.06

Study 4

The students varied the temperature of the oil. At each temperature, they found R for the copper test wire used in Study 1 (see Table 4).

Table 4

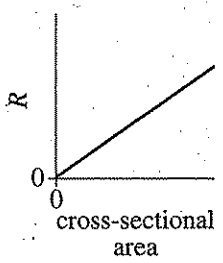
Temperature (°C)	V (volts)	R (ohms)
20	0.11	0.14
60	0.13	0.16
100	0.14	0.18
140	0.16	0.20

17. Based on the results of Studies 1 and 4, the temperature of the test wire in Study 1 was most likely closest to which of the following?

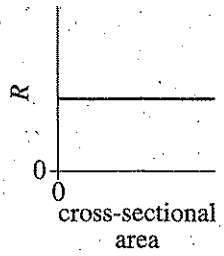
A. 5°C
B. 10°C
C. 20°C
D. 60°C

18. The results of Study 3 are best represented by which of the following figures?

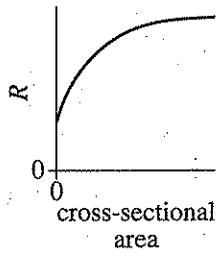
F.



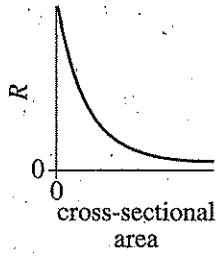
H.



G.



J.



19. Which of the following correctly lists the wires tested in Study 1 in order of increasing electrical resistance?

A. Copper wire, lead wire, platinum wire, tungsten wire
B. Copper wire, lead wire, tungsten wire, platinum wire
C. Copper wire, tungsten wire, lead wire, platinum wire
D. Copper wire, tungsten wire, platinum wire, lead wire

20. Suppose that the length of the copper wire tested in Study 4 had been 200 cm instead of 100 cm. Based on the results of Study 2, when the temperature of the copper test wire was 60°C in Study 4, V would most likely have been closest to which of the following?

F. 0.06 volt
G. 0.16 volt
H. 0.26 volt
J. 0.36 volt

21. Based on Studies 2 and 3, a copper test wire at the temperature of the test wires in Studies 2 and 3 will have the greatest electrical resistance if the test wire has which of the following lengths and cross-sectional areas?

	Length (cm)	Cross-sectional area (mm^2)
A.	20	0.15
B.	20	0.30
C.	40	0.15
D.	40	0.30

22. Given the position of the ammeter in the circuit shown in Figure 1, which of the following assumptions about the electrical current were the students most likely making?

F. Nearly all of the current went through the voltmeter.
G. Nearly all of the current went through the test wire.
H. Almost none of the current went through the test wire.
J. Almost none of the current went through the rheostat.

Passage V

Rock types can often be differentiated by the rare earth elements (REEs) they contain. Table 1 shows the average concentration of 2 REEs, neodymium and samarium, in 4 igneous rock types (oceanic basalt, continental basalt, andesite, and granite) and also in 3 sedimentary rock types (shale, sandstone, and dolomite).

Table 1

Rock type	Average concentration (ppm*) of: neodymium	samarium
Igneous rocks		
oceanic basalt	10	3
continental basalt	50	8
andesite	30	7
granite	50	9
Sedimentary rocks		
shale	30	6
sandstone	15	3
dolomite	1	0.2

*ppm = parts per million

Figure 1 shows the *relative concentration* of REEs in various igneous rock types and in sedimentary rocks taken as a group. Relative concentration is calculated using the following formula:

$$\text{relative concentration of REE in rock type} = \frac{\text{average concentration of REE in rock type}}{\text{average concentration of REE in meteorites}}$$

Meteorites, taken as a group, are used to calculate the relative concentration because their composition is distinctly different from any Earth rock.

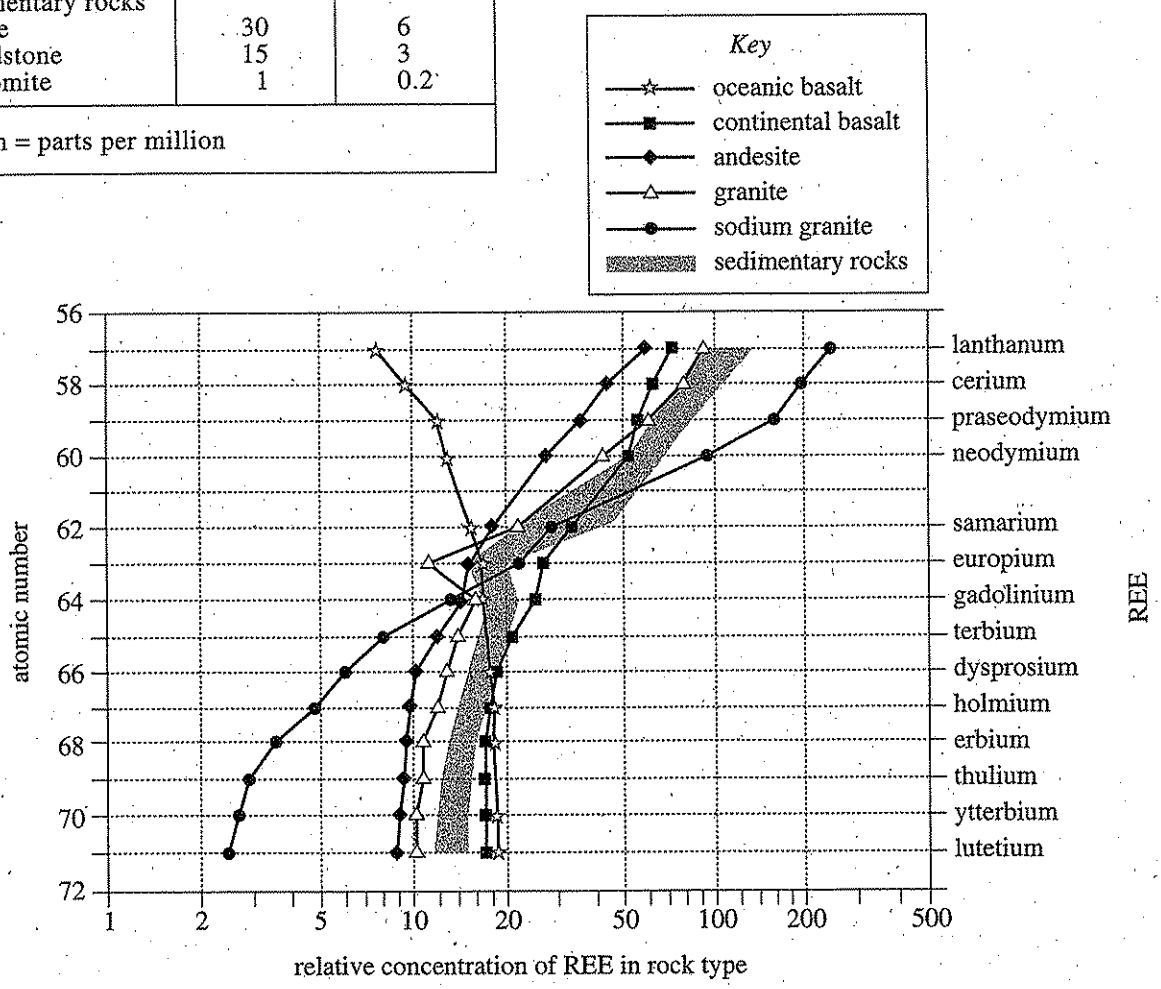


Figure 1

Figure adapted from S. Ross Taylor and Scott McLennan, "The Evolution of Continental Crust." ©1996 by Scientific American, Inc.

23. According to Figure 1, oceanic basalt and continental basalt differ the most in their relative concentrations of which of the following REEs ?

A. Cerium
B. Samarium
C. Holmium
D. Lutetium

24. A chemical analysis of another group of samples of 1 of the igneous rock types listed in Figure 1 revealed the following relative concentrations for 3 of its REEs:

REE	Relative concentration
Lanthanum	91
Europium	11
Ytterbium	10

According to Figure 1, to which rock type do these samples most likely belong?

F. Oceanic basalt
G. Andesite
H. Granite
J. Sodium granite

25. Which of the following statements comparing the average concentrations of neodymium and samarium in the rock types listed in Table 1 is true?

A. In each rock type, the average neodymium concentration is lower than the average samarium concentration.
B. In each rock type, the average neodymium concentration is higher than the average samarium concentration.
C. In some rock types, the average neodymium concentration is lower than the average samarium concentration; in other rock types, the average neodymium concentration is equal to the average samarium concentration.
D. In some rock types, the average neodymium concentration is higher than the average samarium concentration; in other rock types, the average neodymium concentration is equal to the average samarium concentration.

26. Based on Figure 1, the relative concentration of terbium for *limestone*, another rock type, would most likely be:

F. less than 10.
G. between 10 and 14.
H. between 15 and 20.
J. greater than 20.

27. In Figure 1, the plot of relative concentration versus atomic number covers the smallest range of relative concentrations for which of the following rock types?

A. Oceanic basalt
B. Continental basalt
C. Sodium granite
D. Sedimentary rocks

Passage VI

Four billion years ago (4 BYA), the Sun was only 70% as bright as it is today. With sunlight that faint, Earth's average surface temperature should have been −15°C and all surface water would have been frozen. However, isotope evidence from certain sedimentary rocks (rocks made of sediments deposited in liquid water) formed around that time indicates that Earth's surface temperature was well above freezing.

Scientists believe that 1 of 2 greenhouse gases, either ammonia (NH_3) or carbon dioxide (CO_2), was present in Earth's atmosphere at a concentration well above that of the respective gas in the atmosphere today. This gas trapped enough heat radiating from Earth's surface to keep the surface temperature above freezing.

Two scientists present their viewpoints.

Scientist 1

Four BYA, large quantities of NH_3 continuously entered Earth's atmosphere from ocean-floor hydrothermal vents and by other processes. NH_3 is a more efficient greenhouse gas than is CO_2, so a lower concentration of NH_3 is required to warm the atmosphere a given amount. Any NH_3 molecule entering the atmosphere would have been broken down in 5–10 days by UV radiation. However, methane (CH_4), another gas that was abundant in the atmosphere 4 BYA, combined with molecular nitrogen gas to produce organic compounds that blocked much of the incoming UV radiation and kept NH_3 molecules intact for much longer than 10 days. Continuous removal of CO_2 from the atmosphere by ocean water prevented CO_2 from accumulating in the atmosphere.

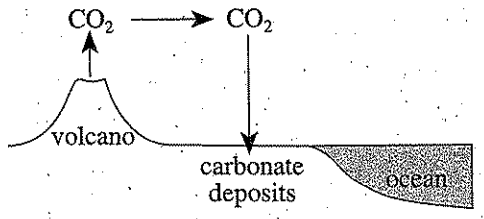
Scientist 2

Two carbon isotopes found in sedimentary rocks indicate a 75% higher concentration of CO_2 in Earth's atmosphere 4 BYA than the 360 parts per million (ppm) present today. Four BYA, large quantities of CO_2 continuously entered the atmosphere through widespread, long-term volcanic activity. Today, as in the past, much CO_2 is removed from the atmosphere as CO_2 becomes part of carbonates in rock and sediment on land. However, 4 BYA, there was 80% less dry land area on which to form and store carbonates, so CO_2 accumulated in the atmosphere.

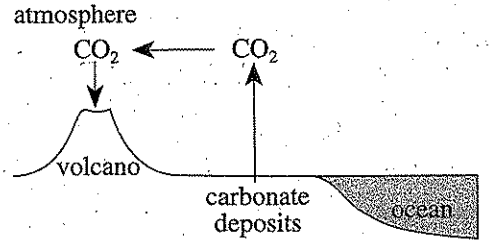
The vast amounts of CH_4 that would be required to help preserve atmospheric NH_3 did not exist on Earth 4 BYA. Thus, atmospheric NH_3 was too short-lived to have been an effective greenhouse gas.

28. Which of the following diagrams is most consistent with Scientist 2's description of how CO_2 enters and is removed from Earth's atmosphere?

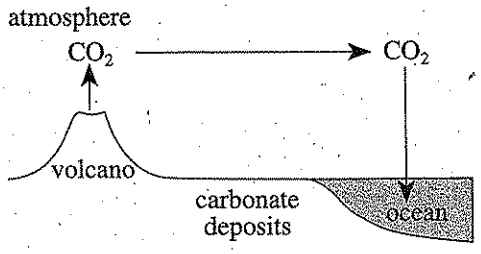
F.



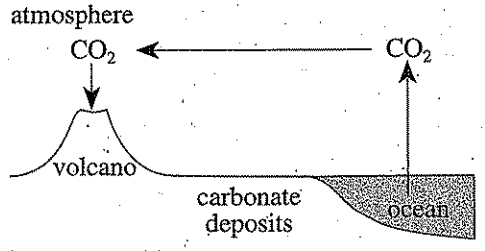
G.



H.



J.



29. CH_4 is also a greenhouse gas. Scientist 1 would most likely agree that the presence of CH_4 in Earth's atmosphere 4 BYA:

A. helped warm Earth's surface.
B. helped cool Earth's surface.
C. reduced the quantity of NH_3 present.
D. increased the quantity of CO_2 present.

30. A given concentration of NH_3 in Earth's atmosphere can trap as much heat radiating from Earth's surface as can a CO_2 concentration 3 times higher. Given this information and Scientist 2's viewpoint, the present-day concentration of NH_3 that would trap an amount of heat equivalent to that trapped by the present-day concentration of CO_2 would be approximately:

F. 50 ppm.
G. 80 ppm.
H. 120 ppm.
J. 360 ppm.

31. The Sun was 30% dimmer 4 BYA than it is today. Assuming the relative proportions of all greenhouse gases in Earth's atmosphere have stayed constant, both scientists would most likely agree that the minimum total concentration of all greenhouse gases necessary to keep Earth's surface temperature above freezing 4 BYA was:

A. more than the minimum total concentration necessary today.
B. the same as the minimum total concentration necessary today.
C. less than the minimum total concentration necessary today, but not zero.
D. zero.

32. Suppose volcanic activity 4 BYA produced large quantities of CH_4. Which scientist would most likely use this information to support his/her viewpoint?

F. Scientist 1, because it would explain how CH_4 entered Earth's atmosphere 4 BYA.
G. Scientist 1, because it would explain how NH_3 entered Earth's atmosphere 4 BYA.
H. Scientist 2, because it would explain how CH_4 entered Earth's atmosphere 4 BYA.
J. Scientist 2, because it would explain how NH_3 entered Earth's atmosphere 4 BYA.

33. In order to protect NH_3 from incoming UV radiation, the organic compounds had to be located:

A. below the elevation in the atmosphere where NH_3 was present.
B. at or above the elevation in the atmosphere where NH_3 was present.
C. on the ocean floor near where NH_3 was produced in hydrothermal vents.
D. on land near where NH_3 was produced from carbonate deposits.

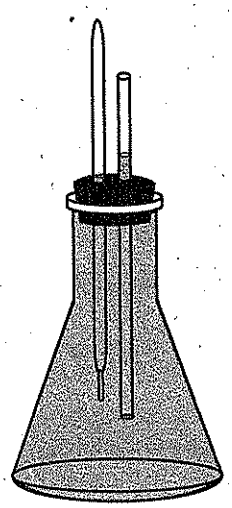
34. Scientist 2 would most likely agree that the concentration of CO_2 in Earth's atmosphere 4 BYA was closest to which of the following?

F. 75 ppm
G. 180 ppm
H. 360 ppm
J. 630 ppm

Passage VII

Students conducted experiments to study the effects of temperature on density.

In the experiments, each flask was filled to the top with either distilled water or salt (NaCl) water at 20°C. A rubber stopper with 2 holes—one fitted with a thermometer and the other fitted with glass tubing—was placed in the neck of the flask (see figure of apparatus).



The initial height of the liquid in the tubing was adjusted to 25 mm above the top of the stopper.

Experiment 1

A flask filled with distilled water was slowly heated. As the temperature of the water increased, the height of the water in the tubing increased. At 100°C, water and steam squirted out the top of the tubing.

Experiment 2

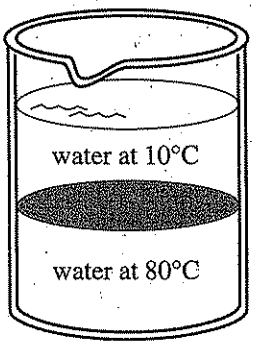
The body of a flask filled with distilled water was submerged in a cold bath at –6°C. As the temperature of the water in the apparatus decreased, the height of the water in the tubing decreased. At 4°C, the height of the water in the tubing stopped decreasing, and then began to increase. At 0°C, water and ice were forced out the top of the tubing. Eventually, the flask cracked in several places.

Experiment 3

Two saltwater solutions were prepared. Solution I had a lower salt concentration (in g/mL) than did Solution II. Two flasks containing Solutions I and II, respectively, were slowly heated. In both flasks, the salt water in the tubing rose and then squirted out the top of the tubing (at 102°C for Solution I and at 104°C for Solution II).

Two flasks containing Solutions I and II, respectively, were cooled as in Experiment 2. In both flasks, the height of the salt water in the tubing decreased until the temperature reached –6°C and then remained level (no freezing occurred).

35. Water in the upper part of a hypothetical 2-compartment container is at 10°C, and water in the lower part is at 80°C, as shown in the figure below.



If the barrier separating the 2 compartments could be removed without disturbing the water, what mixing, if any, would occur?

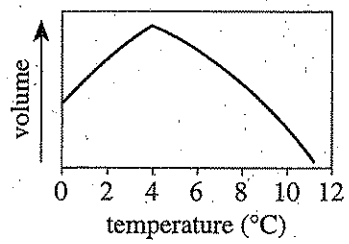
A. No mixing would occur, because the water in the upper part of the container is more dense than the water in the lower part of the container.
B. No mixing would occur, because the water in the upper part of the container is less dense than the water in the lower part of the container.
C. Mixing would occur, because the water in the lower part of the container is more dense than the water in the upper part of the container.
D. Mixing would occur, because the water in the lower part of the container is less dense than the water in the upper part of the container.

36. Based on the results of Experiments 1 and 3, 1 L of distilled water with which of the following quantities of NaCl added to it would most likely boil at the *lowest* temperature?

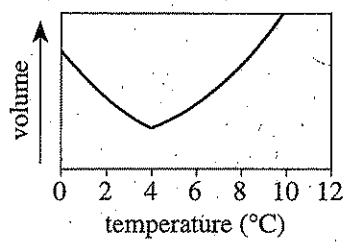
F. 0 g
G. 1 g
H. 20 g
J. 30 g

37. Which of the following graphs best shows how the volume of the liquid H_2O changed with temperature in Experiment 2 ?

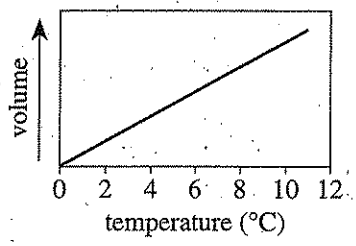
A.



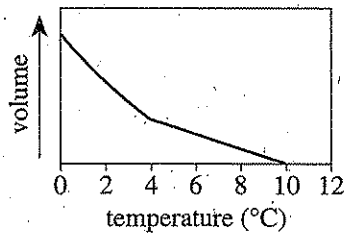
B.



C.



D.



38. Which of the following changes in the procedure of Experiment 3 would have provided the most information about the effect of decreasing temperature on the density of salt water?

F. Using a bath at −13°C to cool the flask
G. Using a bath at −3°C to cool the flask
H. Using a larger flask
J. Using a smaller flask

39. Suppose that equal volumes of Solutions I and II from Experiment 3 were mixed and the resulting solution was then tested as in Experiment 1. Salt water would most likely have started to squirt out of the top of the tubing when the temperature was:

A. less than 100°C.
B. between 100°C and 102°C.
C. between 102°C and 104°C.
D. greater than 104°C.

40. As the height of the water in the glass tubing decreased in Experiment 2, which of the following properties of the water in the apparatus also changed?

I. Volume
II. Mass
III. Density

F. I only
G. I and II only
H. I and III only
J. I, II, and III

END OF TEST 4

STOP! DO NOT RETURN TO ANY OTHER TEST.

Form 13N
ACT Assessment® Writing Test Prompt
(April 2008)

In some high schools, students are limited to participating in only one school-related extracurricular activity or sport each school year. Some parents support such a limit because they think involvement in multiple activities leaves little time for schoolwork and family responsibilities. Other parents do not support such a limit because they think students need many opportunities to explore their interests and talents if they are to make decisions about their futures. In your opinion, should high school students be limited to participating in only one extracurricular activity or sport each school year?

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

Form 65D (April 2008)
The Hunt for Morel Mushrooms

English

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

Math

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

Reading

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

Science

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

ACT Resource Links

ACT Online Practice Tests: https://www.crackab.com/act/

※ **ACT English Practice Tests:**

https://www.crackab.com/act/english/

※ **ACT Math Practice Tests:**

https://www.crackab.com/act/math/

※ **ACT Reading Practice Tests:**

https://www.crackab.com/act/reading/

※ **ACT Science Practice Tests:**

https://www.crackab.com/act/science/

ACT Grammar: https://www.crackab.com/act/grammar/

ACT Real Past Papers Download:

https://www.crackab.com/act-downloads/

Digital SAT & New SAT Practice Tests:

https://www.cracksat.net

Real SAT Tests Download:

http://www.cracksat.net/sat-downloads/

AP Exams Practice Tests:

https://www.crackap.com

https://www.apstudy.net

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 65D	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	73-74	57-58	—	38	**35**
34	71-72	55-56	39	37	**34**
33	70	54	38	36	**33**
32	69	53	37	35	**32**
31	68	51-52	36	34	**31**
30	67	50	35	33	**30**
29	65-66	48-49	34	32	**29**
28	64	46-47	33	31	**28**
27	62-63	44-45	32	30	**27**
26	60-61	41-43	31	29	**26**
25	57-59	39-40	30	27-28	**25**
24	55-56	37-38	29	26	**24**
23	52-54	35-36	27-28	25	**23**
22	49-51	33-34	26	23-24	**22**
21	45-48	31-32	24-25	22	**21**
20	42-44	29-30	23	20-21	**20**
19	39-41	27-28	21-22	18-19	**19**
18	37-38	24-26	20	17	**18**
17	35-36	21-23	18-19	16	**17**
16	32-34	18-20	17	14-15	**16**
15	29-31	14-17	15-16	13	**15**
14	27-28	11-13	13-14	12	**14**
13	25-26	09-10	11-12	11	**13**
12	23-24	07-08	10	10	**12**
11	21-22	06	08-09	08-09	**11**
10	18-20	05	07	07	**10**
9	16-17	04	06	06	**9**
8	14-15	03	05	05	**8**
7	11-13	—	04	04	**7**
6	09-10	02	—	03	**6**
5	07-08	—	03	—	**5**
4	05-06	01	02	02	**4**
3	04	—	—	01	**3**
2	02-03	—	01	—	**2**
1	00-01	00	00	00	**1**