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ACT Assessment

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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.

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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

Amalia Hernández's Ballet Folklórico de México

Amalia Hernández bowed gracefully before the crowd, many viewers stood and applauded, showing their¹ appreciation for the performance they had just witnessed.

Hernández didn't know it yet, but she and her Ballet Folklórico dancers had just won first prize at the 1961 Paris Festival of Nations. 2

Growing up, in Mexico in the 1920s³ Hernández believed she was born to dance. Her father, a prominent rancher and politician, did not approve of his daughter exhibiting herself in such a manner. But Amalia was

1. A. NO CHANGE
B. crowd many
C. crowd. Many
D. crowd. While many

2. At this point the writer is considering adding the following true statement:
Many of Mexico's most famous dancers began their careers with the Ballet Folklórico.
Should the writer make this addition here?
F. Yes, because it maintains the essay's focus on the many famous ballet dancers of Mexico.
G. Yes, because it shows how difficult it is to become a professional dancer.
H. No, because it interrupts the introduction of Amalia Hernández.
J. No, because it contradicts information offered elsewhere in the essay.

3. A. NO CHANGE
B. up in Mexico in the 1920s,
C. up, in Mexico in the 1920s,
D. up in Mexico, in the 1920s.

1 persistent. Despite this, her father acquiesced,

4

when he thought about it and gave in, allowing,
even helping, her to pursue her dream.

5

Senator Hernández built a dance studio and hired Europe's finest teachers to instruct Amalia in: classical and modern ballet. The young woman relished the experience and excelled in her studies, but something wasn't right. 7

6

So Amalia began studying under Mexican folklorist Luis Felipe Obrégón. She learned that her country's

8

folklore was a fusion of Aztec, Mayan, Spanish, French, Dutch, and African influences. The songs and dances she cherished chronicled life, death, and

9

to have a rebirth; they celebrated creation and revolution;

10

they celebrated the seasons and the harvest. However, Hernández decided to translate this lore into a new kind of ballet.

11

4. F. NO CHANGE
G. Finally,
H. In fact,
J. On the other hand,
5. A. NO CHANGE
B. in that he gave in,
C. by finally agreeing,
D. OMIT the underlined portion.
6. F. NO CHANGE
G. in, classical
H. in classical
J. in classical,
7. Which of the following sentences, if added here, would most effectively conclude this paragraph and introduce the topic of the next?
 - A. The music did not make her feel alive, as the folk music and dances of Mexico did.
 - B. She did not like the music well enough to want to continue to dance.
 - C. However, she had to admit that she deeply appreciated the dance studio where she studied.
 - D. Even though Amalia valued her teacher's skills, she truly wanted to focus on modern ballet.
8. F. NO CHANGE
G. country's
H. country's
J. countries
9. Which of the following alternatives to the underlined portion is LEAST acceptable?
 - A. grouping
 - B. combination
 - C. blend
 - D. mixture
10. F. NO CHANGE
G. rebirth;
H. to be reborn;
J. to have rebirth;
11. A. NO CHANGE
B. Nevertheless,
C. Instead,
D. OMIT the underlined portion.

In 1952, she left a prestigious job at Mexico's Institute of Fine Arts to start her own dance company, the Ballet Folklórico de México. She immediately began to develop a program for her small troupe of dancers. 12

In 1954, Mexico's Department of Tourism made the Ballet Folklórico an official cultural ambassador. It has won hundreds of awards and toured over eighty countries, performing in a range of venues from the Greek Parthenon to New York's Radio City Music Hall.

Though Hernández died in 2000, her legacy: the Ballet Folklórico—lives on,

13

as an outstanding dance company.

14

12. The writer is considering adding the following clause to the end of the preceding sentence (changing the period after the word *dancers* to a comma):

eventually choreographing over forty ballets for the company.

Should the writer make this addition there?

- F. Yes, because it further describes the scope of Hernández's contributions to her dance company.
 G. Yes, because it helps the reader gain a sense of what Hernández's ballets were like.
 H. No, because it fails to maintain the paragraph's focus on Hernández's job at Mexico's Institute of Fine Arts.
 J. No, because it disrupts the description of Hernández's role in the Ballet Folklórico.
13. A. NO CHANGE
 B. legacy,
 C. legacy—
 D. legacy

14. Which choice would most effectively guide readers to understand the valuable contributions made by the Ballet Folklórico?

- F. NO CHANGE
 G. sharing Mexico's cultural heritage with the world.
 H. as a well-known performing group.
 J. showing that the group will continue into the future.

Question 15 asks about the preceding passage as a whole.

15. Suppose the author intended to write an essay that illustrates how the traditions and customs of an artist's culture can be the foundation for his or her art. Would this essay successfully fulfill that goal?
- A. Yes, because the essay describes the many awards and honors Hernández's dance company received.
 B. Yes, because the essay explains that Hernández drew upon the folklore of Mexico as a basis for her ballets.
 C. No, because the author focuses on Hernández and her dance company rather than on artists in general.
 D. No, because the essay states that Hernández was educated in a variety of dance forms.

PASSAGE II

A Propensity for Pens

"You have plenty of pens," my friend said gently.

"Give me mine back."

I often find myself in this situation—sheepishly handing back someone else's pen. I'm the type who inadvertently attempts to walk away with the pen at the bank, even though it's chained to the counter. This is not a deliberate act, which I just unconsciously assume

that all pens belong to me. 18

Perhaps this is because being a writer and I never really feel comfortable without a pen in my possession.

I usually carry a good solid fistful of pens in my backpack.

I simply feel better to know a pen is handy. Who knows

when they will run dry?

Maybe I'm afraid an important thought will come to me and I'll have no way to record it. You can always capture an idea by scribbling a sentence on a napkin, a bit of newspaper, or even your hand. As long as you have a pen, paper is a secondary concern.

16. F. NO CHANGE
G. elses'
H. elses
J. else
17. A. NO CHANGE
B. act that
C. act.
D. act
18. If the writer were to delete the words *sheepishly*, *inadvertently*, and *unconsciously* from this paragraph, the paragraph would primarily lose:
F. clarification that the narrator doesn't mean to take others' pens.
G. description that outlines the narrator's method of deception.
H. evidence that the narrator feels threatened.
J. an indication that the narrator is indecisive.
19. A. NO CHANGE
B. being that I'm
C. my being
D. I'm
20. Which of the following alternatives to the underlined portion would NOT be acceptable?
F. a large number
G. a handful
H. many
J. a lot
21. A. NO CHANGE
B. to know that
C. known that
D. knowing
22. F. NO CHANGE
G. the one I'm using
H. something
J. either one

Pens are also featured prominently at my bedside.

Small piles of uncapped ballpoints gather as if of their own

²³

accord, on my night table. [24] Although I can't think of a time when I have actually woken up in the middle of the night with a brilliant thought, the pens' presence indicates my continuing belief that someday I might.

My pen habit, like most habits, is not without its negative consequences. I'm not just referring to the embarrassment of being caught walking off with

²⁵

someone else's property. There's still the fact that

²⁶

most of my clothes have been decorating with ink stains from leaking pens or scrawls from moments of unconscious doodling.

²⁷

[1] After a recent mishap involving half of my travel wardrobe, my father convinced me not to pack pens in my suitcase. [2] And to me, that feels like traveling light. [3] The low air pressure in the plane's cargo hold is bound to make them leak and ruin my clothes. [4] Despite such calamities, I still travel with at least five pens, capped but ready in my pocket. [29]

²⁸

23. A. NO CHANGE
B. gather;
C. gather,
D. gather:
24. At this point, the writer is considering adding the following true statement:
I'll even find one under my pillow occasionally.
Should the writer make this addition here?
F. Yes, because it provides a detail that is relevant to this paragraph.
G. Yes, because it helps explain the statement made in the preceding sentence.
H. No, because it distracts readers from the main focus of this paragraph.
J. No, because the information it provides is vague and pointless.
25. A. NO CHANGE
B. there
C. their
D. its
26. F. NO CHANGE
G. consequently
H. instead
J. also
27. A. NO CHANGE
B. had been decorated
C. are decorating
D. are decorated
28. F. NO CHANGE
G. Recently, a mishap that involved
H. A recent mishap involved
J. A recent mishap involving
29. Which of the following sequences of sentences makes this paragraph most logical?
A. NO CHANGE
B. 1, 3, 4, 2
C. 2, 1, 3, 4
D. 4, 1, 3, 2

Question 30 asks about the preceding passage as a whole.

30. Upon reviewing this essay, the writer is thinking about deleting the opening paragraph. Should that paragraph be kept or deleted?
- F. Kept, because it helps establish both the subject and the tone of the essay.
 - G. Kept, because it identifies the narrator's friend and the problem that person faces.
 - H. Deleted, because it introduces a character that is not developed later in the essay.
 - J. Deleted, because the essay fails to explain how this situation was resolved.

ASSAGE III

Working and Living under the Sea

[1]

Underwater explorer Jacques

Cousteau, exploring under the sea, predicted
31
 that one day humans would be “freed from the
 bondage of the surface” to work and even live
 underwater. In the 1960s, this became reality

when the U.S. Navy deployed its first
32

undersea habitat, *SeaLab*. 33

[2]

An undersea habitat allowed divers to remain on the
 ocean floor for extended periods between dives. Because
 the pressure inside is matched to the pressure of the ocean
 depth outside, divers can enter and exit at will without
34
 fear of decompression sickness—the dangerous bends.

31. A. NO CHANGE
 B. Cousteau—exploring under the sea—
 C. Cousteau who explored under the sea,
 D. Cousteau
32. F. NO CHANGE
 G. there
 H. its
 J. its'
33. The writer is considering adding the following phrase to the end of the preceding sentence (replacing the period after *SeaLab* with a comma):
- an underwater environment where people can live and work.
- Should the writer add this phrase here?
- A. Yes, because it offers a brief definition of the *SeaLab* habitat.
 - B. Yes, because it helps the reader envision what the Navy deployed.
 - C. No, because the *SeaLab* has already been described.
 - D. No, because it provides a digression that leads the paragraph away from its primary focus.
34. F. NO CHANGE
 G. at the exterior,
 H. on the reverse side,
 J. beyond,

This ability extends the time that scientists
can work greatly underwater.

35

35. The best placement for the underlined portion would be:

- A. where it is now.
- B. after the word *ability*.
- C. after the word *time*.
- D. after the word *scientists*.

36. The writer is considering adding the following clause to the end of the preceding sentence (replacing the period after the word *underwater* with a comma):

and they can reminisce casually about the pleasant memories from previous missions.

Should the writer add this clause here?

- F. Yes, because it suggests the camaraderie that is shared among marine scientists.
- G. Yes, because it suggests that an undersea habitat is capable of providing the comforts of home.
- H. No, because it provides a digression that leads the paragraph away from its focus.
- J. No, because it does not specifically describe any of the memories.

37. A. NO CHANGE

- B. depth, of sixty feet, work
- C. depth of sixty feet; work
- D. depth of sixty feet, work

38. F. NO CHANGE

- G. surface using *SeaLab*
- H. surface using *SeaLab*,
- J. surface. Using *SeaLab*,

depth of sixty feet. Work would be

37

limited to one hour per day if the dives

had to start from the water surface, using *SeaLab*,

38

divers can work each day for as long as they desire.

[3]

Not long ago, the most advanced in a series of undersea habitats, *Aquarius*, was rested on the ocean floor in the Florida Keys. Bolted to a two-hundred-ton platform sixty-six feet below sea level at Conch Reef, scientists at this research outpost are offered

39

a unique opportunity to study the impact of pollution on

coral reefs. [40]

39. A. NO CHANGE

- B. this research outpost offers scientists
- C. scientists researching at this outpost are offered
- D. research scientists at this outpost are offered

40. Which of the following true statements, if added here, would best point out the governing bodies from which the *Aquarius* project receives its orders?

- F. *Aquarius* is operated jointly by the National Oceanic and Atmospheric Administration and the University of North Carolina.
- G. University of North Carolina professors worked on the *Aquarius* project.
- H. University professors and scientific researchers were often at odds while collaborating on the *Aquarius* habitat.
- J. Many interested groups and organizations support research related to the *Aquarius* habitat project.

[4]

Hidden under the waves, *Aquarius* is a bright yellow, forty-three-foot-long cylinder. Inside, scientists live in some-
 if cramped quarters, with bunks, a shower and toilet, a microwave, and an array of scientific instruments.

They can watch marine life through large portholes, and enter and exit their pressurized domicile through the

moonpool, a special air pocket that keeps the ocean outside.

[5]

[1] At a depth of sixty-six feet, this decompression takes seventeen hours. [2] When the mission is complete and it is time for the aquanauts to return to land, the pressure inside the habitat must be gradual and returned to that of sea level before divers can ascend. [3] A small price, Cousteau would likely have said, for being freed from the surface for so long. [44]

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

- A. a classification
- B. an assortment
- C. a collection
- D. a supply

42. F. NO CHANGE

- G. *moonpool*. A
- H. *moonpool*; a
- J. *moonpool* a

43. A. NO CHANGE

- B. gradually and
- C. gradually
- D. gradual

44. Which of the following sequences of sentences will make Paragraph 5 most logical?

- F. NO CHANGE
- G. 1, 3, 2
- H. 2, 1, 3
- J. 2, 3, 1

Question 45 asks about the preceding passage as a whole.

45. Suppose the writer had intended to write a brief essay about Jacques Cousteau's contributions to life under the sea. Would this essay fulfill that purpose?

- A. Yes, because the essay describes Cousteau's research of various underwater habitats he discovered in the 1960s.
- B. Yes, because the essay describes the first underwater habitat Cousteau deployed in the 1960s.
- C. No, because the essay is about the *moonpool* and the role the University of North Carolina played in its research.
- D. No, because the essay focuses more generally on underwater habitats and how long scientists can work underwater.

PASSAGE IV

A Problem Solver and an Inventor

Dr. George Franklin Grant was a brilliant, innovative dentist and a professor at Harvard University. But the achievement that he is most widely remembered for today

is his invention and creation of the wooden golf tee.

An avid golfer, Dr. Grant invented and patented the tee in 1899. Before his invention, golfers preparing to tee off (hit their first shot) had to shape a mound of moist dirt or sand to raise the golf ball off the turf in order to hit it cleanly. Unfortunately, the ball would often roll off the handmade mound before the golfer could complete his or her swing. By both raising and stabilizing the ball, Grant's invention remedied this problem.

The tee Dr. Grant invented was not marketed for commercial use. After earning his doctor of dental surgery degree from Harvard University in 1870, Grant became one of Harvard's first African American professors. An internationally recognized expert in mechanical dentistry, he designed a new style of dental bridge, a device that provides support for individuals who have lost or broken teeth. Those constructed according to Grants design fit so well and so comfortably that the general health of his patients have been measurably improved.

46. Which of the following alternatives to the underlined portion would NOT be acceptable?
- F. in which he is most widely remembered for
G. that he is remembered most widely for
H. for which he is most widely remembered
J. he is most widely remembered for
47. A. NO CHANGE
B. invention, which was the creation
C. invention, that is, the creation
D. invention
48. F. NO CHANGE
G. their
H. its'
J. it's
49. A. NO CHANGE
B. for hitting
C. to hitting
D. that hit
50. Which of the following alternatives to the underlined portion would be LEAST acceptable?
- F. corrected
G. alleviated
H. fixed
J. rescued
51. Given that all the choices are true, which one would best introduce the new subject of this paragraph?
- A. NO CHANGE
B. Dr. Grant's achievements in the world of dentistry are equally impressive.
C. Dr. Grant believed that golf helped build discipline and friendships.
D. Friends of Dr. Grant were the happy recipients of his invention.
52. F. NO CHANGE
G. Grant's design
H. Grant's design,
J. Grants design,
53. A. NO CHANGE
B. was
C. are.
D. were



Dr. Grant's invention of the golf tee and his innovative dental bridge may seem to be an unlikely pairing. However, each accomplishment exemplifies a characteristic common to innovators: the ability to identify and solve a problem. In both of these cases, Grant recognized a need and focused his skills, imagination, and

intelligence to devising a way to fill that need.

Instead, Dr. George Franklin Grant made a lasting impression on the world as an innovative engineer in both

of the fields he loved. A brilliant professor of dentistry: he is best remembered for making it possible for generations

of golfers concentrated on their swings without worrying about whether their golf balls would remain in place as they swung.

54. F. NO CHANGE
 G. invention, of the golf tee,
 H. invention, of the golf tee.
 J. invention of the golf tee,

55. A. NO CHANGE
 B. a lack of something that was needed
 C. that a need was in existence
 D. a need that was out there

56. F. NO CHANGE
 G. at
 H. on
 J. for

57. A. NO CHANGE
 B. In addition,
 C. In contrast,
 D. OMIT the underlined portion.

58. F. NO CHANGE
 G. dentistry;
 H. dentistry,
 J. dentistry

59. A. NO CHANGE
 B. concentrating
 C. concentrate
 D. to concentrate

Question 60 asks about the preceding passage as a whole.

60. Suppose the writer's goal had been to write a brief essay documenting key innovations in golf equipment. Would this essay successfully fulfill that goal?
- F. Yes, because it highlights an important invention that changed the way golf is played.
 G. Yes, because it tells readers how and when a key innovation was introduced to the game of golf.
 H. No, because it fails to mention any improvements to golf equipment other than the tee.
 J. No, because it does not include information about tees made of plastic or metal.

PASSAGE V

Here Comes the Garbage Truck!

In 1917, the year our house was built. The city

61

planners had an orderly scheme about the collection
of trash. Garbage cans would be picked up from

62

the narrow alleys that ran behind the rows

63

of houses. The standard-width sidewalks

64

with which the houses faced would remain
free of trash receptacles.

65

For six or seven decades, this is the way
things would have worked. Garbage trucks

66

squeezed through the back alleys, collecting trash.

67

However, the construction of new vehicles in recent years
put an end to the city designers' plans. Today's garbage
trucks are enormous, far wider than the slender alleys.

Unlike the older trucks, they are painted bright yellow.

68

61. A. NO CHANGE
B. built the
C. built, the
D. built; the
62. F. NO CHANGE
G. of
H. by
J. for
63. A. NO CHANGE
B. being that they
C. so that they
D. since they
64. Given that all the choices are true, which description of the sidewalks best supports the logic of the city planners' trash collection system, as described in this paragraph?
F. NO CHANGE
G. paved cement
H. tidy, tree-lined
J. old, familiar
65. A. NO CHANGE
B. that the houses faced
C. toward the houses faced
D. with the houses facing
66. F. NO CHANGE
G. things were to have worked.
H. that things work.
J. things worked.
67. Which choice presents this action in a way most consistent with the writer's description of the alleys?
A. NO CHANGE
B. rambled down
C. rolled along
D. traveled
68. Given that all the choices are true, which one provides the most specific support for the statement in the preceding sentence?
F. NO CHANGE
G. Twice a year, city residents pick up litter from the alleys.
H. Indeed, the new trucks can barely navigate ordinary city streets.
J. Nevertheless, the alleys remain free of trash and yard clippings.

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.

1. For each of 3 years, the table below gives the number of games a football team played, the number of running plays they ran, and the total number of yards the team gained on running plays.

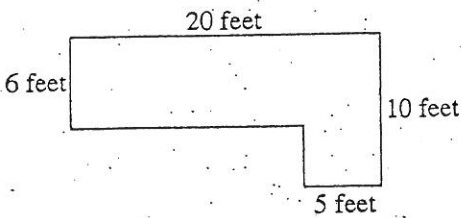
Year	Games	Running plays	Total yards gained on running plays
1997	11	397	1,028
1998	11	394	1,417
1999	9	378	1,920

To the nearest tenth of a yard, what is the average number of yards gained per running play in 1998?

- A. 2.6
- B. 2.7
- C. 3.6
- D. 4.9
- E. 5.1

DO YOUR FIGURING HERE.

2. For the polygon below, the lengths of 2 sides are not given. Each angle between adjacent sides measures 90°. What is the polygon's perimeter, in feet?

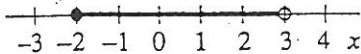


- F. 41
- G. 52
- H. 60
- J. 140
- K. 200



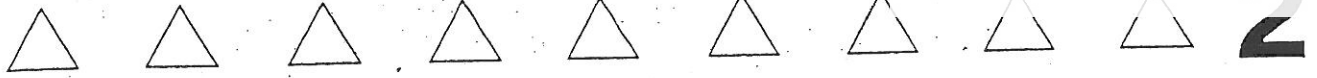
DO YOUR FIGURING HERE.

3. Which of the following inequalities represents the graph shown below on the real number line?



- A. $-2 \leq x \leq 2$
 B. $-2 \leq x < 3$
 C. $0 \leq x < 3$
 D. $2 \leq x \leq 3$
 E. $3 < x \leq -2$
4. What is the value of $3 \cdot 2^{x+y}$ when $x = 4$ and $y = -1$?
- F. 216
 G. 96
 H. 47
 J. 24
 K. 18
5. For integers a and b such that $ab = 8$, which of the following is NOT a possible value of a ?
- A. 2
 B. 1
 C. -4
 D. -6
 E. -8
6. What is the volume, in cubic centimeters, of a cube whose edges each measure 4 centimeters in length?
- F. 12
 G. 16
 H. 24
 J. 64
 K. 96
7. A community center sponsored a 1-day craft show. The center offered 2 sizes of display tables for rent and charged \$40 to rent one of the 70 large tables and \$25 to rent one of the 50 small tables. Which of the following expressions gives the total amount of money, in dollars, collected from renting all of the small tables and L of the large tables?
- A. $L + 50$
 B. $40L + 1,250$
 C. $40L + 2,000$
 D. $65L$
 E. $4,050L$

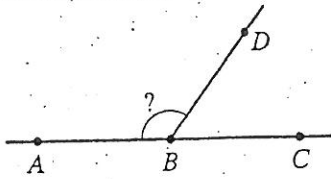
2



DO YOUR FIGURING HERE.

8. In the figure below, A , B , and C are collinear, the measure of $\angle ABD$ is $7x^\circ$, and the measure of $\angle CBD$ is $3x^\circ$. What is the measure of $\angle ABD$?

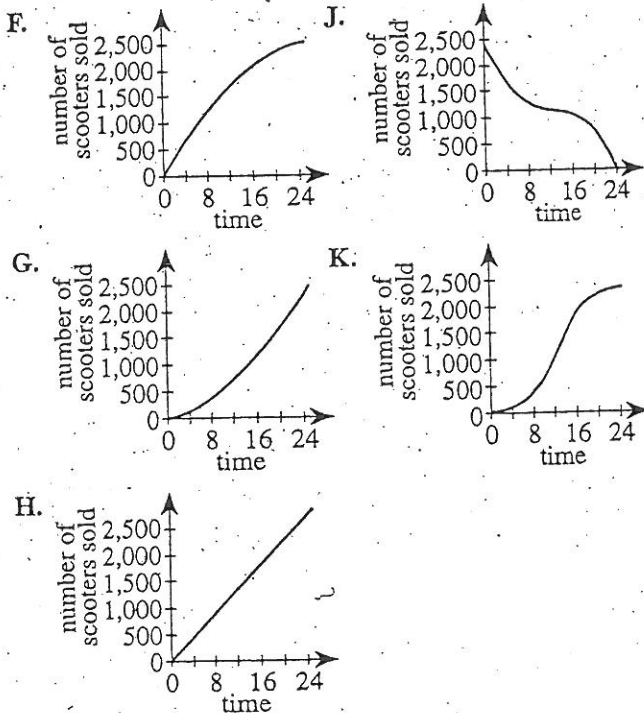
- F. 252°
- G. 126°
- H. 108°
- J. 54°
- K. 18°



9. Which of the following is NOT a possible value for a probability?

- A. 0.001
- B. 0.5
- C. $\frac{6}{10}$
- D. $\frac{3}{8}$
- E. $\frac{34}{31}$

10. For the first several months after the Fiery Red Scooter arrived in toy stores, the rate of sales increased slowly. As this new scooter caught on, however, the rate of sales increased rapidly. After several more months, many people owned a Fiery Red Scooter, and the rate of sales decreased. Which of the following graphs could represent the total number of Fiery Red Scooters sold as a function of time, in months, after the scooter arrived in toy stores?





DO YOUR FIGURING HERE.

1. For a community service project, members of the junior class at San Carlos High School are going to varnish the rectangular dining room floor of a local nursing home. The floor is 60 feet wide and 80 feet long. Under the assumption that 1 can of varnish covers exactly 250 square feet, what is the minimum number of cans of varnish they will need in order to put 1 coat of varnish on this floor?
 - A. 1
 - B. 9
 - C. 10
 - D. 19
 - E. 20

2. Carl is making a scale drawing of his rectangular bedroom floor. The floor is 12 feet wide by 14 feet long. He is using a scale of $\frac{1}{4}$ inch = 1 foot for the scale drawing of the floor. What will be the dimensions, in inches, of Carl's bedroom floor in the scale drawing?
 - F. 3 by $3\frac{1}{2}$
 - G. 4 by $4\frac{2}{3}$
 - H. 6 by 7
 - J. 36 by 42
 - K. 48 by 56

3. According to a recent survey of students about the juice they each preferred, 20% of the students preferred cranberry juice, 40% preferred orange juice, 20% preferred grapefruit juice, and the remaining students preferred tomato juice. If each student preferred only 1 juice and 250 students preferred tomato juice, how many students were surveyed?
 - A. 330
 - B. 500
 - C. 625
 - D. 1,000
 - E. 1,250

4. The circumference of each tire on a bicycle is 50 inches. About how many revolutions does one of these bicycle tires make traveling 300 feet (3,600 inches) without slipping?
 - F. 6
 - G. 18
 - H. 72
 - J. 300
 - K. 864



15. $(4x^2 - 3x + 7) - (-1 + 5x + 2x^2)$ is equivalent to:

DO YOUR FIGURING HERE.

- A. $2x^2 - 8x + 8$
- B. $2x^2 + 2x + 8$
- C. $2x^4 + 2x^2 + 6$
- D. $6x^2 - 8x + 6$
- E. $6x^4 - 8x^2 + 6$

16. A ticket for a movie at the Hazelnut Cinema costs \$5.00. Latoya treats her younger brother to a movie at the Hazelnut Cinema. She gives him $\frac{1}{2}$ the money she brought with her, for his ticket and a snack. When he asks to play a video game, she gives him \$1.00. That leaves Latoya exactly enough money to buy her own ticket. How much money did Latoya bring with her?

- F. \$10.00
- G. \$11.00
- H. \$12.00
- J. \$13.00
- K. \$14.00

17. Mr. Gomez gave his class a test on 20 spelling words. Only one of the following percents is possible as the percent of the 20 words a student spelled correctly. Which one is it?

- A. 77%
- B. 85%
- C. 88%
- D. 96%
- E. 99%

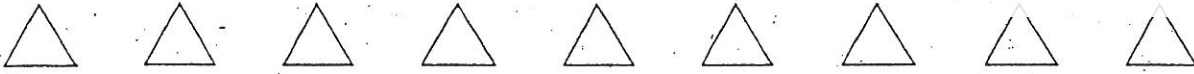
18. The first 5 terms of a geometric sequence are 0.375, -1.5, 6, -24, and 96. What is the 6th term?

- F. -384
- G. -126
- H. -66
- J. 126
- K. 384

19. $(2x - 3y)^2$ is equivalent to:

- A. $4x^2 - 12xy + 9y^2$
- B. $4x^2 - 10xy + 9y^2$
- C. $4x^2 - 9y^2$
- D. $4x^2 + 9y^2$
- E. $4x - 6y$

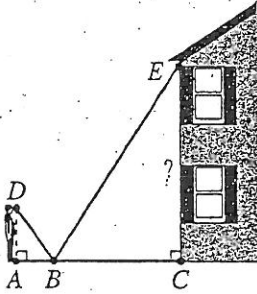
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0. As shown in the figure below, Mr. Thompson, who is standing at point A , needs to determine the distance from point C on the ground to point E at the top of one of the second-story windows of his house. He places a mirror on the ground at point B so that when he looks in the mirror, he can see the top of the window. Mr. Thompson's eye level, at point D , is 6 ft above the ground. He notes that $AB = 4$ ft and $BC = 14$ ft. Approximately how many feet above the ground is the top of the second-story window?

(Note: In $\triangle ABD$ and $\triangle CBE$, $\angle ABD$ is congruent to $\angle CBE$.)

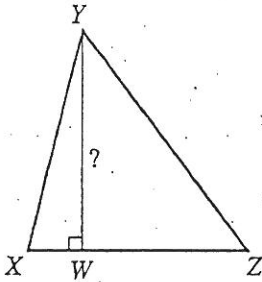


- F. 2
G. 10
H. 16
J. 21
K. 24

1. What is the solution to the equation $7x - (x - 3) = 6$?

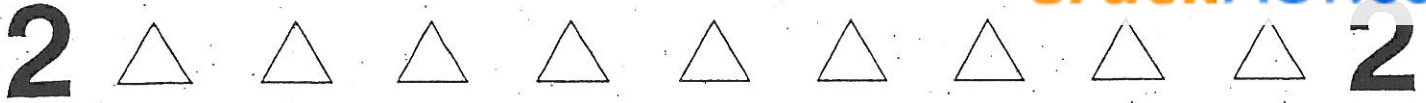
- A. $-\frac{3}{2}$
B. -2
C. $\frac{1}{2}$
D. $\frac{3}{2}$
E. 2

2. The area of $\triangle XYZ$ below is 32 square inches. If \overline{XZ} is 8 inches long, how long is altitude \overline{YW} , in inches?



- F. 10
G. 8
H. 6
J. 4
K. 2

DO YOUR FIGURING HERE.



23. Given $f(x) = 2x^2 - 5x + 7$, what is the value of $f(-10)$?

DO YOUR FIGURING HERE.

- A. -243
- B. -143
- C. 157
- D. 257
- E. 457

24. The cheerleading squad wants to purchase new uniforms to wear at the regional championship competition. They decide to sell candy bars for \$1.00 each. The squad will receive \$0.40 for each of the first 200 candy bars sold. For each of the next 300 sold, the squad will receive \$0.50. For each additional candy bar sold, the squad will receive \$0.60. How many candy bars must the squad sell to reach their goal of raising \$350.00?

- F. 350
- G. 584
- H. 667
- J. 700
- K. 875

25. The table below shows the age distribution of the student body at Memorial High School.

Age, in years	14	15	16	17	18
Percent of students	6%	28%	26%	31%	9%

What percent of the students are at least 16 years old?

- A. 34%
- B. 40%
- C. 50%
- D. 60%
- E. 66%

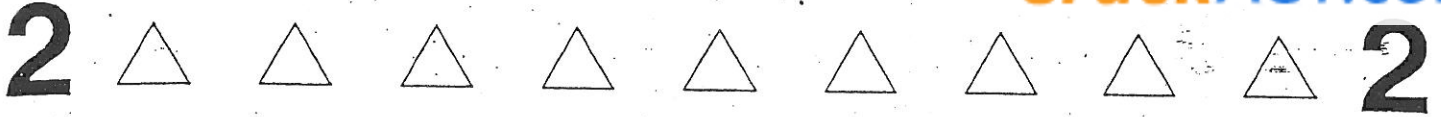
26. What percent of $\frac{2}{3}$ is $\frac{1}{3}$?

- F. 22%
- G. 33%
- H. 50%
- J. 67%
- K. 200%

27. The sign below advertises a sale on coats. What is the sale price of a coat with a regular price of \$84.00?

SALE SALE SALE
All Coats
3/4 off the regular price!
SALE SALE SALE

- A. \$ 9.00
- B. \$21.00
- C. \$42.00
- D. \$63.00
- E. \$83.25



DO YOUR FIGURING HERE.

28. The ratio of a side of square A to the length of rectangle B is 2:3. The ratio of a side of square A to the width of rectangle B is 2:1. What is the ratio of the area of square A to the area of rectangle B ?

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

29. In Intermediate Algebra class, Ms. Schimmack makes the statement "y varies directly as the product of w^2 and x , and inversely as z^3 " and asks her students to translate it into an equation. Which of the following equations, with k as the constant of proportionality, is a correct translation of Ms. Schimmack's statement?

A. $y = \frac{kw^2x}{z^3}$
 B. $y = \frac{kz^3}{w^2x}$
 C. $y = \frac{w^2xz^3}{k}$
 D. $y = \frac{z^3}{kw^2x}$
 E. $y = kw^2xz^3$

30. In a certain isosceles triangle, the measure of each of the base angles is twice the measure of the vertex angle. What is the measure, in degrees, of each of the base angles?

F. 36°
 G. 60°
 H. 72°
 J. 120°
 K. 144°

31. For a single production run, when n items are made and sold, a company's profit, P dollars, can be modeled by $P = n^2 - 300n - 100,000$. What is the smallest number of items that must be made and sold in order for the company not to lose money on the production run?

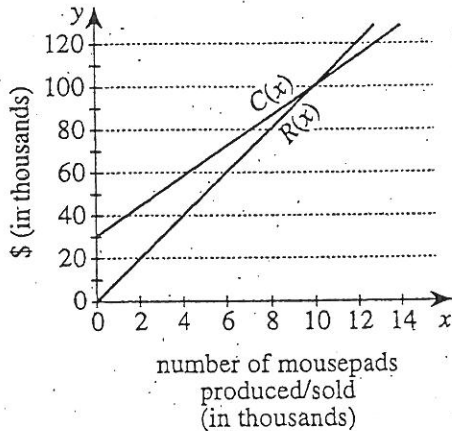
A. 150
 B. 200
 C. 300
 D. 350
 E. 500



DO YOUR FIGURING HERE.

Use the following information to answer questions 32–34.

Mousepads Galore is a company that produces computer mousepads. *Cost* is the total money spent to produce and sell the mousepads, and *revenue* is the total income generated by the sale of the mousepads. The graph below depicts projections for the linear cost function, $C(x)$, and the linear revenue function, $R(x)$.



32. During the month of April, Mousepads Galore broke even (did not gain or lose any money) when x mousepads were produced and sold. How many mousepads did the company produce and sell during the month of April?
- F. 10,000
 G. 12,000
 H. 14,000
 J. 15,000
 K. 30,000
33. The cost function shown in the graph for Mousepads Galore has 2 components: a fixed cost, plus a constant production cost per mousepad. Which of the following is the fixed cost?
- A. \$ 0
 B. \$ 1,000
 C. \$ 10,000
 D. \$ 30,000
 E. \$ 100,000
34. Mousepads Galore sells each mousepad at the same price, which is an integer number of dollars. According to the revenue function, what is the price of each of these mousepads?
- F. \$ 3
 G. \$ 7
 H. \$ 10
 J. \$ 12
 K. Cannot be determined from the given information

Which of the following is a *complete* factorization of the expression $2x + 2xy + 6x^2y$?

- A. $2x(y + 3xy)$
- B. $2x + 2xy(1 + 3x)$
- C. $2x(1 + y + 4xy)$
- D. $1 + y + 3xy$
- E. $2x(1 + y + 3xy)$

DO YOUR FIGURING HERE.

Which of the following is an equation of the line that passes through the points $(1,3)$ and $(-3,-13)$ in the standard (x,y) coordinate plane?

- F. $x + y = 4$
- G. $4x - y = 1$
- H. $5x - y = 2$
- J. $6x - 2y = 8$
- K. $7x - 2y = 5$

A square has sides that are the same length as the radius of a circle. If the circle has an area of 36π square units, how many units long is the perimeter of the square?

- A. 18
- B. 24
- C. 36
- D. 72
- E. 324

If the following system has a solution, what is the x -coordinate of the solution?

$$\begin{aligned} 3x + 6y &= 52 \\ x + 6y &= 24 \end{aligned}$$

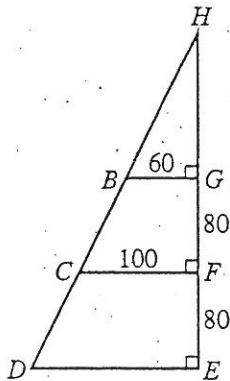
- F. 19
- G. 14
- H. 6
- J. 0
- K. The system has no solution.



Use the following information to answer questions 39–41.

DO YOUR FIGURING HERE.

In the figure below, B and C are on \overline{HD} and G and F are on \overline{HE} . The measurements given are in inches. Both $BGFC$ and $CFED$ are trapezoids. The area, A , of a trapezoid is given by $A = \frac{1}{2}h(b_1 + b_2)$, where h is the height and b_1 and b_2 are the lengths of the 2 parallel sides.



39. What is the area of $BGFC$, in square inches?
- A. 2,500
 B. 5,400
 C. 6,400
 D. 7,000
 E. 12,800
40. What is the length of \overline{BC} , in inches?
- F. 90
 G. 100
 H. $\sqrt{4,800}$
 J. $\sqrt{8,000}$
 K. $\sqrt{16,400}$
41. What is the radius, in inches, of the largest circle that can be drawn so that no point of the circle is outside $CFED$?
- A. 40
 B. 50
 C. 60
 D. 70
 E. 80

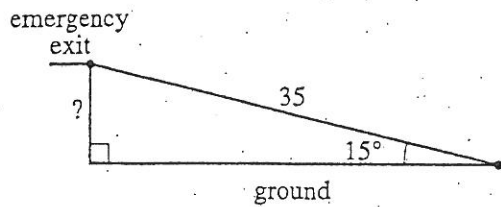
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- As shown in the figure below, an escape ramp leading from an emergency exit of an airplane is 35 feet long when fully extended and forms a 15° angle with the level ground.

DO YOUR FIGURING HERE.



Given the trigonometric approximations in the table below, what is the height above the ground of the emergency exit, rounded to the nearest 0.1 foot?

$\cos 15^\circ$	0.966
$\sin 15^\circ$	0.259
$\tan 15^\circ$	0.268

- F. 2.8
G. 7.4
H. 7.7
J. 9.1
K. 9.4
- There are 10 equally spaced dots marked on a circle. Kim chooses an integer, n , that is greater than 1. Beginning at a randomly chosen dot, Kim goes around the circle clockwise and colors in every n th dot. He continues going around and around the circle coloring in every n th dot, counting each dot whether it is colored in or not, until he has colored in every dot. Which of the following could have been Kim's integer n ?
- A. 2
B. 3
C. 4
D. 5
E. 6
- Consider the exponential equation $y = Ca^t$, where C and a are positive real constants and t is a positive real number. The value of y decreases as the value of t increases if and only if which of the following statements about a is true?
- F. $-1 < a$
G. $0 < a$
H. $0 < a < 1$
J. $1 < a < 2$
K. $1 < a$
- What is the distance, in coordinate units, between the points $P(-2,-1)$ and $Q(1,3)$ in the standard (x,y) coordinate plane?
- A. $\sqrt{5}$
B. $\sqrt{7}$
C. 3
D. 5
E. 7

DO YOUR FIGURING HERE.

46. During their morning jog in the park, Jean stops at a drinking fountain. Sula continues to jog and gets 10 meters ahead of Jean. Sula is jogging at a constant rate of 2 meters per second, and Jean starts jogging at a constant rate of 2.4 meters per second to catch up to Sula. Which of the following equations, when solved for t , gives the number of seconds Jean will take to catch up to Sula?

- F. $2t + 10 = 2.4t$
- G. $2t - 10 = 2.4t$
- H. $\frac{10 + 2.4t}{2.4} = 2t$
- J. $2t = 10$
- K. $2.4t = 10$

47. Which of the following defines the solution set for the system of inequalities below?

$$\begin{aligned} x &\leq 6 \\ 4 + 2x &\geq 0 \end{aligned}$$

- A. $x \geq -2$
- B. $x \leq 6$
- C. $-8 \leq x \leq 6$
- D. $-2 \leq x \leq 6$
- E. $2 \leq x \leq 6$

48. At Brookfield High School, 55 seniors are enrolled in the sociology class and 40 seniors are enrolled in the drawing class. Of these seniors, 20 are enrolled in both the sociology class and the drawing class. How many of the 120 seniors enrolled at Brookfield High School are NOT enrolled in either the sociology class or the drawing class?

- F. 5
- G. 15
- H. 20
- J. 35
- K. 45

49. If two lines in the standard (x,y) coordinate plane are perpendicular and the slope of one of the lines is 3, what is the slope of the other line?

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



50. In the standard (x,y) coordinate plane, $(12,3)$ is half-way between $(2a, a + 3)$ and $(4a, a - 5)$. What is the value of a ?

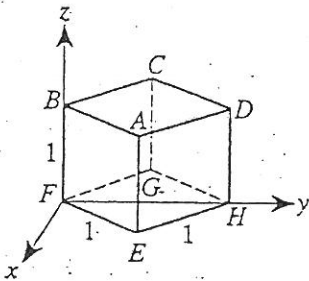
F. 0
G. 2
H. 3
J. 4
K. 6

DO YOUR FIGURING HERE.

51. How many 3-letter orderings, where no letter is repeated, can be made using the letters of the word GATORS?

A. 3
B. 6
C. 27
D. 120
E. 216

52. As shown in the (x,y,z) coordinate space below, the cube with vertices A through H has edges that are 1 coordinate unit long. The coordinates of F are $(0,0,0)$, and H is on the positive y -axis. What are the coordinates of D ?



F. $(0,1,1)$
G. $(0, \sqrt{2}, 0)$
H. $(0, \sqrt{2}, 1)$
J. $(0, \sqrt{2}, \sqrt{3})$
K. $(1,1,1)$

53. Whenever x , y , and z are positive real numbers, which of the following expressions is equivalent to $2 \log_3 x + \frac{1}{2} \log_6 y - \log_3 z$?

A. $\log_3 \left(\frac{x^2 y}{z} \right)$
B. $\log_3 \left(\frac{x^2}{z} \right) + \log_6 (\sqrt{y})$
C. $\log_3 \left(\frac{z}{x^2} \right) + \log_6 \left(\frac{y}{2} \right)$
D. $\log_3 (x - z) + \log_6 (\sqrt{y})$
E. $2 \log_3 (x - z) + \log_6 \left(\frac{y}{2} \right)$



54. If $2 \leq x \leq 5$ and $-4 \leq y \leq -3$, what is the maximum value of $|y - 2x|$?

- F. 20
- G. 14
- H. 13
- J. 8
- K. 7

DO YOUR FIGURING HERE.

55. The measure of each interior angle of a regular n -sided polygon is $\frac{(n-2)180^\circ}{n}$. A regular pentagon is shown below. What is the measure of the designated angle?



- A. 108°
- B. 144°
- C. 198°
- D. 252°
- E. 288°

56. Which of the following trigonometric functions has an amplitude of 2?

(Note: The *amplitude* of a trigonometric function is $\frac{1}{2}$ the nonnegative difference between the maximum and minimum values of the function.)

- F. $f(x) = 2 \sin x$
- G. $f(x) = 2 \tan x$
- H. $f(x) = \sin\left(\frac{1}{2}x\right)$
- J. $f(x) = \cos 2x$
- K. $f(x) = \frac{1}{2} \cos x$

57. Which of the following is an equivalent expression for r in terms of S and t whenever r , S , and t are all distinct and $S = \frac{rt-3}{r-t}$?

- A. $\frac{St-3}{S-t}$
- B. $\frac{S-3}{S-1}$
- C. $\frac{S-t}{S-3}$
- D. $\frac{St-3}{S+t}$
- E. $\frac{3}{t-S}$

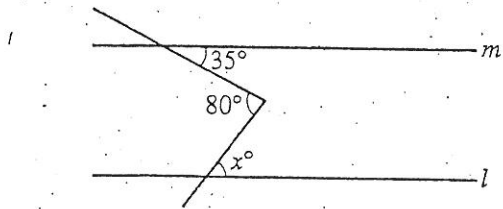
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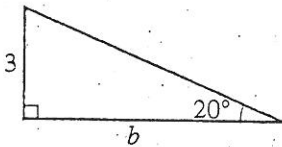
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58. In the figure below, lines l and m are parallel and angle measures are as marked. If it can be determined, what is the value of x ?

DO YOUR FIGURING HERE.



- F. 35
 G. 45
 H. 65
 J. 80
 K. Cannot be determined from the given information
59. In the triangle below, where the 2 given side lengths are expressed in feet, what is the value of b ?



- A. $3 \cos 20^\circ$
 B. $3 \sin 20^\circ$
 C. $3 \tan 20^\circ$
 D. $3 \sin 70^\circ$
 E. $3 \tan 70^\circ$
60. An angle in standard position in the standard (x,y) coordinate plane has its vertex at the origin and its initial side on the positive x -axis. If the measure of an angle in standard position is $1,573^\circ$, it has the same terminal side as an angle of each of the following measures EXCEPT:
- F. -587°
 G. -227°
 H. 133°
 J. 493°
 K. 573°

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 *Monkey King* by Patricia Chao (©1997 by Patricia Chao).

It's my tenth birthday. Ma doesn't get a cake or presents because we're busy getting ready to go to visit our Nai-nai in San Diego. That is, my sister, Marty, and I are going while Ma and Daddy spend the summer in
5 Taiwan, where my father has a teaching job. In the front of the tunnel to the plane Ma hands us over to the stewardess, who wears white gloves. Marty cries but I don't.

During the flight the stewardess keeps coming over with children's magazines, coloring books, magnetic tic-tac-toe. Not that we need distractions; we sit quietly, buckling our seat belts when the sign says to. Most of the way I read *Eight Cousins*, feeling my sister's hot skull pressed against my shoulder as she sleeps.

15 My Nai-nai is so glad to see us, she has tears in her eyes. "*Ni kan!*" she says to her cousin Su-yi, who has come to the airport too because our grandmother doesn't drive. Nai-nai used to live with Su-yi, but now she has a separate house on the same street.

20 Ma has warned us not to tire Nai-nai out. But my grandmother is inexhaustible. Mornings, when she comes to wake us, she's already dressed, hair up, face powdered, lipstick on. The first night when she tucks us in Marty asks, "When do you go to bed?" and Nai-nai
25 answers: "Very, very late. Old lady doesn't need much sleep."

Over my grandmother's shoulder I am watching the curtains, patterned with cobalt and fuchsia primroses, dancing over the open window. I have brought
30 Piggy, although I am way too old. Marty left her doll on her pillow at home. Nai-nai doesn't make fun of me. "Poor old man," she says, when she notices Piggy's tattered chest. She looks in her drawers and finds a baby T-shirt I can dress him in.

35 Marty and I play softball and kickball with the kids on our street. Sometimes we go to the beach, along with a lot of other kids in bathing suits, crowded into the back of a station wagon that smells like hot rubber and coconut lotion. It is the most beautiful ocean I have

40 ever seen, with all different kinds of blue in it, rolling like fluted glass toward us.

I tell the other kids about the Gulf of Mexico, where Aunty Mabel and Uncle Richard live. There were things waiting there in that warm flat water, crabs
45 who'd clamp your toes no matter how carefully you stepped. Then I tell them about the beach in Monterey, where I was born, with all the wildflowers in the spring, and of course the seals.

Marty and I get very tan, and Nai-nai scolds us.
50 But she softens when she sees how hungry we are after our days at the beach, how we wolf everything down, no matter how strange. When we first got here we were picky, polite. Nai-nai corrected the way Marty held her chopsticks and made her cry. Our grandmother serves
55 the meal in courses, unlike Ma, who sets everything down on the table at once.

Now we compromise. Marty is allowed to use a fork, and Nai-nai sometimes gives in to our pleas at the grocery store. One night she even makes hamburgers,
60 following the recipe from *Joy of Cooking*, although we forget to get buns so we have to have them on toast.

On the first rainy day, Nai-nai climbs the stepladder and takes out boxes from the top shelf of her bedroom closet. They are filled with presents from her
65 admirers, back in her youth when she was a lieder singer. She kept everything: dried sprays of orchids, brittle and black-edged; a collection of music boxes from Switzerland; perfume, never opened, the bottoms of the crystal flasks coated brown. I imagine the per-
70 fume to be like orange juice concentrate: if you added water it would be as good as fresh.

She shows us photographs of our parents' wedding. "Handsome couple," she says. My mother doesn't look too different, except for more makeup and wavy
75 hair, but my father is unrecognizable. The man in the picture has dark, thick hair and a smooth, confident face, as if nothing bad had ever happened to him.

My hair is long but I am not allowed to wear it loose except at night. Nai-nai washes it for me in the
80 kitchen sink. I force myself to stand very still, although I get a crick in my neck and the water from the spray nozzle tickles.

Once, after my hair had dried enough to brush out, Nai-nai puts it up into a bun like hers. I watch her in the dresser mirror, trying to memorize the motions, but my grandmother is too fast. When she's done she gives me the hand mirror so that I can examine the back of my head. I see that she has anchored the bun with a single pale green hairpin, like an arrow through a valentine.

"It's jade," my grandmother says, patting my shoulder. "You keep."

The narrator's use of sensory details, such as the color of the curtains and the smell of the station wagon, most strongly suggests that:

- A. she is too young to comprehend her world in anything but sensory images.
- B. the separation from her parents is so upsetting that she is strikingly aware of her physical surroundings.
- C. the routine nature of the trip causes her to fully notice small changes in her surroundings since her last visit.
- D. vivid images best represent what she appreciates about the experiences of her trip.

It can reasonably be inferred from the passage that the narrator views the children who live on Nai-nai's street as:

- E. spoilsports unwilling to participate in activities that would make the summer days even more enjoyable.
- G. friends who often vocalize what intrigues them about the ocean's beautiful appearance.
- H. companions with whom to share the memorable stories of her life.
- J. children who have been deprived of the wonderful opportunity to play on the beach.

As depicted in the eighth and ninth paragraphs (lines 49–61), the relationship between the girls and their grandmother is best described by which of the following statements?

- A. The girls are reluctantly adjusting to their grandmother's ways.
- B. The girls and their grandmother are learning to accept each other in new ways.
- C. The grandmother is exhausted from trying to entertain and care for the girls.
- D. The grandmother, though loving, is rigid about what she considers correct.

Details in the tenth paragraph (lines 62–71) most strongly suggest that the grandmother:

- F. hopes the girls will pursue careers as singers or actors.
- G. hopes the girls will keep and preserve the presents she received as a lieder singer.
- H. exaggerates the experiences in her life in a way the narrator enjoys.
- J. has a lively past she wants the girls to learn about.

5. The narrator's imaginative way of viewing her surroundings is best revealed by her description of the:

- A. baby T-shirt.
- B. stewardess's white gloves.
- C. coconut lotion.
- D. perfume.

6. Which of the following statements about why the narrator and Marty will spend the summer with Nai-nai is supported by the passage?

- F. They are taking a special trip planned for the narrator's birthday.
- G. Their parents will be in Taiwan, so the girls need a place to stay.
- H. Their parents believe it is important for the girls to learn more about Nai-nai's past.
- J. Nai-nai lives by the ocean, where there is more to do in the summer than at their parents' house.

7. Which of the following statements most nearly captures the sentiment behind the narrator's comment "Nai-nai doesn't make fun of me" (line 31)?

- A. "Nai-nai knows how it feels to be laughed at."
- B. "Nai-nai knows why I would like a baby T-shirt."
- C. "Nai-nai understands why I ask when she goes to bed."
- D. "Nai-nai understands why I bring Piggy."

8. It can reasonably be inferred from the passage that which of the following events happened first in the narrator's life?

- F. She visited Aunty Mabel and Uncle Richard.
- G. She visited Nai-nai at Su-yi's house.
- H. She lived in Monterey.
- J. She lived in Taiwan.

9. In line 75, the narrator describes her father as "unrecognizable," which most nearly suggests that she:

- A. does not recognize her father because he has often been away from home.
- B. is aware of the changes in her father's appearance.
- C. is unsure that the man in the picture is her father.
- D. does not recognize her father because to her surprise he looks younger now than he does in the picture.

10. It can most reasonably be inferred from the passage that the narrator's father:

- F. has faced many instances of misfortune in his life.
- G. becomes distressed when Marty cries before the trip.
- H. views his wedding day as the turning point of his life.
- J. has contemplated moving to San Diego with his family.

Passage II

SOCIAL SCIENCE: This passage is adapted from the article "No Longer Alone: The Scientist Who Dared to Say Animals Think" by Emily Eakin (©2001 by The New York Times).

Donald Griffin was at the Central Park Zoo watching the polar bears nuzzle a synthetic log smeared with peanut butter. Dr. Griffin observed as Gus, 800 pounds, tried to fit his nose into an enticingly sticky knothole. To the untutored eye it looked like just another feeding time at the zoo, but at Central Park the exercise with the log and snack goes by the grander name of "animal enrichment" and is intended to stimulate the bears' minds as well as their appetites. It's a concept for which the bears have Dr. Griffin, 85, in large part to thank.

Twenty-five years ago he published a short book suggesting that humans didn't have the monopoly on thoughts and feelings. Animals, he argued, most likely had them, too.

Other scientists were appalled. According to the behaviorist doctrine that held sway at the time, animals were little more than "stimulus response automata," robots with a central nervous system. The idea that an ant or an elephant might have thoughts, images, experiences or beliefs was not just laughable; it was seditious.

But over the last decade alone a flood of new data have emerged that would seem to have turned the tide definitively in Dr. Griffin's favor. In Arizona an African Gray parrot named Alex can identify colors and shapes as well as any preschooler. In Georgia a bonobo ape named Kanzi converses with his trainer via computer keyboard and watches Tarzan movies on television. Researchers at the Massachusetts Institute of Technology published evidence suggesting that rats dream. Animal enrichment programs featuring mental puzzles disguised as toys and treats have become a standard part of daily life at zoos. And in the spring of 2001 the University of Chicago Press issued an updated edition of Dr. Griffin's 1992 book, *Animal Minds*.

If Dr. Griffin views these developments as vindication, he is too modest to say so. "We know so very little," he said. "Scientists, including me, have come to be very cautious. Early work on primate gestures and facial expressions was grossly misinterpreted."

In fact the recent findings appear to have only intensified the debate over animal consciousness. Lately, experts on the human mind—philosophers and psychologists—have been weighing in alongside the scientists. For if it turns out that animals can think, then the idea that consciousness is unique to humans—a basic assumption in Western thought—becomes impossible to maintain.

Clearly Gus, Alex and Kanzi aren't automatons, but just how conscious are they? Do they experience pain, desire and other sensations the way humans do?

(Philosophers call this *phenomenal consciousness*.) Are they capable of thinking about their experiences? (Philosophers call this *self-consciousness*.) Do they have beliefs? What about remembering the past? Do earthworms have some form of consciousness? What about salamanders? Is it even possible to study an animal's inner life? The range of opinion on these questions is nearly as great as the number of possible answers. Tufts University philosopher Daniel C. Dennett declared the state of thinking on animal consciousness a "mess."

On the one hand there are the pro-consciousness philosophers like Colin McGinn, a professor at Rutgers University, and Peter Singer, a professor of bioethics at Princeton and a leading animal rights advocate. These scholars believe that most if not all animals have phenomenal consciousness. "I think it's plain common sense that animals have conscious states," Mr. McGinn said. "Animals way down to insects have phenomenal consciousness. It's a primitive feature of the biological world."

On the other hand there are the skeptics like Mr. Dennett and Herbert Terrace, a psychologist at Columbia University. What "are you seeing when you see sentience in a creature?" Mr. Dennett asked in a 1995 essay. "It is in fact ridiculously easy to induce powerful intuitions of not just sentience but full-blown consciousness (ripe with malevolence or curiosity or friendship) by exposing people to quite simple robots made to move in familiar mammalian ways at mammalian speeds."

Dr. Griffin appears mildly amused by the debate his work has helped unleash. During his visit to the Central Park Zoo he gave a talk to donors and trustees. "Daniel Dennett calls the pursuit of animal consciousness a 'wild goose chase,'" he told the audience with a chuckle. "But there are no neurons or synapses in the human brain that aren't also in animals. It's as difficult to disprove animal consciousness as it is to prove it."

11. The passage most strongly suggests that animal enrichment programs at zoos are designed primarily to do which of the following?
- Offer the animals mental stimulation they might otherwise have had in the wild
 - Trick the animals into eating well-balanced diets
 - Encourage the animals to be more tolerant of humans
 - Prepare the animals for potential release into their natural habitats

12. Gus the polar bear's behavior with the synthetic log in the first paragraph would most likely be explained by Daniel Dennett and Herbert Terrace as which of the following?
- F. Physical response to an external stimulus
 - G. Mental stimulation for animal enrichment
 - H. Evidence of phenomenal consciousness
 - J. An example of self-consciousness
13. The examples supplied in the fourth paragraph (lines 22–35) appear most to undermine the position held by:
- A. the passage's author.
 - B. Donald Griffin.
 - C. Colin McGinn.
 - D. Daniel Dennett.
14. The passage indicates that animal rights advocates would be most likely to agree with which of the following statements?
- F. Some animal species ought to be called stimulus response automata.
 - G. Animal enrichment programs are well intentioned but ultimately ineffective.
 - H. Most animal species have some degree of phenomenal consciousness.
 - J. The behaviorist doctrine provides ample support for animal rights.
15. The passage most strongly suggests that today's controversy over whether animals think was prompted by which of the following?
- A. Early scientific work on primate gestures
 - B. A book written by Donald Griffin in the 1970s
 - C. A parrot that can identify colors
 - D. Programs at the Central Park Zoo
16. The main idea of the quotation from Daniel Dennett's essay in the ninth paragraph (lines 73–82) is that:
- F. robots can be built to act extremely similar to humans.
 - G. mammals are quite capable of curiosity and friendship.
 - H. people can easily infer attributes of consciousness from nonconscious things.
 - J. insects are much less likely than mammals to have phenomenal consciousness.
17. The primary function of the last paragraph is to:
- A. suggest that even without definite proof, Donald Griffin is not willing to relinquish his theory.
 - B. summarize in detail the evidence used by Donald Griffin in support of his theory.
 - C. illustrate Donald Griffin's resentment of Daniel Dennett's philosophical position.
 - D. imply that Donald Griffin is prepared to provide new evidence countering Daniel Dennett's statements.
18. According to the passage, stimulus response automata are:
- F. puzzles disguised as toys.
 - G. robots with a central nervous system.
 - H. parrots that can identify colors.
 - J. machines made to move like mammals.
19. According to the passage, Donald Griffin believes that scientists' early work on primate gestures and facial expressions was:
- A. overly cautious.
 - B. badly misconstrued.
 - C. somewhat laughable.
 - D. largely satisfactory.
20. According to the passage, the experience of pain and desire by humans is called which of the following by philosophers?
- F. Phenomenal consciousness
 - G. Stimulus response.
 - H. Primate gestures
 - J. Sentience

Passage III

HUMANITIES: This passage is adapted from "Reading Blind" by Margaret Atwood (©1989 by Margaret Atwood). It was originally published as the introduction to *The Best American Short Stories 1989*.

Our first stories come to us through the air. We hear voices.

Children grow up within a web of stories. We listen before we can read. Some of our listening is more like listening in, to the voices of the adult world, on the radio or the television or in our daily lives. Often it's an overhearing of things we aren't supposed to hear, eavesdropping on gossip or family secrets. From all these scraps of voices, from the whispers and shouts that surround us, even from the silences, the unfilled gaps in meaning, we patch together for ourselves an order of events, a plot or plots; these, then, are the things that happen, these are the people they happen to, this is the forbidden knowledge.

We have all been little pitchers with big ears, shooed out of the kitchen when the unspoken is being spoken, and we have probably all been tale-bearers, blurters at the dinner table, unwitting violators of adult rules of censorship. Perhaps this is what writers are: those who never kicked the habit. We remained tale-bearers. We learned to keep our eyes open, but not to keep our mouths shut.

Two kinds of stories we first encounter form our idea of what a story is and color the expectations we bring to stories later. Perhaps it's from the collisions between these two kinds of stories—what is often called "real life" (and which writers greedily think of as their "material") and what is sometimes dismissed as "mere literature" or "the kinds of things that happen only in stories"—that original and living writing is generated. A writer with nothing but a formal sense will produce dead work, but so will one whose only excuse for what is on the page is that it really happened. Anyone who has been trapped in a bus beside a nonstop talker graced with no narrative skill or sense of timing can testify to that. Expressing yourself is not nearly enough. You must express the story.

Perhaps all I want from a good story is what children want when they listen to tales.

They want their attention held, and so do I. I always read to the end, out of some adult sense of duty owed; but if I start to fidget and skip pages, and wonder if conscience demands I go back and read the middle, it's a sign that the story has lost me, or I have lost it.

They want to feel they are in safe hands, that they can trust the teller. With children this may mean simply that they know the speaker will not betray them by closing the book in the middle, or mixing up the heroes and the villains. With adult readers it's more complicated than that, and involves many dimensions, but there's the same element of keeping faith. Faith must be

kept within the language—even if the story is funny, its language must be taken seriously—with the concrete details of locale, mannerism, clothing; with the shape of the story itself. A good story may tease, as long as this activity is not used as an end in itself. If there's a promise held out, it must be honored. Whatever is hidden behind the curtain must be revealed at last, and it must be at one and the same time completely unexpected and inevitable. It's in this last respect that the story comes closest to resembling two of its oral predecessors, the riddle and the joke. Both, or all three, require the same mystifying buildup, the same surprising twist, the same impeccable sense of timing. If we guess the riddle at once, or if we can't guess it because the answer makes no sense—if we see the joke coming, or if the point is lost because the teller gets it muddled—there is failure. Stories can fail in the same way.

But anyone who has ever told, or tried to tell, a story to children will know that there is one thing without which none of the rest is any good. Young children have little sense of dutifulness or of delaying anticipation. They are longing to hear a story, but only if you are longing to tell one. They will not put up with your lassitude or boredom. If you want their full attention, you must give them yours. You need a sense of urgency.

Urgency does not mean frenzy. The story can be a quiet story. But it must be urgently told. It must be told with as much intentness as if the teller's life depended on it. And, if you are a writer, so it does, because your life as the writer is only as long, and as good, as the story itself. Most of those who hear it or read it will never know you, but they will know the story. Their act of listening is its reincarnation.

From listening to the stories of others, we learn to tell our own.

21. It can reasonably be inferred that the primary purpose of this passage is to:
- persuade readers to stop being tale-bearers and instead be good listeners.
 - present one author's attempt to stop writers from being nonstop talkers and instead practice the craft of a storyteller.
 - instruct readers to practice oral storytelling in order to become good writers.
 - present a viewpoint on the art of storytelling and the relationship between the author and the audience.

- 3
2. Which of the following best describes the way the first paragraph functions in relation to the passage as a whole?
- F. It offers an assertion that is the basis for the author's discussion of storytelling.
 - G. It introduces an opinion that is later contradicted by the author's personal experience.
 - H. It presents a confusing image that is not explained by supporting details in the following paragraphs.
 - J. It supports the essay's assertion that writing is easy because stories come to us through air.
3. When the writer refers to "adult rules of censorship" in lines 18–19, she is most likely referring to rules determined by:
- A. a sense of propriety derived from maturity and social experience.
 - B. the laws that protect the personal privacy of citizens in a democracy.
 - C. the customs and habits practiced by the tellers of tales.
 - D. a shared understanding formed between children who are tale-bearers.
4. In the fourth paragraph (lines 23–37), the author says that a writer must be able to "express the story." It can reasonably be inferred that which of the following is NOT a part of that ability?
- F. Possessing literary and narrative skill
 - G. Retelling events because they occurred
 - H. Pacing the telling of the story
 - J. Combining real experience with fiction
5. According to the passage, what the author calls "real life" (line 27) and "mere literature" (line 29) differ from one another in that:
- A. real life, unlike mere literature, supplies believable action that interests adults but that bores younger audiences.
 - B. real life is associated with daily, actual events, while mere literature is often dismissed as events that only occur in fiction.
 - C. mere literature, unlike real life, provides the details that writers greedily think of as their own material.
 - D. mere literature truly expresses the meaning behind real-life experience, while real life produces formal, dead work.
26. According to the author's comparison, successful stories written for adults and successful tales told to children:
- F. possess no similar attributes.
 - G. are equally easy to compose.
 - H. have little to do with "real life."
 - J. share several important characteristics.
27. The author states that good stories share all of the following characteristics with jokes and riddles EXCEPT a:
- A. mystifying buildup.
 - B. surprise twist.
 - C. predictable ending.
 - D. sense of timing.
28. Based on the passage, a child's experience of overhearing the voices of the adult world is significant because it:
- F. later prevents the child as a writer from being able to distinguish reality and fantasy.
 - G. invites the adult censorship that discourages the child in his or her later formation as a writer.
 - H. provides a child with information later used to create meaning in the child's life.
 - J. enables a child to create a new world of his or her own by tuning out the voices of the adult world.
29. The author states that when she reads a story, her adult response to the story is that she:
- A. feels obligated to read it to the end.
 - B. refuses to finish it if it loses her.
 - C. no longer feels guilty if she skips pages.
 - D. expects it to have a happy ending with all its elements revealed.
30. When the author describes a good story as requiring "a sense of urgency" (line 76), she is most directly referring to the concept that a writer has to:
- F. tell the story with her or his full attention.
 - G. make sure that the story is exciting and fast paced.
 - H. immediately reveal the plot with intentness.
 - J. relate the story out of a sense of duty.

Passage IV

NATURAL SCIENCE: This passage is adapted from *Just Six Numbers: The Deep Forces That Shape the Universe* by Martin Rees (©2000 by Martin Rees).

The Sun is fuelled by conversion of hydrogen (the simplest atom, whose nucleus consists of one proton) into helium (the second-simplest nucleus, consisting of two protons and two neutrons). Attempts to harness fusion as a power source ('controlled fusion') have so far been stymied by the difficulty of achieving the requisite temperatures of many millions of degrees. It is even more of a problem to confine this ultra-hot gas physically in a laboratory—it would obviously melt any solid container—and it has instead to be trapped by magnetic forces. But the Sun is so massive that gravity holds down the overlying cooler layers, and thereby 'keeps the lid on' the high-pressure core. The Sun has adjusted its structure so that nuclear power is generated in the core, and diffuses outward, at just the rate needed to balance the heat lost from the surface—heat that is the basis for life on Earth.

This fuel has kept the Sun shining for nearly five billion years. But when it starts to run out, in another five billion years or so, the Sun's core will contract, and the outer layers expand. For a hundred million years—a brief interval relative to its overall lifetime—the Sun will brighten up and expand into the kind of star known as a 'red giant', engulfing the inner planets and vaporizing any life that remains on Earth. Some of its outer layers will be blown off, but the core will then settle down as a white dwarf, shining with a dull blue glow, no brighter than a full moon today, on the parched remains of the Solar System.

Astrophysicists have computed what the inside of our Sun should be like, and have achieved a gratifying fit with its observed radius, brightness, temperature and so forth. They can tell us confidently what conditions prevail in its deep interior; they can also calculate how it will evolve over the next few billion years. Obviously these calculations can't be checked directly. We can, however, observe other stars like the Sun that are at different stages in their evolution. Having a single 'snapshot' of each star's life is not a fatal handicap if we have a large sample, born at different times, available for study. In the same way, a newly landed Martian wouldn't take long to infer the life-cycle of humans (or of trees), by observing large numbers at different stages. Even among the nearby stars, we can discern some that are still youngsters, no more than a million years old, and others in a near-terminal state, which may already have swallowed up any retinue of planets that they once possessed. Such inferences are based on the assumption that atoms and their nuclei are the same everywhere.

Astrophysicists can compute, just as easily as the Sun's evolution, the life-cycle of a star that is (say) half, twice, or ten times the mass of the Sun. Smaller stars burn their fuel more slowly. In contrast, stars ten

times as heavy as the Sun—the four blue Trapezium stars in the constellation of Orion, for instance—shine thousands of times more brightly, and consume their fuel more quickly. Their lifetimes are much shorter than the Sun's, and they expire in a more violent way, by exploding as supernovae. They become, for a few weeks, as bright as several billion suns. Their outer layers, blown off at 20,000 kilometres per second, form a blast-wave that ploughs into the surrounding interstellar gas.

Supernovae represent cataclysmic events in the life of the stars, involving some 'extreme' physical processes; so supernovae naturally fascinate astronomers. But only one person in ten thousand is an astronomer. What possible relevance could these stellar explosions thousands of light-years away have to all the others, whose business lies purely on or near the Earth's surface? The surprising answer is that they are fundamental to everyone's environment. Without them, we would never have existed. Supernovae have created the 'mix' of atoms that the Earth is made of and that are the building blocks for the intricate chemistry of life. Ever since Darwin, we've been aware of the evolution and selection that preceded our emergence, and of our links with the rest of the biosphere. Astronomers now trace our Earth's origins back to stars that died before the Solar System formed. These ancient stars made the atoms of which we and our planet are composed.

31. The primary purpose of the passage is to:
- encourage readers to become aware of specific stars and constellations in other solar systems.
 - showcase new information astrophysicists have learned through direct observation of the Sun's core.
 - convince readers that the work of astrophysicists is inconclusive with respect to the origin of Earth and its inhabitants.
 - describe the evolution and demise of stars and the effects their deaths have for the planets and life.
32. The passage mentions astrophysicists calculating all of the following about stars EXCEPT:
- what the inside of the Sun should be like.
 - how the Sun will evolve over the next few billion years.
 - what the life cycle of a star bigger or smaller than the Sun is.
 - how long the Sun will emit a dull blue glow.

3. Information in the first paragraph indicates that "controlled fusion" requires all of the following EXCEPT:
- A. the transformation of atomic nuclei.
 - B. ultra-hot temperatures.
 - C. the Sun as the fuel source.
 - D. magnetic containment of helium.
4. According to the passage, what is the last described event in the Sun's life cycle?
- F. It will shine thousands of times more brightly.
 - G. Its core will become a white dwarf.
 - H. Its outer layers will be ejected from the Solar System.
 - J. It will explode as a supernova.
35. In the context of the third paragraph (lines 30–50), lines 38–41 primarily serve to emphasize the:
- A. ability of astrophysicists to locate stars that have the same features and birth date as the Sun.
 - B. difficulty of getting clear photographs of the Sun as it undergoes changes in its structure.
 - C. method used by astrophysicists to verify computations about the Sun.
 - D. fatal mistakes astrophysicists make when observing large sample sets over an extended period of time.
36. Which of the following questions is NOT answered by information given in the passage?
- F. What is one characteristic of a white dwarf?
 - G. What assumption do astrophysicists make in order to compute the evolution of the Sun?
 - H. Why is the Sun so massive in comparison to Earth?
 - J. Why are astronomers fascinated by supernovae?
37. The main purpose of the last paragraph is to:
- A. stress the significance of supernovae to humans and to the formation of Earth.
 - B. present a detailed account of cataclysmic events in the Solar System.
 - C. expose the flaws of Darwin's theories of evolution and selection.
 - D. persuade readers to become amateur astronomers.
38. As it is used in lines 70–71, the phrase *all the others* most likely refers to:
- F. the stellar explosions near Earth.
 - G. the planets in the Solar System.
 - H. astrophysicists and astronomers.
 - J. most people on Earth.
39. The author would most likely agree with which of the following statements?
- A. Fusion will not be used as a power source in the future because of opposition by industrial leaders.
 - B. The age of stars is inferred by calculating their proximity to the Sun.
 - C. The Trapezium stars in the constellation Orion will have a longer life span than the Sun.
 - D. Earth and its inhabitants are made up of particles from primordial stars.
40. The passage most nearly indicates that attempts to harness fusion as a power source have been:
- F. remarkably successful.
 - G. unsuccessful to date.
 - H. hindered by financial issues.
 - J. inconsistent across trials.

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

Lyme disease is caused by bacteria that are transmitted to humans by the bite of infected deer ticks. The first sign of Lyme disease is often a bull's-eye rash on the skin. Figure 1 shows the 2-year deer tick life cycle.

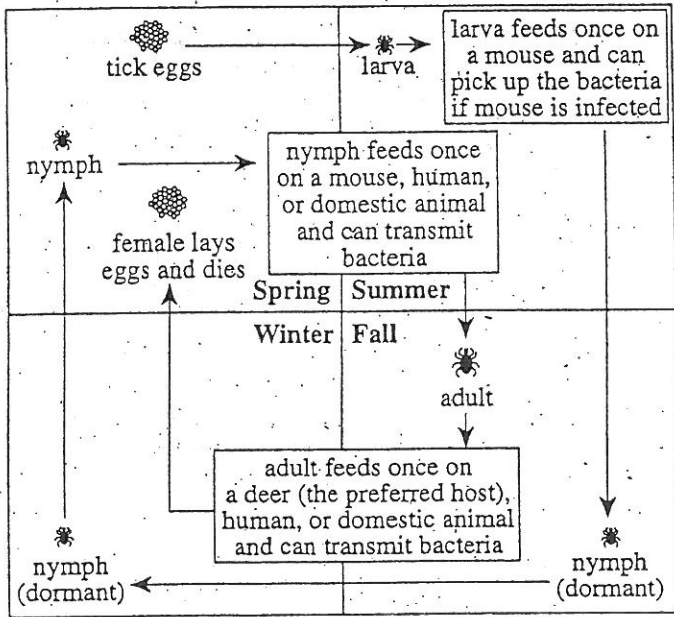
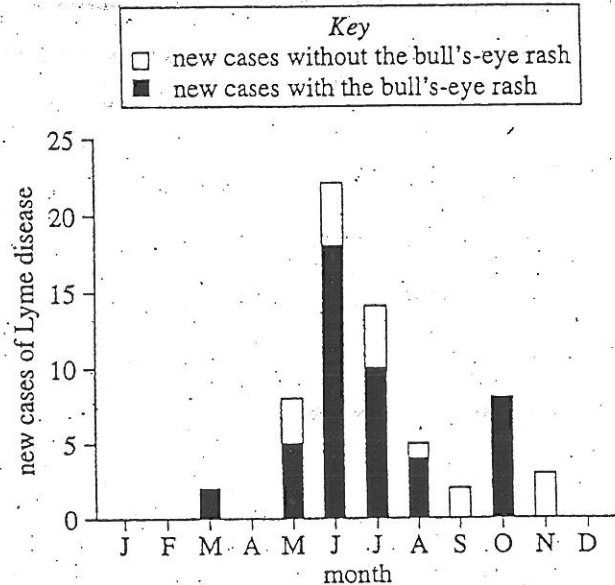


Figure 1

Figure 1 adapted from "Deer Tick Ecology." ©1998 by the American Lyme Disease Foundation, Inc.

A study area adjacent to a forest was divided into 5 zones (A–E). People living in the study area were tested monthly for Lyme disease. The results are shown in Figure 2. For each zone, Table 1 shows the number of houses, mice, deer tick larvae per mouse, households that sighted deer daily, and the percent of households inhabited by at least 1 person infected with Lyme disease.



Note: Bars on the graph are stacked.

Figure 2

Zone	Number of:				Percent of households inhabited by at least 1 infected person
	houses	mice	larvae/mouse	households that sighted deer daily	
A	12	300	50	12	75
B	13	203	19	10	62
C	13	128	23	8	54
D	13	108	67	4	38
E	14	93	20	6	36

Figure 2 and Table 1 adapted from Catherine C. Latavica et al., "Rapid Emergence of a Focal Epidemic of Lyme Disease in Coastal Massachusetts." ©1989 by The Massachusetts Medical Society.

1. Based on Table 1, as the number of mice found in a given zone increased, the number of larvae per mouse:
 - A. increased only.
 - B. decreased only.
 - C. decreased, then remained the same.
 - D. varied with no general trend.
2. Based on Figure 1, which organism is essential in maintaining the Lyme disease bacteria in the deer tick population?
 - F. Deer
 - G. Mice
 - H. Humans
 - J. Domestic animals
3. Based on Table 1, the average percent of households inhabited by at least 1 infected person in Zones A–E of the study area was closest to:
 - A. 30%.
 - B. 40%.
 - C. 50%.
 - D. 60%.
4. Suppose additional data had been obtained about the total number of infected deer tick larvae in each of the zones. Given Table 1, one would predict that the largest total of infected deer tick larvae would have been found in which zone?
 - F. Zone A
 - G. Zone B
 - H. Zone D
 - J. Zone E
5. According to Figure 2, the total number of new cases of Lyme disease was the same for both months in each of the following pairs of months EXCEPT:
 - A. March and September.
 - B. April and December.
 - C. May and October.
 - D. August and November.

Passage II

Oxyfluorocarbons (OFCs) are oils composed of only carbon (C), fluorine (F), and oxygen (O). They are useful as lubricants in exposed mechanical systems on spacecraft. However, OFCs tend to decompose upon exposure to heated metal surfaces, which usually have a *metal oxide* (MO) outer layer (see Figure 1).

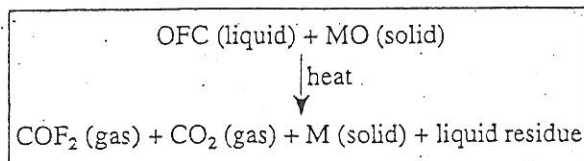


Figure 1

When an oil decomposes, the mechanical systems stop working, crippling the spacecraft.

Chemists studied the decomposition of 2 OFCs (OFC1 and OFC2).

Experiment 1

In a chamber at 100°C and 0.01 atmospheres (atm) pressure, 1.5 g of OFC1 was mixed with 50 mg of powdered iron(III)oxide (Fe₂O₃), an MO. The gases produced by the decomposition of the OFC caused the pressure to increase. The *induction period* (the time for the pressure to rise to 0.20 atm) was measured. Shorter induction periods indicate more rapid decomposition. The procedure was repeated at different temperatures, and for OFC2 (see Table 1).

Table 1.		
Temperature (°C)	Induction period (sec)	
	OFC1	OFC2
100	1,800	998
120	903	603
140	442	301
160	218	133
180	111	52
200	55	18
220	29	6

Experiment 2

The induction periods of OFC1 with various powdered Fe compounds were measured as in Experiment 1 at 180°C (see Table 2). Some of these compounds are hypothesized to exist on heated metal surfaces, or to form as minor by-products of the reaction shown in Figure 1.

Table 2		
Compound	Formula	Induction period (sec)
Iron(II)*oxide	FeO	5,784
Iron(III)fluoride	FeF ₃	3
Iron(III)chloride	FeCl ₃	48
Iron(III)carbonate	Fe ₂ (CO ₃) ₃	996
Iron(III)sulfate	Fe ₂ (SO ₄) ₃	998

*Roman numerals in parentheses indicate the amount of positive charge on the iron atom.

6. If, in Experiment 1, a trial had been done at 150°C, the induction periods (in sec) for OFC1 and OFC2 would most likely have been which of the following?

	OFC1	OFC2
F.	203	311
G.	311	203
H.	301	442
J.	442	301

7. Based on the results of Experiment 2, which compound produced the fastest decomposition of OFC1 at 180°C?

- A. FeO
 B. FeF₃
 C. FeCl₃
 D. Fe₂(CO₃)₃

8. In which of the following ways was the design of Experiment 1 different from that of Experiment 2? In Experiment 1:
- F. only OFC1 was studied; in Experiment 2, only OFC2 was studied.
 - G. only OFC2 was studied; in Experiment 2, only OFC1 was studied.
 - H. temperature was varied; in Experiment 2, temperature was always the same.
 - J. temperature was always the same; in Experiment 2, temperature was varied.
9. In Experiment 1, during the decomposition of OFC2 at 100°C, as time increased from 0 to 998 sec, the pressure in the chamber:
- A. decreased from 0.20 atm to 0.01 atm.
 - B. decreased from 0.01 atm to 0.20 atm.
 - C. increased from 0.20 atm to 0.01 atm.
 - D. increased from 0.01 atm to 0.20 atm.
10. A chemist claimed that under identical conditions, OFC2 will always break down in the presence of an MO more quickly than will OFC1. Are the results of Experiment 1 consistent with her claim?
- F. No; at each temperature tested, the induction period for OFC1 was less than that for OFC2.
 - G. No; at each temperature tested, the induction period for OFC1 was greater than that for OFC2.
 - H. Yes; at each temperature tested, the induction period for OFC1 was less than that for OFC2.
 - J. Yes; at each temperature tested, the induction period for OFC1 was greater than that for OFC2.
11. Based on the information in the passage, which of the following could be the chemical formula for an OFC?
- A. $\text{CF}_3(\text{CF}_2\text{O})_{25}\text{CF}_3$
 - B. $\text{CF}_3(\text{CH}_2\text{CF}_2\text{O})_{45}\text{CF}_3$
 - C. $\text{CF}_3(\text{CF}_2\text{CO}_2)_{15}\text{CCl}_3$
 - D. $\text{CF}_3(\text{CF}_2\text{OCF}_2)_{35}\text{CH}_3$

Passage III

In *Zamia* (a genus of seed plants), males have pollen-producing cones, and females have seed-producing cones. Pollination requires the movement of pollen from inside a male cone to inside a female cone, where multiple *ovules* are located and pollinated. The ovules then develop into seeds. Two students discuss the pollination process.

Student 1

In *Zamia*, 90% of ovule pollinations result from insect pollination; 10% result from wind pollination. No other pollination mechanism exists.

Zamia have *mutualistic* (mutually beneficial) relationships with insects. *Weevils* (a type of beetle) swarm male *Zamia* cones when these cones are releasing pollen. Upon entering the cones, the weevils become covered with the plant's sticky pollen. The weevils then visit the female *Zamia* cones. In the absence of weevils, the percent of ovule pollination in *Zamia* is about 10%.

Wind pollination is infrequent because *Zamia* pollen is large and heavy. Additionally, the openings into the female cones are aligned horizontally, so wind-borne pollen must be blown horizontally to enter these cones.

Student 2

Wind pollination and insect pollination each cause 50% of pollination events in *Zamia* ovules. Without wind pollination, the percent of ovule pollination decreases by 50%. Likewise, without insect pollination, the percent of ovule pollination decreases by 50%. If neither of these processes occurs, the percent of ovule pollination decreases by 100%.

Wind tunnel experiments show that the shape of the female *Zamia* cones creates air currents that facilitate the horizontal movement of pollen into these cones. Additionally, male *Zamia* cones produce enormous quantities of pollen, a trait that is common only in wind-pollinated plants.

Experiments

The students proposed 3 experiments using a natural *Zamia* population in an area with weevils and in which the percent of ovule pollination is normally 99% (see the table).

Experiment	Procedure
1	Some female <i>Zamia</i> cones are covered with plastic bags that exclude insects and wind.
2	Some female <i>Zamia</i> cones are covered with mesh bags that exclude insects, but not wind.
3	Some female <i>Zamia</i> cones are covered with cylinders that exclude wind, but not insects.

12. Suppose Experiment 2 were performed as described. Based on Student 2's hypothesis, the percent of ovule pollination in the female *Zamia* cones that would be covered with mesh bags would be closest to:
- F. 0%.
G. 10%.
H. 50%.
J. 99%.
13. Student 1 states that "wind-borne pollen must be blown horizontally to enter these cones." Which of the following describes how Student 2 responds to this statement? Student 2 argues that the shape of the:
- A. female *Zamia* cones creates air currents that decrease the likelihood that pollen will enter these cones.
B. female *Zamia* cones creates air currents that increase the likelihood that pollen will enter these cones.
C. male *Zamia* cones creates air currents that decrease the likelihood that pollen will enter these cones.
D. male *Zamia* cones creates air currents that increase the likelihood that pollen will enter these cones.

14. Suppose an experiment were performed using a natural population of *Zamia* and that all of the male cones were covered with plastic bags that excluded insects and wind. Assuming that Student 1's hypothesis is correct, the percent of ovule pollination would most likely be closest to:
- F. 0%
 - G. 33%
 - H. 67%
 - J. 100%
15. Student 1 would most likely agree with the statement that *Zamia* pollen is:
- A. never present in the male *Zamia* cones.
 - B. not carried long distances by the wind.
 - C. produced in the female *Zamia* cones.
 - D. smaller than the pollen found in most plants.
16. With regard to the experiments described in the table, Students 1 and 2 would most likely agree that the percent of ovule pollination would be highest in female *Zamia* cones that are:
- F. not covered with a bag or a cylinder.
 - G. covered with mesh bags that exclude insects.
 - H. covered with cylinders that exclude wind.
 - J. covered with plastic bags that exclude insects and wind.
17. Which of the following would most likely be used as a control group in Experiment 1?
- A. Male *Zamia* cones that are covered with mesh bags
 - B. Male *Zamia* cones that are left uncovered
 - C. Female *Zamia* cones that are covered with mesh bags
 - D. Female *Zamia* cones that are left uncovered
18. Suppose the 3 experiments were performed as described. Student 2's hypothesis would be best supported if the percents of ovule pollination were the same for which of the following 2 groups of female *Zamia* cones?
- F. Those in Experiment 1 that were covered with plastic bags and those in Experiment 1 that were not covered with plastic bags
 - G. Those in Experiment 1 that were covered with plastic bags and those in Experiment 2 that were covered with mesh bags
 - H. Those in Experiment 2 that were covered with mesh bags and those in Experiment 2 that were not covered with mesh bags
 - J. Those in Experiment 2 that were covered with mesh bags and those in Experiment 3 that were covered with cylinders

Passage IV

Three studies were conducted to investigate factors that affect wind erosion.

Study 1

Samples of 3 different soils (A–C) were collected from a study area and each was analyzed for sand, silt, and clay particle content and water content (see Table 1).

Soil	Dry particle content (%)			Water content (%)
	sand	silt	clay	
A	79.8	11.7	8.5	2.9
B	67.1	18.1	14.8	6.8
C	17.6	33.2	49.2	21.3

Study 2

Another sample of each soil was dried in an oven for 24 hours, crushed, and passed through a screen with 0.84 mm openings. Each sample was used to fill its own 7 mm deep porous metal tray. Each tray was placed in a wind tunnel. A piece of white tape was placed at the down-wind end of the tray (see Figure 1).

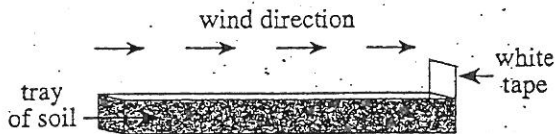


Figure 1

The wind speed was gradually increased until particles from the soil first began to collect on the white tape. This *threshold wind speed* was recorded for each sample.

The procedure described above was repeated, except that sand particles (an abrasive), which had been dyed green, were added at a constant rate to the moving air. The results are shown in Table 2.

Oven-dried Soil	Threshold wind speed (m/sec)	
	no sand added	sand added
A	0.31	0.22
B	0.30	0.21
C	0.31	0.21

Study 3

A third sample of each soil was prepared as in Study 2. Each tray was placed in shallow water for 24 hours to saturate the sample. Each tray was then placed in the wind tunnel and exposed to an 8.5 m/sec wind. Once the wind had dried the top of the soil sample sufficiently, soil particles began to appear on the white tape. At that time, the water content of the top 1 mm of the soil sample was determined. This procedure was repeated 3 more times: first adding dyed sand to the 8.5 m/sec wind, then using a 13 m/sec wind, without and then with added sand. The results are shown in Figure 2.

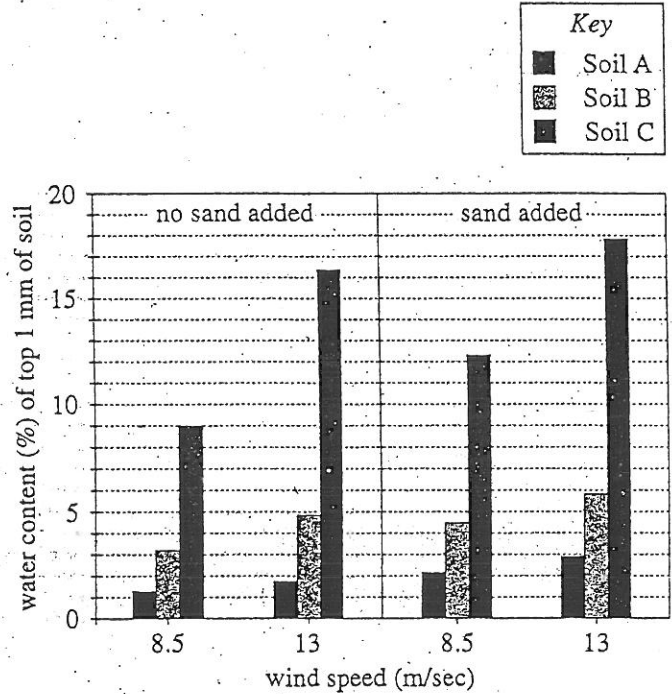


Figure 2

Tables and Figure 2 adapted from A. Selah and D. W. Fryrear, "Threshold Wind Velocities of Wet Soils as Affected by Wind Blown Sand." ©1995 by Williams and Wilkins.

19. It was hypothesized that soils with higher clay contents have typical water contents higher than those of soils with lower clay contents. Is this hypothesis consistent with the results of Study 1?
- A. Yes; as the clay content of the 3 soils increased, the water content decreased.
 - B. Yes; as the clay content of the 3 soils increased, the water content also increased.
 - C. No; as the clay content of the 3 soils increased, the water content decreased.
 - D. No; as the clay content of the 3 soils increased, the water content also increased.

20. A fourth soil from the same study area was analyzed using the procedures described in Study 1 and was found to contain 73% sand, 15% silt, and 12% clay particles. A water content for that soil in which of the following ranges would be most consistent with the results of Study 1?
- F. Less than 2.9%
 - G. Between 2.9% and 6.8%
 - H. Between 6.8% and 21.3%
 - J. Greater than 21.3%
21. Based on Study 1, the water content of Soil C immediately after being saturated for the 24 hours in Study 3 was most likely:
- A. less than 1%.
 - B. between 1% and 5%.
 - C. between 5% and 15%.
 - D. greater than 15%.
22. Which of the following statements about the threshold wind speeds in the trials in which no dyed sand was added to the moving air is supported by the results of Study 2 for the 3 soils?
- F. The threshold speed for Soil A was twice as high as the threshold wind speeds for the other 2 soils.
 - G. The threshold speed for Soil C was twice as high as the threshold wind speeds for the other 2 soils.
 - H. The threshold speeds for all 3 soils were approximately the same.
 - J. The threshold speeds for all 3 soils were all 0 m/sec.
23. Based on the results of Study 2 for a given soil, the addition of dyed sand to the moving air produced a threshold wind speed that was approximately:
- A. one-third lower than the threshold wind speed when no sand was added to the moving air.
 - B. the same as the threshold wind speed when no sand was added to the moving air.
 - C. half again as high as the threshold wind speed when no sand was added to the moving air.
 - D. twice as high as the threshold wind speed when no sand was added to the moving air.
24. Suppose equal volumes of Soil A and Soil B were collected, thoroughly mixed, oven-dried for 24 hours, crushed, and passed through a screen as in Study 2. If this soil sample were then used in a repeat of Study 2 using added dyed sand, the threshold wind speed for this sample would most likely be between:
- F. 0.10 m/sec and 0.15 m/sec.
 - G. 0.15 m/sec and 0.20 m/sec.
 - H. 0.20 m/sec and 0.25 m/sec.
 - J. 0.25 m/sec and 0.30 m/sec.

Passage V

A *capacitor* is a device used to store electrical charge. *Capacitance* is the amount of charge a capacitor can hold at a given voltage.

A student used the circuit shown in Figure 1 to perform 3 experiments.

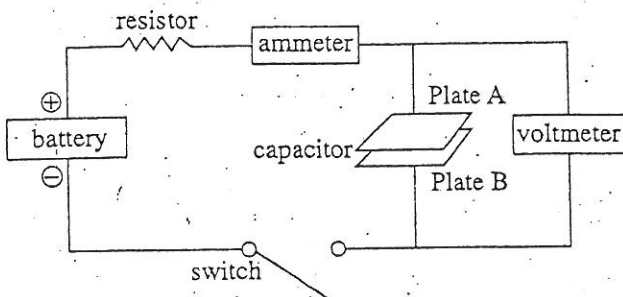


Figure 1

The *parallel-plate capacitor* consisted of 2 identical flat, parallel plates of copper, separated by a small distance (see Figure 2).

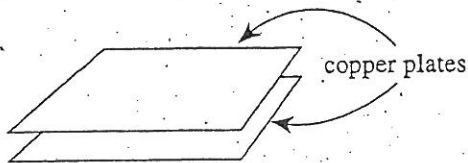


Figure 2

Initially, each plate of the capacitor was *uncharged*. (That is, each plate contained an equal number of positive charges and negative charges.) When the switch in the circuit was closed, *electrons* (negatively charged particles) flowed from Plate A of the capacitor through the ammeter, resistor, and battery to Plate B. After an amount of negative charge (Q) equaling -1×10^{-8} coulomb flowed to Plate B, the switch was reopened, and the voltage (V) in volts, between the charged plates was measured. Finally, the capacitance (C) was calculated in farads (F).

Experiment 1

Two square copper plates, each $0.05 \text{ m} \times 0.05 \text{ m}$ (surface area $2.5 \times 10^{-3} \text{ m}^2$), were separated by various thicknesses of air. The results are shown in Table 1.

Plate separation (10^{-4} m)	V (volts)	C (10^{-11} F)
1	45.2	22.1
5	227	4.4
10	455	2.2

Experiment 2

Three pairs of square copper plates, each pair having a different surface area, were tested. Each pair was separated by a $1 \times 10^{-4} \text{ m}$ thickness of air. The results are shown in Table 2.

Surface area of each plate (10^{-3} m^2)	V (volts)	C (10^{-11} F)
1	112	8.9
3	37.6	26.6
5	22.6	44.2

Experiment 3

The square copper plates from Experiment 1 were separated by a $1 \times 10^{-4} \text{ m}$ thickness of various materials. The number K is related to each material's suitability for use in a capacitor. The results are shown in Table 3.

Material	K	V (volts)	C (10^{-11} F)
Mica	5.4	8.4	119
Water	80.4	0.56	1,780
Titanium dioxide	173	0.26	3,828

25. In Experiment 1, the voltage across the plates increased and the capacitance of the capacitor decreased as the:

- A. surface area of the plates increased.
- B. separation between the plates increased.
- C. separation between the plates decreased.
- D. number K of the material between the plates decreased.

26. In Experiment 2, the student varied which of the following properties of the capacitor?

- F. Number K of the material between the plates
- G. Surface area of the plates
- H. Separation between the plates
- J. Material composing the plates

27. Based on the results of the 3 experiments, the capacitor with which of the following combinations of separation, surface area per plate, and material will have the highest capacitance?

	Separation (m)	Surface area (m ²)	Material
A.	1×10^{-4}	1×10^{-3}	mica
B.	1×10^{-4}	1×10^{-3}	titanium dioxide
C.	1×10^{-4}	2×10^{-3}	titanium dioxide
D.	2×10^{-4}	1×10^{-3}	water

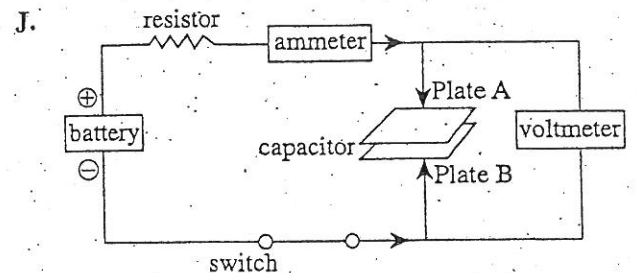
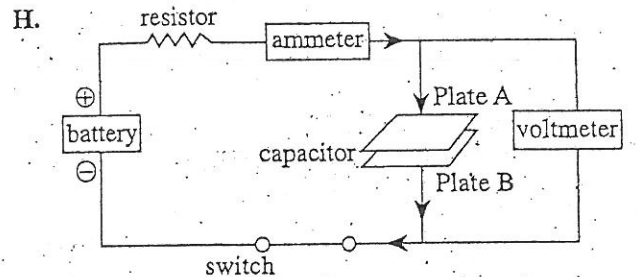
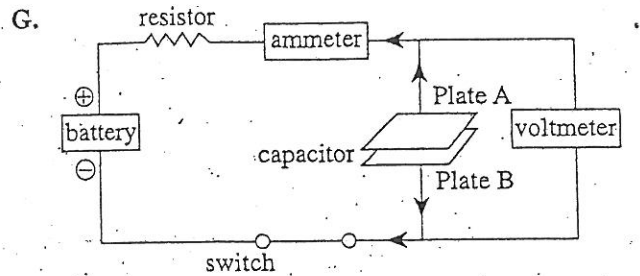
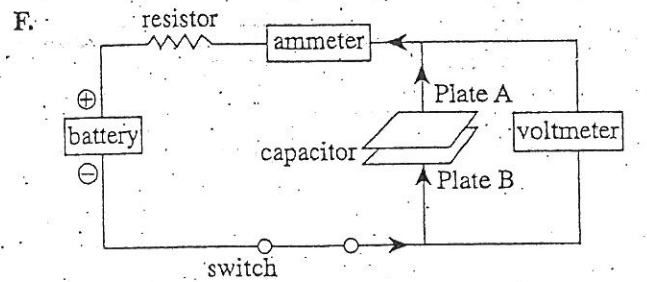
28. Assume that as K decreases, a material's suitability for use between the plates of a capacitor decreases. Based on the results of Experiment 3, which of the following correctly lists mica, water, and titanium dioxide in order of decreasing suitability for use between the plates of a capacitor?

- F. Mica, water, titanium dioxide
- G. Mica, titanium dioxide, water
- H. Titanium dioxide, water, mica
- J. Titanium dioxide, mica, water

29. In each trial of Experiments 1–3, after the capacitor was charged and the switch opened, what was the charge on Plate A?

- A. $+1 \times 10^{-8}$ coulomb
- B. $+2 \times 10^{-8}$ coulomb
- C. $+3 \times 10^{-8}$ coulomb
- D. $+4 \times 10^{-8}$ coulomb

30. To charge the capacitor as described in the passage, the student caused electrons to flow in the direction(s) indicated by which of the following figures?



Passage VI

When compounds dissolve in water, they either give off heat to, or absorb heat from, the solution. The transfer of heat (ΔH) is negative (*exothermic*) when heat is given off, or positive (*endothermic*) when heat is absorbed. Figure 1 shows the ΔH , in kilojoules per mole (kJ/mole, where 1 mole is 6×10^{23} molecules of any compound), when Compounds A or B dissolve in water at 25°C. *Solubility* is the maximum amount of a compound that will dissolve in a given volume of solvent. Figures 2 and 3 show how temperature affects the solubility (in moles/L) of Compounds A and B, respectively, in water.

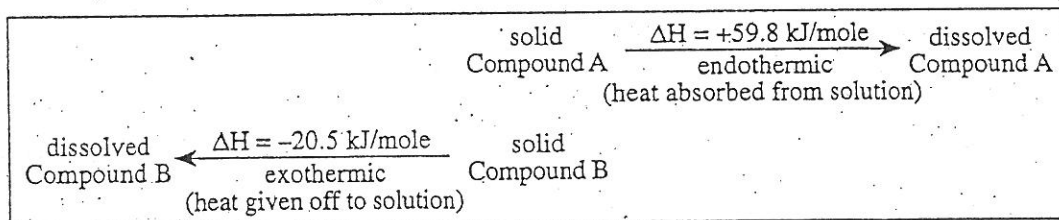


Figure 1

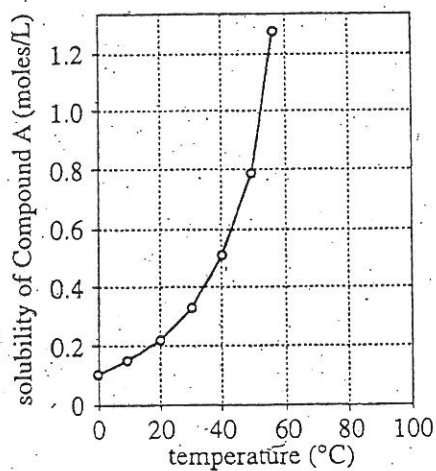


Figure 2

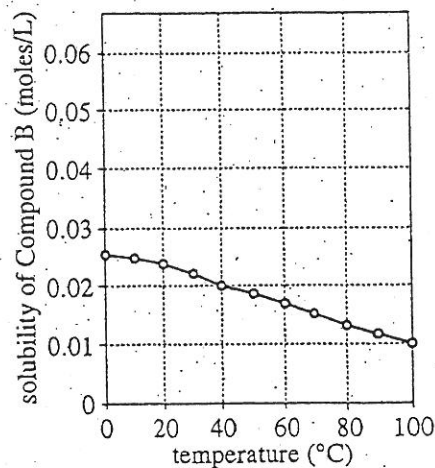


Figure 3

31. According to Figures 2 and 3, Compounds A and B have the same solubility at what temperature, if any?
- A. 0°C
 - B. 35°C
 - C. 55°C
 - D. The solubilities are not equal at any temperature shown in the figures.
32. A solution is made that has a concentration of 1 mole/L of Compound A and 0.5 mole/L of Compound B. According to the passage, the number of molecules of Compound A in the solution is:
- F. half the number of molecules of Compound B in the solution.
 - G. equal to the number of molecules of Compound B in the solution.
 - H. twice the number of molecules of Compound B in the solution.
 - J. 4 times the number of molecules of Compound B in the solution.
33. A chemist claimed that compounds that dissolve exothermically in water decrease in solubility as temperature increases. Is her claim supported by the data in Figures 1–3?
- A. Yes; the solubility of Compound A decreased as temperature increased.
 - B. Yes; the solubility of Compound B decreased as temperature increased.
 - C. No; the solubility of Compound A increased as temperature increased.
 - D. No; the solubility of Compound B increased as temperature increased.
34. A chemist added either Compound A or Compound B to water at 25°C . The temperature of the solution decreased until the solution began to freeze. Based on the data in Figure 1, which compound did he most likely add to the water?
- F. Compound A, because its ΔH is positive.
 - G. Compound A, because its ΔH is negative.
 - H. Compound B, because its ΔH is positive.
 - J. Compound B, because its ΔH is negative.
35. Ammonium nitrate is a compound that has a ΔH of $+25.7$ kJ/mole when it dissolves in water at 25°C . Based on the data in Figure 1, if 1 mole each of ammonium nitrate and Compound A are dissolved separately in equal amounts of water at 25°C , how will the transfer of heat compare?
- A. Ammonium nitrate will absorb less heat from the solution than will Compound A.
 - B. Ammonium nitrate will absorb more heat from the solution than will Compound A.
 - C. Ammonium nitrate will give off less heat to the solution than will Compound A.
 - D. Ammonium nitrate will give off more heat to the solution than will Compound A.

Passage VII

Planets revolve around the Sun in elliptical orbits, as shown in Figure 1.

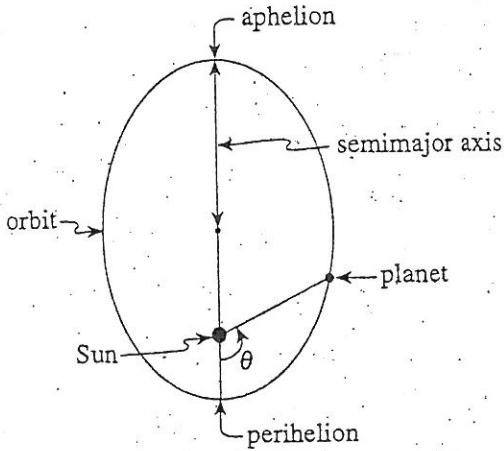


Figure 1

The *eccentricity* of an ellipse describes its elongation; the more elongated the ellipse, the greater its eccentricity. The semimajor axis is half the length of the ellipse.

Perihelion (Angle $\theta = 0^\circ$) is the point on the orbit closest to the Sun; *aphelion* ($\theta = 180^\circ$) is the point on the orbit farthest from the Sun. The speed of a planet varies with θ . The speed of a planet versus θ is shown in Figure 2 for orbits with various eccentricities and semimajor axes.

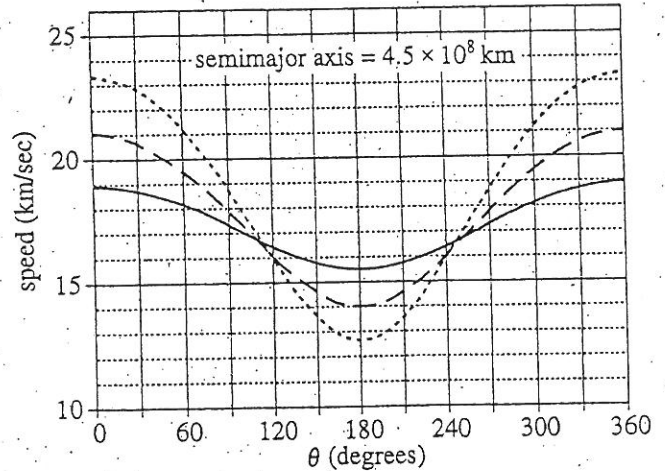
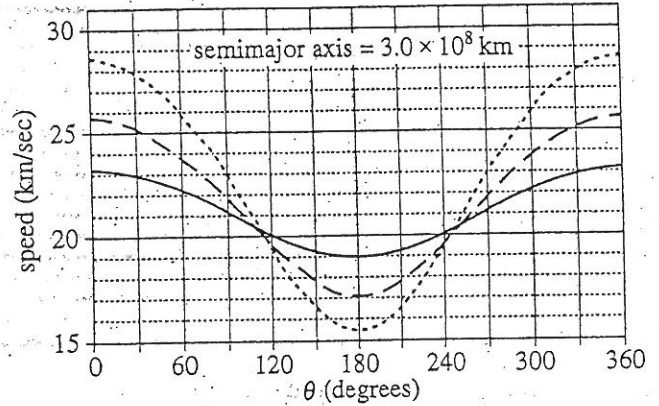
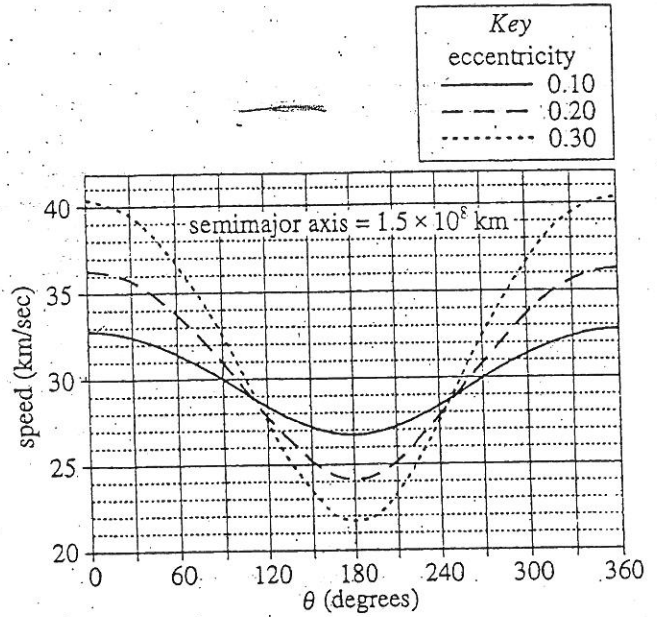


Figure 2

36. Consider a planet as it travels from $\theta = 0^\circ$ to $\theta = 359^\circ$ in an orbit with a semimajor axis of 1.5×10^8 km and an eccentricity of 0.10. Based on the data in Figure 2, how many times does the planet have a speed of 30 km/sec as it travels between those 2 angles?
- F. One time
G. Two times
H. Three times
J. Four times
37. Based on the data in Figure 2, how does the speed of a planet change while it moves from perihelion to aphelion and while it moves from aphelion to perihelion?
- | | <u>Perihelion to aphelion</u> | <u>Aphelion to perihelion</u> |
|----|-------------------------------|-------------------------------|
| A. | speed increases | speed increases |
| B. | speed increases | speed decreases |
| C. | speed decreases | speed increases |
| D. | speed decreases | speed decreases |
38. A planet will escape from the solar system if its orbital speed is greater than the *escape velocity*. Based on the data in Figure 2, if the semimajor axis is 1.5×10^8 km, the eccentricity is 0.10, and the escape velocity at perihelion is 44.2 km/sec, will the planet escape the solar system?
- F. Yes, because the planet's orbital speed at perihelion is greater than the escape velocity.
G. Yes, because the planet's orbital speed at perihelion is less than the escape velocity.
H. No, because the planet's orbital speed at perihelion is greater than the escape velocity.
J. No, because the planet's orbital speed at perihelion is less than the escape velocity.
39. Based on the data in Figure 2, the orbital speed of a planet will most likely remain constant if the eccentricity of the planet's orbit is:
- A. exactly 0.
B. between 0.1 and 0.5.
C. between 0.5 and 0.9.
D. exactly 1.
40. Based on the data in Figure 2, for a planet in an orbit around the Sun with a semimajor axis of 3.0×10^8 km and an eccentricity of 0.05, the speed at $\theta = 0^\circ$ will be:
- F. less than 23 km/sec.
G. between 23 km/sec and 26 km/sec.
H. between 26 km/sec and 28 km/sec.
J. greater than 28 km/sec.

END OF TEST 4

STOP! DO NOT RETURN TO ANY OTHER TEST.

English

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

Math

- 51) B
- 52) G
- 53) B
- 54) F
- 55) A
- 56) H
- 57) D
- 58) H
- 59) D
- 60) H
- 61) C
- 62) J
- 63) A
- 64) H
- 65) B
- 66) J
- 67) A
- 68) H
- 69) C
- 70) G
- 71) B
- 72) F
- 73) B
- 74) G
- 75) C

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

- 51) D
- 52) H
- 53) B
- 54) G
- 55) D
- 56) F
- 57) A
- 58) G
- 59) E
- 60) K

Reading

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

Science

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

One of the...

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 63E

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