ACT真题集

2003年12月-61E

第九套

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“Tomorrow is the first blank page of a 365-page book. Write a good one!”

Form 61E

(2003年12月) | 2015年第五版

ENGLISH TEST

45 Minutes—75 Questions

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

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

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

PASSAGE I

The Alligator: More Than Just a Pretty Smile

[1]

Alligators are native to the southeastern United States. They live and reside in freshwater ponds, lakes, swamps, marshes, and streams. The average male is thirteen feet long and weighs 600 pounds, females are slightly smaller. Hatchlings are less than nine inches long and weigh about three ounces.

[2]

Less than 9 percent of all hatchlings survive their first two and a half years predators find them easy quarry. However, alligators who do reach adulthood are well suited for continued survival. Alligators have a remarkable metabolism that enables them to withstand cool weather and allows them to survive traumatic injuries, such as losing a limb. They can stay underwater without breathing for twenty-four hours. They can go a year without eating, if necessary. If they survive to reach adulthood, alligators can live fifty years.

1. A. NO CHANGE
   B. The habitat where they live consists of
   C. Living in the habitat of
   D. They live in

2. F. NO CHANGE
   G. pounds females being
   H. pounds; females are
   J. pounds; females being

3. A. NO CHANGE
   B. years. Predators
   C. years, predators
   D. year's predators

4. F. NO CHANGE
   G. weather, it
   H. weather also it
   J. weather, it also

[3]

An alligator's brain is small—about the size of a walnut. Despite this, alligators are superb and excellent[5] hunters. They camouflage themselves merely by floating on the surface of the water. To their unsuspecting[6] prey, they look like harmless logs. Using highly sensitive hearing, sight, and smell, as well as touch receptors on the sides of their jaws[7] alligators easily identify prey. Flaps in their nose, throat, and ears close to keep water out, so that[8] transparent membranes protect their eyes when it permitted[9] them to see or hunt underwater as well as on the surface. Alligators can go[10] through water at astonishing speeds. Their jaws contain seventy to eighty conical teeth and has[11] a closing power of up to 1,200 pounds per square inch.

[4]

Experienced alligator hunters believe that alligators are thriving, and authorities estimate that there are well over[12] a million alligators in the wild. The greatest threat to the alligator is the loss of it's[13] habitat as wetlands are drained; to build housing[14] for

5. A. NO CHANGE
   B. superbly excellent
   C. excellently superb
   D. superb

6. NO CHANGE
   G. (Do NOT begin new paragraph) Unsuspecting to their
   H. (Begin new paragraph) To their unsuspecting
   J. (Begin new paragraph) Unsuspecting to their

7. A. NO CHANGE
   B. receptors, on the sides of their jaws
   C. receptors on the sides of their jaws;
   D. receptors on the sides of their jaws,

8. F. NO CHANGE
   G. in which
   H. and
   J. since

9. A. NO CHANGE
   B. while permitting
   C. to have permitted
   D. permits

10. The writer wants to emphasize here how quickly alligators move. Which choice would most dramatically achieve this effect?
    F. NO CHANGE
    G. proceed
    H. streak
    J. advance

11. A. NO CHANGE
    B. employs
    C. possesses
    D. have

12. F. NO CHANGE
    G. are over more than
    H. is well over
    J. is considerably more than

13. A. NO CHANGE
    B. its
    C. they're
    D. there

14. F. NO CHANGE
    G. drained to build housing
    H. drained, to build, housing
    J. drained, to build housing,

and visited it but never lived there again. [23]

[3]

The farm connects[24] to the Civil War general and U.S. president motivated the recent restoration by a team of National Park Service historians, laborers, and archaeologists. Their goal in the project has been to restore the farm to the way it looked under the Grants' ownership.

[4]

In addition to restoring the main house's front porch and roof and stabilizing its chimneys, the repairing of windows was being performed by workers.[25] On February 2, 1998, as the chief maintenance officer removed a second-floor window casing[26] he spotted a scrap of yellowed paper caught in a cavity between the window and the wall. When he gingerly unfolded the paper and read the words "Dearest Julia," he knew he had *discovered* something special.

[5]

[1] The letter is a fragment, stained and ragged and torn. [2] The return address indicates that Ulysses Grant mailed the letter to his wife in 1851 while he was stationed with the army in Detroit. [3] Because he wrote about household concerns, including his horse Nelly, the letter seems to be ordinary correspondence amid[27] husband and wife. [4] According to the National Park Service, that is what makes it significant. [5] Historians at White Haven want to establish for visitors a sense of the typical everyday life of the Grant family in Missouri.

23. Which of the following sequences of sentences makes Paragraph 2 most logical?
    - A. NO CHANGE
    - B. 1, 3, 2
    - C. 2, 1, 3
    - D. 2, 3, 1

24. F. NO CHANGE
    - G. farm's connection
    - H. farming connects
    - J. farmer's connecting

25. A. NO CHANGE
    - B. workers repaired and fixed windows.
    - C. workers repaired windows.
    - D. remodeling by fixing windows was being done by workers.

26. F. NO CHANGE
    - G. casing,
    - H. casing:
    - J. casing;

27. A. NO CHANGE
    - B. between
    - C. among
    - D. for

[6] The letter will help them do so. [29]

28. Which choice offers the most effective conclusion for Paragraph 5?
    F. NO CHANGE
    G. The letter is truly unlike any other.
    H. That everyday life is not much like ours.
    J. White Haven is important to American history.

29. Upon reviewing Paragraph 5 and finding that some information has been left out, the writer composes the following sentence:

    He was then a first lieutenant; he would not become a general until 1861, during the Civil War.

    If this sentence were added to the paragraph, the most logical place to put it would be after Sentence:
    A. 2.
    B. 3.
    C. 4.
    D. 5.

Question 30 asks about the preceding passage as a whole.

30. Suppose the writer's goal had been to write an essay about how the Ulysses S. Grant National Historic Site has heightened public awareness of such sites. Would this essay fulfill that goal?
    F. Yes; the focus of the essay is on matters having to do with Ulysses S. Grant, who was president of the United States not long after the Civil War.
    G. Yes; the essay reveals how a body of important historical artifacts helps to shape our understanding of the country's past.
    H. No; the essay does not make any specific connection between the historic site and public awareness of the site's significance.
    J. No; the essay offers only a limited look at a slice of American history and there is nothing particularly positive in the information the essay provides about the historic site.

PASSAGE III

Extending Myself

Some people say that a woman's hair is her crowning glory. Well, my decade-old hairstyle had begun to look like a tarnished crown, so I opted for [31] something new—braid extensions. At Renee's Beauty Salon, I can not only get my hair done but also hear the latest neighborhood

31. Which of the following alternatives to the underlined portion would NOT be acceptable?
    A. decided on
    B. wished on
    C. went for
    D. chose

news and various other local happenings. [32]

It will take Renee all morning to remake me into the image and likeness of a stately [33] and striking African American diva. She tunes in her favorite talk show and sets to work. Renee starts by [34] cornrowing my natural hair, braiding it as close [35] to my scalp. This creates a base for the individual braided extensions that will later be tied into the rows. [36]

"These people need direction in their lives," Renee observes about the talk show's troubled guests. I nod, partly, in agreement partly because my head rocks [37] back and forth as she pulls and tugs. Shifting her attention slightly, I am asked which church I attend and invited [38] to visit her congregation.

The way Renee cornrows my hair is soothing, [39] like a scalp massage. While the loose ends of each [40] row are brought together into one final plait, which is tucked under at the back of my head. Then Renee, who has a degree from a beauty school, [41] inserts the thin braided extensions, one by one,

32. Given that all the choices are examples of something else discussed at the beauty salon, which one provides the most specific example?
   F. NO CHANGE
   G. whether Whitney Houston wears a wig or a weave.
   H. other topics relevant to the community.
   J. which politician is in hot water now.

33. Given that all the choices are true, which one would most effectively emphasize how dramatic the change will be?
   A. NO CHANGE
   B. transform me from an everyday mother of two into
   C. perfect the hairstyle that will turn me into
   D. ply her trade so that I end up looking like

34. Which of the following alternatives to the underlined portion would NOT be acceptable?
   F. establishes
   G. proceeds
   H. starts
   J. gets

35. A. NO CHANGE
   B. as closely
   C. close as
   D. close

36. F. NO CHANGE
   G. extensions that eventually are going to
   H. extensions, the latter of which will
   J. extensions so that they will

37. A. NO CHANGE
   B. nod, partly in agreement,
   C. nod partly, in agreement,
   D. nod, partly in agreement

38. F. NO CHANGE
   G. there's a question about which church I attend, and I am invited
   H. Renee asks which church I attend and invites me
   J. I'm asked about the church I attend, inviting me

39. Which of the following alternatives to the underlined portion would NOT be acceptable?
   A. The way in which Renee cornrows my hair
   B. Renee cornrows my hair in a way that
   C. The way that Renee cornrows my hair
   D. The way of Renee cornrows my hair

40. F. NO CHANGE
   G. After the
   H. When the
   J. The

41. A. NO CHANGE
   B. Renee, having graduated from a local beauty school,
   C. Renee
   D. OMIT the underlined portion.

using a large crochet needle to pull them through the cornrows. Each synthetic braid is tied to my natural hair with a tight double knot, which Renee guarantees it will [42] not unravel. After three hours, three hundred braids, and one final double knot, I stare in the mirror at myself and at the mound of long black braids. "Beautiful," Renee proclaims, [43] "just like Janet Jackson."

I have since had some of the braids replaced with light and dark brown ones for variation. [44] I like to think I stand out more in a crowd, and I definitely feel more sure of myself. Some people are intrigued, examining my hair as if it were a work of art and asking me how I did it. I resist explaining, simply saying that my hair is an "extension" of how I feel inside. [45]

42. F. NO CHANGE
G. that it
H. they
J. OMIT the underlined portion.

43. Which choice would most effectively emphasize the sense of approval in Renee's statement?
A. NO CHANGE
B. verbalizes,
C. comments,
D. remarks,

44. F. NO CHANGE
G. so that there are varied and diverse colors.
H. to provide different colors for variation.
J. for the variation of different colors.

45. The primary purpose of the quotation marks around the word *extension* in the preceding sentence is to signal to the reader that the word:
A. has a specific technical meaning here related to the art of hairstyling.
B. is referring to something different here than elsewhere in the essay.
C. could be considered an alternate title for the essay.
D. is either slang or invented vocabulary.

PASSAGE IV

My Soccer Pal

If you were to ask my mother what she remembers most vividly about my birth. [46] She might tell you about the gift my father brought me while I was still in the hospital: [47] a soccer ball. Perhaps the gift is not as surprising as it sounds. [48] My dad

46. F. NO CHANGE
G. birth. Then she
H. birth, which she
J. birth, she

47. A. NO CHANGE
B. still in the hospital;
C. still, in the hospital,
D. still in the hospital

48. If the writer were to delete the preceding sentence, the paragraph would primarily lose:
F. an effective and logical transition.
G. an important new point in the argument.
H. an example that clarifies a point previously made.
J. supporting evidence for statements made later in the paragraph.

is a serious soccer player who's early ambition had
49
been to play professionally in his native country,

Mexico. Consequently, what did my dad think a
50

baby could of done with that huge ball?
51

I didn't experience love at first

sight, in the beginning. Many months passed before
52
I paid any attention to the soccer ball. I learned to clutch it and roll over with it when I began to sit up and crawl. My dad insists that it was the endless hours he spent
53
kicking the ball to me when I was five or six helped me to develop my soccer skills. However, I know that I started enjoying the sport when Max, our dog, joined our practices. [54]

Max was an eighty-pound German shepherd who loved running after any moving object. He was strong, swift, and smart, but above all he was gentle. Even though
55
he would go after the ball at full speed, he never hurt me.

Regardless, he challenged me to be quick enough and
56
creative enough to take the ball from him.

The practice session would start with Dad kicking the ball to an open area. Max would immediately run after the ball and the ball would be stopped with his nose. As I
57
approached Max, he would protect the ball by circling

49. A. NO CHANGE
B. that's
C. whose
D. which

50. F. NO CHANGE
G. In fact,
H. Still,
J. Thus,

51. A. NO CHANGE
B. would of done
C. would done
D. could do

52. F. NO CHANGE
G. sight from the start.
H. sight initially.
J. sight.

53. A. NO CHANGE
B. because of
C. being
D. OMIT the underlined portion.

54. In order to indicate a source for the information in the first half of this paragraph, the writer has decided to add a phrase at the beginning of the paragraph's opening sentence. Given that all the following are true, which one would best accomplish this purpose?
F. Some people might say
G. According to Mom,
H. It's clear that
J. At this point,

55. A. NO CHANGE
B. (Do NOT begin new paragraph) Just as
C. (Begin new paragraph) Despite the fact that
D. (Begin new paragraph) Even though

56. F. NO CHANGE
G. Besides,
H. Instead,
J. So far,

57. A. NO CHANGE
B. the ball would stop
C. stopping it
D. stop it

around it and faking me with his moves. I would try to stay with him until I could find the perfect angle to attack the ball, but he was usually one step ahead of me. It has [58]

58. Which of the following alternatives to the underlined portion would NOT be acceptable?
F. ball, although
G. ball; however,
H. ball, which
J. ball, yet

been for ten years since those days, but I can still [59] remember how good I felt every time I won the ball from Max.

59. A. NO CHANGE
B. over
C. more then
D. passed

I can't tell exactly when my enthusiasm for the sport began—perhaps the day Dad put the ball in my crib, or perhaps the day I first played soccer with Max. I do know, however, that I owe much of my success in [60] the sport to Max, my favorite partner for soccer practice.

60. F. NO CHANGE
G. know, however,
H. know, however
J. know however,

PASSAGE V

My New Set of Wheels

The day after I moved back to New York City, I went out and bought a vegalah. The word *vegalah* is Yiddish for "little wagon," and when I was growing up in the Bronx, that's what we called the hip-high wire basket on two wheels [61] that my parents used for all sorts of errands. My parents seldom bothered to fold up or store away their vegalah in a closet. Moreover, [62] they kept the cart by the front door, ready for when they needed to haul laundry down the long basement corridor to the washing machines even [63] to carry flour, chocolate, and walnuts to my grandmother's Popham Avenue apartment, where my sister preferred to bake. They'd also use it to wheel books to and from the public library.

61. A. NO CHANGE
B. hip-high, wire, basket, on two wheels
C. hip-high wire basket on two wheels,
D. hip-high wire, basket on two wheels,

62. F. NO CHANGE
G. However,
H. Instead,
J. After that,

63. A. NO CHANGE
B. or
C. as if
D. OMIT the underlined portion.

[1] Now, walking along Montague Street in Brooklyn, I notice all sorts of vegalahs.

[2] There's the gleaming silver vegalah, its' handle [64] serving a practical purpose. [65] [3] That one belongs to the apartment manager, who lives upstairs, then [66] there's the broad, rattling plastic vegalah of the neighbor [67] who lives downstairs. [4] I can often identify their owners just by looking at the carts. [5] That cart usually contains piles of fabric topped off with something fancy, such as [68] a bunch of peacock feathers or a spool of lace.

[6] And then there are the copies of my own vegalah that I see coming and going, pulling [69] by a number of area residents, who may, like me, wish their carts had more individuality. [70]

The vegalah I bought is a bright blue model with sturdy black wheels. But new carts are like new sneakers: they [71] lack the character that comes from use. The skeletal wire frame, the hooks that jingle, the grey or plaid liner—over time, these acquire as much distinctiveness [72] as a human face. I wonder how my cart will age, whether it will warp or wobble or develop an endearing squeak.

64. F. NO CHANGE
G. this
H. it's
J. its

65. Given that all of the choices are true, which one contains description that best *suggests* a distinctive feature of this vegalah?
A. NO CHANGE
B. neatly repaired with duct tape.
C. about the same size as the one on my vegalah.
D. as sturdy as most.

66. F. NO CHANGE
G. upstairs. Then
H. upstairs, meanwhile
J. upstairs, but

67. Given that all of the choices are true, which one adds new information to the essay that contributes to this paragraph's attention to the owners of the vegalahs?
A. NO CHANGE
B. New York City resident
C. seamstress
D. cart owner

68. Which of the following alternatives to the underlined portion would NOT be acceptable?
F. fancy:
G. as fancy as
H. fancy
J. fancy, perhaps

69. A. NO CHANGE
B. going are pulled
C. going, they are pulled
D. going, pulled

70. For the sake of the logic and coherence of the paragraph, the best placement of Sentence 4 would be:
F. where it is now.
G. before Sentence 1.
H. after Sentence 1.
J. after Sentence 2.

71. A. NO CHANGE
B. sneakers, they
C. sneakers, but
D. sneakers

72. F. NO CHANGE
G. acquire, as much distinctiveness,
H. acquire, as much distinctiveness
J. acquire as much distinctiveness,

I enjoy the operating of it[73] because it makes me feel like an urban citizen. Also, every day I feel a spindly, ringing connection along with[74] my parents as I wheel the vegalah over the pavement to my new home.[75]

73. A. NO CHANGE
    B. the experience of operating it
    C. making use of it as a possession
    D. using it

74. F. NO CHANGE
    G. for
    H. with
    J. of

75. Given that all the choices are true, which one concludes the essay in a way that is most consistent with the focus of the essay?
    A. NO CHANGE
    B. think about all they did for me as a child.
    C. leave the apartment early every morning.
    D. remember my reasons for moving back to New York.

END OF TEST 1

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

MATHEMATICS TEST

60 Minutes—60 Questions

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

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

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

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

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

DO YOUR FIGURING HERE.

1. If a car averages 20 miles per gallon of gasoline and gasoline costs $1.20 per gallon, how much would the gasoline cost to drive the car 300 miles?

   A. $72
   B. $36
   C. $24
   D. $18
   E. $15

2. The A-1 Cab Company charges $2.60 for the first $\frac{1}{2}$ mile of a cab ride and $1.25 for each additional $\frac{1}{2}$ mile, regardless of how many people are in the cab. Two students share a cab ride from the bus station to their college dormitory, a distance of $2\frac{1}{2}$ miles. If they share the cost of the cab equally, how much is each person's share?

   F. $7.60
   G. $6.50
   H. $5.10
   J. $3.85
   K. $3.80

3. Sam received scores of 86, 81, 82, 80, and 71 on 5 equally weighted tests. Which of the following is his mean score?

   A. 83
   B. 82
   C. 81
   D. 80
   E. 79

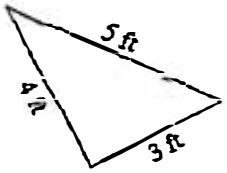
4. Three friends will run a race. If there are no ties, in how many distinct orders can these 3 friends finish the race?

   F. 2
   G. 3
   H. 4
   J. 5
   K. 6

5. The 1st term in the geometric sequence $-3, 6, -12, 24, -48, \ldots$ is -3. What is the 6th term?

A. 96
B. 72
C. −72
D. −96
E. Cannot be determined from the given information

6. How many triangles that have integer side lengths are similar to the triangle shown below?



F. 1
G. 2
H. 3
J. 4
K. Infinitely many

7. When $a = 7$, $b = -3$, and $c = 4$, $bac - ac^2 - ab = ?$

A. −217
B. −175
C. −49
D. 7
E. 217

A rectangle has a width of $(3x - 2)$ feet and a length of $(4x + 3)$ feet. Which of the following expressions represents the area, in square feet, of the rectangle?

F. $12x^2 - 6$
G. $12x^2 + x - 6$
H. $12x^2 + x + 6$
J. $12x^2 - 17x + 6$
K. $12x^2 + 17x - 6$

What is 4% of 7.34×10^4 ?

A. 293,600
B. 29,360
C. 2,936
D. 1,835
E. 183.5

Due to gravitational differences between the Moon and Earth, an astronaut who weighs 198 pounds on Earth weighs, proportionally, 33 pounds on the Moon. How many pounds would an astronaut who weighs 120 pounds on Earth weigh on the Moon?

F. 6
G. 18
H. 20
J. 33
K. 45

What is the perimeter, in meters, of a square having an area of 4 square meters?

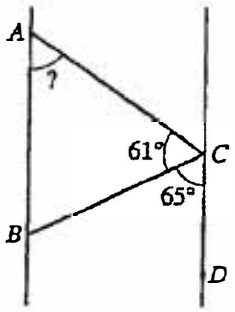
A. 2
B. 4
C. 6
D. 8
E. 10

DO YOUR FIGURING HERE.

12. The number of bricks, B, needed to build a wall of uniform length L feet and uniform height H feet can be found by the equation $B = 7LH$. A wall of uniform height that is 20 feet long is constructed using 350 bricks. What is the height, in feet, of the wall?

F. 0.25
G. 1.75
H. 2.5
J. 17.5
K. 50

13. In the figure below, $\overleftrightarrow{AB} \parallel \overleftrightarrow{CD}$, $\angle BCD$ measures 65°, and $\angle BCA$ measures 61°. What does $\angle BAC$ measure?

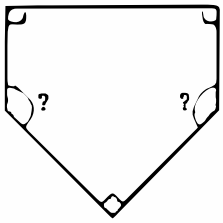


A. 54°
B. 56°
C. 61°
D. 63°
E. 65°

14. Latisha is starting a workout routine. The first day she plans to jog 1 mile. Each day after that, she plans to increase her distance by $\frac{1}{4}$ mile until she is jogging 2 miles per day. Then she plans to continue jogging 2 miles every day. If Latisha begins her workout routine today, how many miles will she jog in the first 7 days?

F. $7\frac{1}{2}$
G. $11\frac{1}{2}$
H. $12\frac{1}{4}$
J. 14
K. 28

15. The home plate of a baseball diamond is illustrated below. The interior angles that are not right angles are congruent. What is the measure of each of these angles?



A. 125°
B. 130°
C. 135°
D. 140°
E. 145°

6. $(4a + 3b + 2c) - (2a + 2b - 7c)$ is equivalent to:

F. $2a + b - 5c$
G. $2a + b + 9c$
H. $2a + 5b - 5c$
J. $2a + 5b + 9c$
K. $12abc$

If $f(x) = -2x^3 - 2x^2$, then $f(-2) = ?$

A. 8
B. 24
C. 48
D. 56
E. 80

This month, Heather sold 75 figurines in 2 sizes. The large figurines sold for $15 each, and the small figurines sold for $10 each. The total amount of money received for the large figurines was the same as the total received for the small figurines. How many large figurines did Heather sell this month?

F. 25
G. 30
H. 37
J. 45
K. 50

What are the 2 positive integers such that the square root of their sum is 5 and the square root of their product is 12 ?

A. 2 and 3
B. 3 and 4
C. 5 and 144
D. 9 and 16
E. 12 and 25

$3(4 - y) = 12 - 2(5y - 1)$, then $y = ?$

$-\frac{2}{13}$

$-\frac{1}{9}$

$\frac{2}{13}$

$\frac{2}{7}$

$\frac{22}{53}$

e hypotenuse of a right triangle is 12 cm long. The nter leg is 5 cm long. What is the length, in centeters, of the other leg of this triangle?

7
8
10
17
$\sqrt{119}$

DO YOUR FIGURING HERE.

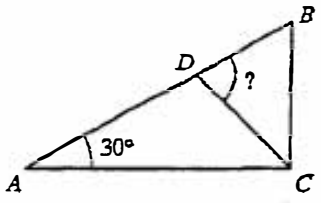
22. What is the distance between the points with coordinates (3,4) and (–2,7) in the standard (x,y) coordinate plane?

F. $\sqrt{10}$
G. $\sqrt{34}$
H. $\sqrt{74}$
J. $\sqrt{82}$
K. $\sqrt{122}$

23. A balloon game at an amusement park is played by tossing darts at a board that duplicates part of the standard (x,y) coordinate plane. A balloon is attached to the board at each point (x,y) such that x and y are integers. If a player breaks 3 balloons attached to adjacent collinear points, the player wins the grand prize. Sheila has broken the balloons at coordinates (–4,2) and (–5,1). Which of the following are the coordinates of a balloon Sheila could break to win the grand prize?

A. (–3, 3)
B. (–4, 1)
C. (–5, 0)
D. (4,–2)
E. (2, 4)

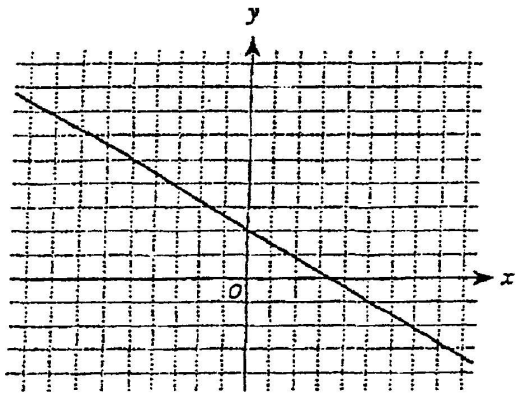
24. In $\triangle ABC$ shown below, the measure of $\angle A$ is 30°, $\angle ACB$ is a right angle, D is on $\overline{AB}$, and $\overline{DC}$ bisects $\angle ACB$. What is the measure of $\angle CDB$, in degrees?



F. 45°
G. 60°
H. 75°
J. 90°
K. 105°

DO YOUR FIGURING HERE.

25. One of the following equations, in slope-intercept form, is the equation of the line shown below in the standard (x,y) coordinate plane. Which one?



A. $y = -\frac{3}{5}x + 2$

B. $y = -\frac{3}{5}x - 2$

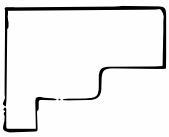
C. $y = -\frac{5}{3}x - 2$

D. $y = \frac{3}{5}x + 2$

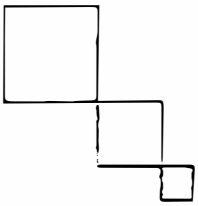
E. $y = \frac{5}{3}x + 2$

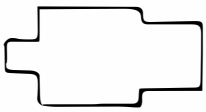
26. Each of the figures below can be divided into 3 squares: one with side lengths 6 cm, another with side lengths 4 cm, and the third with side lengths 2 cm. Which figure has the greatest perimeter?

F. 

J. 

G. 

K. 

H. 

DO YOUR FIGURING HERE.

27. When a bank pays $I\%$ interest, compounded annually, a deposit of $\$P$ increases to $\$P\left(1 + \frac{I}{100}\right)^y$ at the end of y years, where y is a whole number.

Lou initially deposits \$600 in an account that pays 4.75% interest, compounded annually. Lou does not make any further deposits or withdrawals. How much money, in dollars, is in Lou's account after 8 years?

A. $6 \cdot (1 + 4.75)^8$
B. $6 \cdot (1 + 0.0475)^8$
C. $600 \cdot (1 + 4.75)^8$
D. $600 \cdot (1 + 0.0475)^8$
E. $600 \cdot (1 + 0.0475) \cdot 8$

28. The number $\sqrt{2}$ is irrational; its decimal representation neither terminates nor repeats. How many of the following 4 real numbers are irrational?

$(\sqrt{2})^2, (\sqrt{8} \cdot \sqrt{2}), 6\sqrt{2}, (\sqrt{14} + \sqrt{2})$

F. 0
G. 1
H. 2
J. 3
K. 4

29. What is the solution set for the equation $x^2 - 12x + 36 = 4$?

A. $\{-8, -4\}$
B. $\{-2, 8\}$
C. $\{4, 8\}$
D. $\{5, 8\}$
E. $\{7, 10\}$

30. For all real numbers a, which of the following is equivalent to $\sqrt{(\sqrt{a^2})^2}$?

F. 1
G. $\sqrt{a}$
H. $|a|$
J. a^2
K. a^4

DO YOUR FIGURING HERE.

31. Which of the following is NOT equivalent to 80% of n ?

A. $0.80n$

B. $8(0.10n)$

C. $\frac{4n}{5}$

D. $4\left(\frac{n}{5}\right)$

E. $\frac{8n}{100}$

32. Which of the following is the slope of the line with equation $3x + 2y = 7$ in the standard (x,y) coordinate plane?

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

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

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

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

K. $\frac{7}{3}$

33. The function $g(x)$ is defined for all real numbers x. Some of the function values are given in the table below. One of the following equations defines the function $g(x)$. Which one is it?

x	-2	0	1	2	3
$g(x)$	5	-3	-1	5	15

A. $g(x) = x - 3$

B. $g(x) = 2x - 3$

C. $g(x) = x^2 + 1$

D. $g(x) = 2x^2 - 3$

E. $g(x) = 3x^2 - 1$

34. If $90° < \theta < 180°$, and $\sin\theta = \frac{5}{13}$, then $\cos\theta$ = ?

F. $\frac{13}{5}$

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

H. $-\frac{12}{13}$

J. $-\frac{13}{12}$

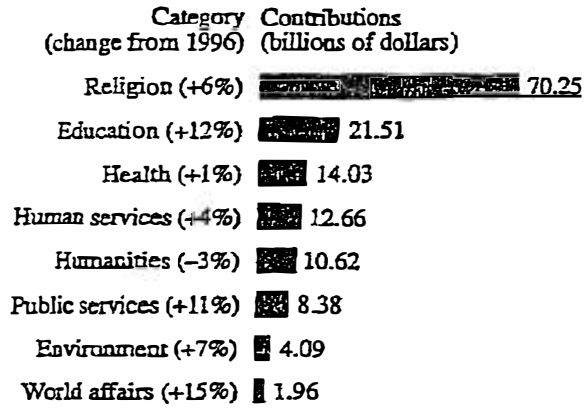
K. $-\frac{13}{5}$

DO YOUR FIGURING HERE.

Use the following information to answer questions 35–38.

In the United States, contributions to 8 categories of charitable organizations totaled $143.5 billion in 1997. The bar graph below shows the distribution of these contributions, in billions of dollars, to the 8 categories. It also gives the percent of change in 1997 contributions compared to 1996 contributions for each category.

1997 Charitable Contributions



35. The 1997 contributions in the human services category were closest to how many times the 1997 contributions in the environment category?

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

36. What is the median of the 8 percents of change listed on the graph?

F. 0.5
G. 3.5
H. 4
J. 6.5
K. 7.4

37. Among the following, which is the closest approximation, in billions of dollars, to the 1996 charitable contributions in the humanities category?

A. 7.43
B. 7.62
C. 10.30
D. 10.95
E. 13.81

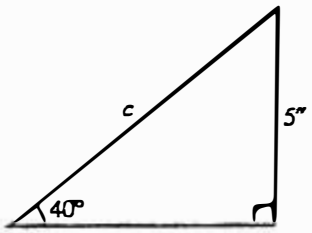
DO YOUR FIGURING HERE.

38. If the given bar graph were converted into a circle graph (pie chart), the sector for the religion category would have a central angle measuring (to the nearest degree) how many degrees?

F. 70°
G. 88°
H. 147°
J. 176°
K. 345°

39. In the right triangle shown below, which of the following expressions gives the correct value of c, in inches?

A. $\frac{5}{\cos 40°}$
B. $\frac{5}{\sin 40°}$
C. $\frac{5}{\tan 40°}$
D. $5 \cos 40°$
E. $5 \sin 40°$



40. What is the area, in square inches, of a circle with a diameter of 16 inches?

F. 8π
G. 16π
H. 32π
J. 64π
K. 256π

41. If $\left(x^{\frac{1}{2}}\right)^{\frac{1}{3}} = x^p$ for all $x \geq 0$, then $p^2 = ?$

A. $\frac{1}{36}$
B. $\frac{1}{25}$
C. $\frac{1}{12}$
D. $\frac{4}{25}$
E. $\frac{25}{36}$

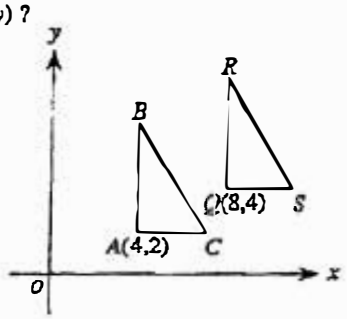
42. A ball is thrown upward from a point that is 32 feet above the ground. The ball has an initial velocity of 16 feet per second. The height, h feet above the ground, t seconds after the ball was thrown can be modeled by the equation $h = 32 + 16t - 16t^2$. According to this model, how many seconds after the ball is thrown will it hit the ground?

F. 1
G. 2
H. 4
J. 8
K. 16

GO ON TO THE NEXT PAGE.

DO YOUR FIGURING HERE.

43. The figure below shows $\triangle ABC$ and its translation image $\triangle QRS$ in the standard (x,y) coordinate plane, where A translates to Q, B translates to R, and C translates to S. The length of $\overline{BC}$ is the same as the length of $\overline{RS}$. Which of the following represents this translation, $T(x,y)$?



A. $T(x,y) = (4y, x)$

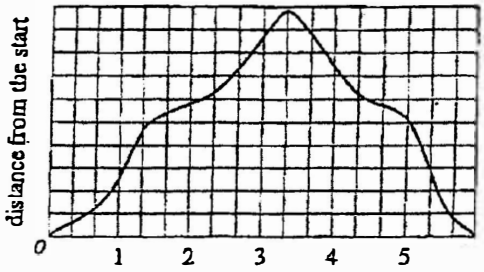
B. $T(x,y) = (2x, 2y)$

C. $T(x,y) = (x + 4, y + 2)$

D. $T(x,y) = (x - 4, y - 2)$

E. $T(x,y) = \left(\frac{x}{2}, \frac{y}{2}\right)$

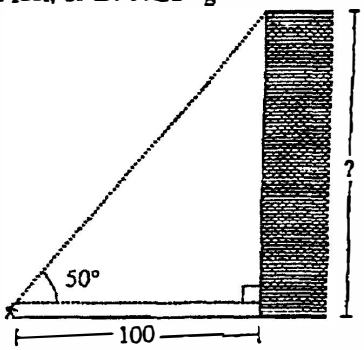
44. The graph below shows the relationship between the time and the straight-line distance a roller coaster car is from the start. Which of the following best describes what the car must have done between times 3 and 4 ?



F. The car stopped and then started again.
G. The car reached its maximum speed and began to slow down.
H. The car slowed down but did not stop, and then began gaining speed.
J. The car went over the highest hill and began going down the hill.
K. The car reached its maximum distance from the start and began moving closer to the start.

DO YOUR FIGURING HERE.

45. Tito wants to find the approximate height of a building. As shown below, when Tito is at a distance of 100 feet along level ground from the building, he estimates that he must look up at an angle of 50° to see the top of the building. If Tito is 6 feet tall, which of the following expressions gives the best estimate of the height, in feet, of the building?



A. $\frac{100}{\sin 50°} + 6$

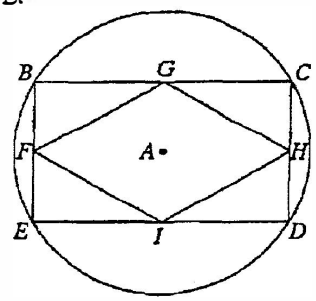
B. $\frac{100}{\cos 50°} + 6$

C. $100 \sin 50° + 6$

D. $100 \cos 50° + 6$

E. $100 \tan 50° + 6$

46. Point A is at the center of the circle, rectangle, and rhombus in the figure below. The vertices of rectangle $BCDE$ lie on the circle and the vertices of rhombus $FGHI$ are the midpoints of the sides of rectangle $BCDE$.



If the radius of the circle is 2 feet, how long is a side of the rhombus, in feet?

F. 1

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

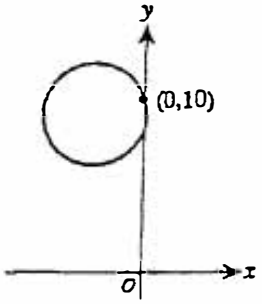
H. 2

J. 3

K. 4

DO YOUR FIGURING HERE.

47. The circle $(x+3)^2+(y-9)^2=10$ is shown in the standard (x,y) coordinate plane below. Which of the following is an equation of the line that is tangent to the circle at the point (0,10) ?



A. $y=-3x-10$
B. $y=-3x+10$
C. $y=\frac{1}{3}x-10$
D. $y=\frac{1}{3}x+10$
E. $y=3x+10$

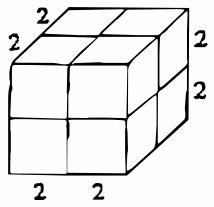
48. Points M, N, X, and Y are collinear, M is the midpoint of $\overline{XY}$, and N is the midpoint of $\overline{XM}$. What is the ratio of the length of $\overline{NY}$ to the length of $\overline{XN}$?

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

49. What are the real solutions for x, if any, to the equation $(|x|-a)(|x|-b)=0$ if a and b are positive integers?

A. $\pm a$ and $\pm b$
B. $-a$ and $-b$
C. a and b
D. $\sqrt{a}$ and $\sqrt{b}$
E. There are no real solutions.

50. A large cube consists of 8 small cubes as shown below. Each small cube has an edge length of 2 inches. If 1 small cube is removed, how does the surface area, in square inches, of the original large cube compare to that of the remaining solid?



F. The original cube has 24 square inches less surface area than the remaining solid.
G. The original cube has 12 square inches less surface area than the remaining solid.
H. The original cube has the same surface area as the remaining solid.
J. The original cube has 12 square inches more surface area than the remaining solid.
K. The original cube has 24 square inches more surface area than the remaining solid.

51. Suppose $f(x)$ and $g(x)$ are functions defined for all real numbers x, and $f(x)$ is the inverse function of $g(x)$. If r is a real number and $f(r) = 0$, then $g(0) = ?$

DO YOUR FIGURING HERE.

A. 0

B. 1

C. 2

D. $\frac{r}{2}$

E. r

52. The polynomial $x^2 - kx - 30$ is the product of the binomial $(x + 5)$ and another binomial. Which of the following is the integer value of k ?

F. −11
G. −6
H. 1
J. 6
K. 11

53. One of the following systems of inequalities is shown graphed as the shaded region in the standard (x,y) coordinate plane below. Which one is it?

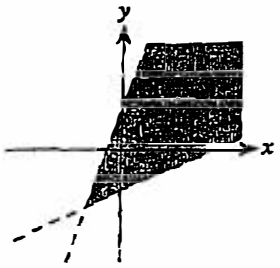
A. $y < 3x + 3$
$y > \frac{x}{2} - 3$

B. $y < 3x + 3$
$y > -\frac{x}{2} - 3$

C. $y < 3x - 3$
$y > \frac{x}{2} + 3$

D. $y < -3x + 3$
$y > \frac{x}{2} - 3$

E. $y > 3x + 3$
$y > \frac{x}{2} - 3$



54. The real number c is positive and the real numbers a and b are such that $ab > 0$ and $a > b$. Which of the following is true for all such a, b, and c ?

F. $\frac{a}{c} < \frac{b}{c}$

G. $\frac{c}{a} < \frac{c}{b}$

H. $a - c < b - c$

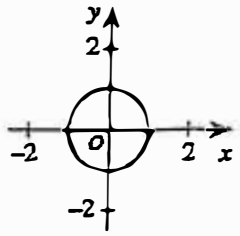
J. $a - c < b + c$

K. $a + c < b - c$

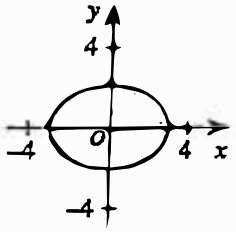
55. One of the following graphs in the standard (x,y) coordinate plane is the graph of the equation $\frac{x^2}{4} + \frac{y^2}{9} = 1$. Which one is it?

DO YOUR FIGURING HERE.

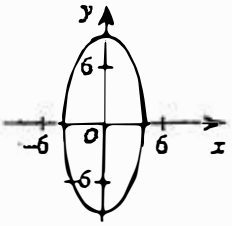
A.



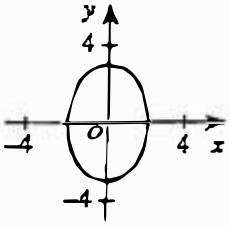
D.



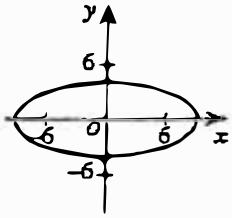
B.



E.



C.



56. Given that a, b, and c are all positive, which of the following is equivalent to $\log\left(\frac{ab^2}{c}\right)$?

F. $\log a + 2\log b - \log c$

G. $2(\log a + \log b) - \log c$

H. $\frac{2a \log b}{\log c}$

J. $\frac{(\log a)(\log b^2)}{\log c}$

K. $\frac{(\log a)(\log b)^2}{\log c}$

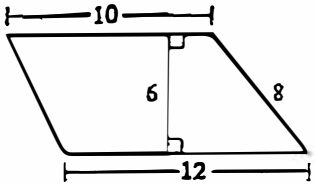
DO YOUR FIGURING HERE.

57. How many cubic centimeters are equal to 1 cubic meter?

(Note: 1 meter = 100 centimeters)

A. 100
B. 300
C. 10,000
D. 30,000
E. 1,000,000

58. Melanie is helping to paint a geometric design on a school wall. The figure below, with its dimensions in feet, shows the trapezoidal region Melanie agreed to paint. The bases of the trapezoidal region are 10 feet and 12 feet, respectively. By painting the trapezoidal region, how many square feet of the wall will Melanie paint?



F. 66
G. 72
H. 88
J. 96
K. 132

59. The table below gives ordered pairs in the standard (x,y) coordinate plane. If $a \neq 0$, which of the following sine functions goes through all of these ordered pairs?

x	0	1	2	3	4	5	6	7	8
y	0	a	0	$-a$	0	a	0	$-a$	0

A. $y = \sin(\pi a x)$

B. $y = a \sin\left(\frac{\pi}{2}x\right)$

C. $y = a \sin(\pi x)$

D. $y = \sin\left(\frac{\pi}{2}x - a\right)$

E. $y = a \sin\left(x - \frac{\pi}{2}\right)$

60. At a chess tournament, each person played exactly 1 game with every other person. Twenty-eight games were played. How many people played in the tournament?

F. 7
G. 8
H. 14
J. 28
K. 56

END OF TEST 2

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

DO NOT RETURN TO THE PREVIOUS TEST.

3

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 Antelope Wife* by Louise Erdrich (©1998 by Louise Erdrich).

My mother sewed my birth cord, with dry sage and sweet grass, into a turtle holder of soft white buckskin. She beaded that little turtle using precious old cobalts and yellows and Cheyenne pinks and greens in a careful design. I remember every detail of it, me, because the turtle hung near my crib, then off my belt, and was my very first play toy. I was supposed to have it on me all my life, bury it with me on reservation land, but one day I came in from playing and my indis was gone. I thought nothing of it, at first and for many years, but slowly over time the absence . . . it will tell. I began to wander from home, first in my thoughts, then my feet took after, so at last at the age of eighteen, I walked the road that led from the front of our place to the wider spaces and then the country beyond that, where that one road widened into two lanes, then four, then six, past the farms and service islands, into the dead wall of the suburbs and still past that, finally, into the city's bloody heart.

My name is Cally Roy. Ozhawashkwamashkodeykway is what the spirits call me. All my life so far I've wondered about the meaning of my spirit name but nobody's told it, seen it, got ahold of my history flying past. Mama has asked, she has offered tobacco, even blankets, but my grandmas Mrs. Zosie Roy and Mary Shawano only nod at her, holding their tongues as they let their eyes wander. In a panic, once she knew I was setting out, not staying home, Mama tried to call up my grandmas and ask if I could live at their apartment in the city. But once they get down to the city, it turns out they never stop moving. They are out, and out again. Impossible to track down. It's true, they are extremely busy women.

So my mom sends me to Frank.

Frank Shawano. Famous Indian bakery chef. My Mama's eternal darling, the man she loves too much to live with.

I'm weary and dirty and sore when I get to Frank's bakery shop, but right away, walking in and the bell dinging with a cheerful alertness, I smell those good bakery smells of yeasty bread and airy sugar. Behind the counter, lemony light falls on Frank. He is big, strong, pale brown like a loaf of light rye left to rise underneath a towel. His voice is muffled and weak, like it is squeezed out of the clogged end of a pastry tube. He greets me with gentle pleasure.

"Just as I'm closing." His smile is very quiet. He cleans his hands on a towel and beckons me into the back of the bakery shop, between swinging steel doors. I remember him as a funny man, teasing and playing games and rolling his eyes at us, making his pink sugar-cookie dogs bark and elephants trumpet. But now he is serious, and frowns slightly as I follow him up the back stairs and into the big top-floor apartment with the creaky floors, the groaning pipes, odd windows that view the yard. My little back room, no bigger than a closet, overlooks this space.

I'm so beat, though, I just want to crawl into my corner and sleep all.

"Not too smal , this place?" He sounds anxious.

I shake my head. The room seems okay, the mattress on the floor, the blankets, and the shelves for my things.

"Call your mom?" Frank gives orders in the form of a question. He acts all purposeful, as though he is going back downstairs to close up the store, but as I dial the number on the kitchen wall phone he lingers. He can't drag himself away from the magnetic field of my mother's voice, muffled, far off, but on the other end of the receiver. He stands in the doorway with that same towel he brought from downstairs, folding and refolding it in his hands.

"Mama," I say, and her voice on the phone suddenly hurts. I want to curl next to her and be a small girl again. My body feels too big, electric, like a Frankenstein body enclosing a tiny child's soul.

We laugh at some corny joke and Frank darts a glance at me, then stares at his feet and frowns. Reading between my Mama's pauses on the phone, I know she is hoping I'll miss the real land, and her, come back and resume my brilliant future at the tribal college. In spite of how I want to curl up in my city

corner, I picture everything back home. On the wall of my room up north, there hang a bundle of sage and Grandma Roy's singing drum. On the opposite wall, I taped up posters and photos. Ever since I was little, I slept with a worn bear and a new brown dog. And my real dog, too, curled at my feet sometimes, if Mama didn't catch us. I never liked dolls. I made good scores in math. I get to missing my room and my dog and I lose track of Mama's voice.

1. As she is revealed in the passage, the narrator can best be described as being:
   - A. indifferent about what she accomplishes or where she lives.
   - B. angry at her mother, her grandmas, and Frank.
   - C. embarrassed about not knowing the meaning of her spirit name.
   - D. anxious about determining her future and establishing her identity.

2. As it is presented in the passage, the relationship between the narrator and her mother can best be characterized as:
   - F. torn by dispute and discord.
   - G. filled with love and longing.
   - H. revolving around a mutual need for approval.
   - J. marred by misunderstanding and tension.

3. The main conflict in this passage could best be described as the:
   - A. tension between the narrator's mother and Frank.
   - B. hostility expressed between the narrator and her mother.
   - C. narrator's efforts to break her ties to her mother and grandmothers.
   - D. narrator's internal struggle to connect with her past and find her future.

4. As it is depicted in the passage, the narrator's reaction to what happened to her indis is most clearly revealed by which of the following statements?
   - F. "My mother sewed my birth cord, with dry sage and sweet grass, into a turtle holder of soft white buckskin" (lines 1–2).
   - G. "I thought nothing of it, at first and for many years, but slowly over time the absence . . . it will tell" (lines 10–11).
   - H. "All my life so far I've wondered about the meaning of my spirit name but nobody's told it, seen it, got ahold of my history flying past" (lines 21–24).
   - J. "In a panic, once she knew I was setting out, not staying home, Mama tried to call up my grandmas and ask if I could live at their apartment in the city" (lines 27–30).

5. The narrator indicates that her mother's strongest preference would be for the narrator to:
   - A. return to the tribal college.
   - B. live with her grandmothers in the city.
   - C. work at Frank's bakery.
   - D. set out for the country beyond her tribal home.

6. It can most reasonably be inferred that which of the following questions can be answered by information given in the passage?
   - F. Are the narrator's grandmothers happy that they moved to the city?
   - G. How long ago did Frank and the narrator's mother live together?
   - H. Do Frank and the narrator's mother love each other?
   - J. Does the narrator eventually return to her tribal home?

7. The narrator implies that losing her indis has caused her to:
   - A. cling to her family.
   - B. leave her home.
   - C. remember its every detail.
   - D. fight with her family.

8. The passage indicates that before the narrator left her tribal home, she distanced herself from home by:
   - F. deliberately losing her indis.
   - G. wondering about the meaning of her spirit name.
   - H. spending time at Frank's bakery.
   - J. daydreaming about going away.

9. The description of the narrator's mother's voice having a "magnetic field" (line 68) is used in the passage as:
   - A. an allusion to the way voices are transmitted over telephone lines.
   - B. a comparison of the voice to a magnet that both attracts and repels people.
   - C. a figurative portrayal of the voice's power to hold certain people's attention.
   - D. an ironic reference to the fact that the narrator's mother is being pulled toward Frank.

10. It can most reasonably be inferred that the narrator's use of the simile "like a Frankenstein body enclosing a tiny child's soul" (lines 75–76) is meant to convey the narrator's feeling at that moment that:
    - F. someone other than her mother created her.
    - G. her body is too large in comparison to her mother's body.
    - H. she wants to be treated as a child but knows that she is an adult.
    - J. she feels sick after her long trip to the bakery, as if her body is swollen.

Passage II

SOCIAL SCIENCE: This passage is adapted from the article "Averting a Death Foretold" by Gregg Easterbrook, which appeared in *Newsweek* magazine (©1994 by Newsweek, Inc.).

Few books have ever had as much effect on the American public consciousness as Rachel Carson's *Silent Spring*, published in 1962. And few books have ever fallen so wide of the mark—because none of the coming environmental calamities predicted in *Silent Spring* has happened. Paradoxically, that may be the most impressive aspect of the book. Carson's warnings triggered a wave of environmental reforms that held back the day of reckoning she foresaw.

What did *Silent Spring* foresee? "The robin seems to be on the verge of extinction," Carson wrote in an eye-catching paragraph. Robins were among the most prolific birds in North America: the notion that they might soon join the dodo on nature's backlist helped make *Silent Spring* a sensation. Carson thought that indiscriminate pesticide use was killing off many bird species directly and triggering genetic resistance among insects that attack crops. Soon pesticides might also render extinct a key "friendly" species, the earthworm, breaking the food chain of many avians [birds]. No birds would be left to greet the next winter's end with song. There would come a silent spring.

It is the fate of the birds, at the heart of her analysis, that conveys the most dramatic difference between what Carson foresaw and what later occurred after her warnings were heard. The robin easily evaded extinction. Another bird Carson thought about to vanish, the bald eagle, has (since the banning of DDT) bounced back so spectacularly that it has been "delisted" from endangered-species status. Bruce Peterjohn, chief analyst of the North American Breeding Bird Survey, compiled annual population trends for 40 birds depicted as near extinction by Carson. Of those 40 birds, 19 have had stable populations since 1966, 14 have shown population increases, and 7 have fallen. This sounds like business as usual for nature, since most ecologists now believe relative species populations would vary whether there were human meddling or not.

None of Carson's other major predictions has come to pass. For instance, *Silent Spring* projects that cancer caused by synthetic chemicals could become endemic, so much so that even humanity might fall extinct. When *Silent Spring* was published, pesticide use was reckless; synthetic chemicals were believed to account for up to 90 percent of cancers; few federal programs existed to combat industrial excess.

Yet even taking AIDS into consideration, overall U.S. public health has steadily improved. Lung cancer caused by cigarette smoking has reached dreadful proportions, but most other cancers are either declining or, at worst, up slightly, when the aging of the population is taken into account. Richard Doll, the British researcher who first proved the link between cigarettes and lung cancer, now estimates that synthetic chemicals cause less than 5 percent of human cancers.

Next, though agricultural chemicals are still overused, neither pesticide toxicity nor insect mutations has progressed to the runaway level. Highly potent agricultural chemicals such as chlordane, dieldrin and DDT—Carson's leading concern—have been banned. The tonnage of synthetic compounds used in agriculture has gone up since Carson's day, but most farm chemicals have been reformulated to render them biodegradable. Most have narrow toxicity (killing only a specific insect or weed) versus the broad toxicity (capable of killing mammals as well as bugs and plants) of the 1950s substances Carson studied.

Of course such turns of events hardly ensure that new environmental threats are not in the making. For instance, recent studies suggest that several types of neotropical migratory birds are in decline. But most trends suggest silence in spring is unlikely to come.

Surely this is because Carson's warnings helped inspire a revolution in environmental protection. Since *Silent Spring*, the Environmental Protection Agency has been established, the Endangered Species Act has been passed; sweeping air- and water-pollution control laws have gone into effect; forest preservation has become a prominent cause; chemical safety has become a leading concern; conservation generally has become a core American political value. For any prominent thinker's warning of disaster to be wrong is the best possible outcome for society, if reform explains the discrepancy between forecast and result. That the predictions in Rachel Carson's masterpiece did not come true should be seen as the greatest aspect of her legacy.

11. It can most reasonably be inferred that the author believes which of the following statements is true?
    - A. The health of average Americans is still in decline.
    - B. Americans' environmental concerns are more grave than ever before.
    - C. Americans are generally healthier now than in past decades.
    - D. It is unlikely that new environmental threats will present themselves.

12. According to the passage, Carson's greatest legacy was:
    - F. forecasting the weather cycles that would affect America.
    - G. motivating actions that resulted in her predictions not coming true.
    - H. revealing the toxicity of many synthetic compounds being used in agriculture.
    - J. being the first to introduce the idea of environmental awareness to Americans.

The passage states that Carson believed one way pesticides could endanger birds was by:

A. breaking their food chains.
B. polluting their water sources.
C. causing too much competition among insect species.
D. causing them to mutate too slowly.

The author offers as evidence of progress since the banning of DDT the:

F. decline in the incidence of lung cancer caused by cigarette smoking.
G. development of more broadly toxic chemical agents.
H. resurgence of less harmful insect pests.
J. removal of the bald eagle from the endangered species list.

It can reasonably be inferred from the passage that most ecologists would view the conclusions reached by Peterjohn as:

A. confirmation of the fact that many avian species have become extinct.
B. support for the notion that unusual occurrences are taking place in nature.
C. proof that synthetic chemicals are destroying the environment.
D. consistent with normal variations in avian species populations.

In the context of the fourth and fifth paragraphs (lines 50–56), Doll's estimate, cited in lines 53–56, most strongly suggests that the United States has:

F. made progress in reducing the dangers of synthetic chemicals.
G. much room for improvement in making its chemicals safer.
H. yet to prove the dangers of cigarette smoking.
J. not yet seen the full effects of Carson's predictions.

17. The passage suggests that an improvement in agricultural chemicals is their:

A. more widespread current use.
B. more reasonable application and cost.
C. focus on controlling specific pests.
D. greater effect on a wider variety of pests.

18. The last paragraph lists a number of changes in the way Americans protect the environment since the publication of *Silent Spring*. The author suggests that the changes listed:

F. were motivated by the book's publication.
G. are evidence that new environmental threats are in the making.
H. were political solutions that will not endure.
J. are proof that Carson's predictions were inaccurate.

19. The author concludes that, in this case, "reform explains the discrepancy between forecast and result" (lines 84–85). This most nearly means that:

A. we simply cannot predict occurrences in nature.
B. acting upon predictions can influence future events.
C. those who predict disasters are almost always wrong.
D. results are more important than predictions.

20. According to the passage, who performed the research that concluded that synthetic chemicals accounted for up to 90 percent of cancers?

F. The medical community
G. Carson
H. North American Breeding Bird Society researchers
J. The passage does not answer this question definitively.

GO ON TO THE NEXT PAGE.

Passage III

HUMANITIES: This passage is adapted from the memoir *Moving Violations: War Zones, Wheelchairs and Declarations of Independence* by John Hockenberry (©1995 by John Hockenberry). *NASA* refers to the National Aeronautics and Space Administration.

I was working in the National Public Radio newsroom when the announcement about the NASA journalist in space program first crossed the news wires. I had always wanted to be an astronaut. Long ago I had decided that I had missed the launchpad. But this program seemed like a second chance. I was a journalist. I wanted to go into space. I would apply. "Go ahead and apply," one of the editors said. "We will decide who from NPR will go into space. Besides, John, I think we can agree that NASA will not be sending a paraplegic as the first journalist to go into space. Right?"

I did agree, at first. Then I began to think about the problem. Was it really such a lost cause to think that even as a paraplegic one might be able to train and compete for a slot on a space shuttle mission? There was no denying the sentiments in the voice of my editor. It was a lost cause. "I'm sure it would be a good experience for you to apply, anyway," she said with the conviction that we have not reached the point in human evolution when paraplegics are sent into space.

Would the space program actually be crazy enough to send a crippled person into space? If NASA would not consider such a thing, then it was a lost cause, a waste of time. But this was not the real issue. The real issue was to look at the problem on its merits, independent of whether or not some institution would give me permission. What would a disabled person do on the shuttle? Was there any intrinsic value in sending paraplegics into space?

As I began to think about the problem it became clear that if all I tried to show was that NASA had no reason not to send a paraplegic into space, then I had no chance. Paraplegics in space? Maybe someday. Just as electing an African-American president of the United States was a lost cause as long as no one seriously believed it would ever happen. Black president? Maybe someday. These are American homegrown lost causes where "maybe someday" becomes a substitute for actual freedom and access.

The fact that I was in a wheelchair did not instantly cause me to argue the premise. I too could believe it was ridiculous to suggest that a person in a wheelchair might travel into space. I too wondered if I was wasting the application. The tone of my editor seemed to suggest, don't rock the boat, don't attract attention. Today we're doing journalists in space, John, maybe someday we'll do disabled people in space.

Maybe someday . . . But to address this issue of space travel on its merits I would have to completely reevaluate how I thought of myself. Paraplegic, Paralyzed, Disabled Guy, Wheelchair User: all of these categories became suspect. For instance, the word "paralysis." I have always hated this word. It seems to suggest that a person cannot move at all, when actually even the most disabled person can move. It really depends on how you look at things. Compared to birds, we have lost the use of our wings, and compared to fish, we have lost the use of our gills. I'm sure that to fish, humans all decked out in scuba gear look pretty much like marine animals from some particularly tragic special education class. To birds, humans flying by peering out of the tiny windows of pressurized jetliners must look odd and tragic.

To deal with the tragedy of not being able to live underwater or in the air humans invent a less humiliating way of thinking about it. It is not we who are flawed by not being able to survive in water or fly through the air. It is they who are underwater creatures, it is they who are winged, their physical assets redefined as rungs of evolution's ladder. Fish below birds, all of them below humans. But when we are not slaughtering them with rifles, jet engines, and nets, birds and fish must view us as the slow group.

To address whether or not paraplegics should become part of the space program you had to confront the real problem with paralysis, the physics, not the sociology. Is it the wheelchair? Is it the curbs? Is it the stairs? It's the gravity. Think about it. Paralyzed people live in an excess of gravity. So much gravity, in fact, that they often need to use wheelchairs or other gravity-assist devices. Far from being a problem, an environment where one could float around instead of walking would be just perfect. Lose the gravity . . . no need for wheelchairs. In outer space, with everyone floating around, it would be difficult to tell the paralyzed people from the nonparalyzed people.

21. As he is revealed in the passage, the narrator can best be characterized as:

    A. analytical and imaginative.
    B. tolerant and despairing.
    C. whimsical and disinterested.
    D. conservative and aggressive.

22. It can most reasonably be inferred from the passage that by her remarks to the narrator, quoted in lines 7–11 and lines 17–18, the editor wants to:

    F. encourage him to sign up for the program, which she feels he has a good chance to be accepted into.
    G. help him be realistic about his chances for acceptance into the program, which leads him to question her assumptions.
    H. prevent him from even applying to the program, which he eventually does anyway in spite of her telling him not to.
    J. get him thinking about filling out the program's application, which he hadn't yet considered doing.

The main function of the second paragraph (lines 12–20) is to:

A. present the narrator's reasons for wanting to join the space program.
B. allow the narrator to argue that he should be accepted into the space program.
C. offer insight into the narrator's thought processes as he works through a problem.
D. reveal the kind of interaction that the narrator usually has with his editor.

In the third paragraph (lines 21–29), the narrator decides that it is important for him to:

F. give up thinking about going into space, since NASA probably would not consider such a thing.
G. determine the real value of sending a paraplegic into space, whether or not NASA considers doing it.
H. analyze the real issue as NASA describes it, and to evaluate the merits of NASA's argument.
J. find out what he would do on the shuttle, since his contribution would be different from that of earlier astronauts who had disabilities.

The narrator compares the possibility of electing an African American as president to the possibility of sending a paraplegic into space in order to claim that:

A. while both are widely considered lost causes, progress toward increased access in other areas has been made.
B. neither will happen until discriminatory laws are changed.
C. neither will happen unless people come to believe they can happen.
D. while some still consider these lost causes, attitudes are changing quickly in the United States.

In the context of the sixth paragraph (lines 48–63), lines 56–63 are most likely meant to illustrate the idea that people:

F. describe themselves using words such as *odd* and *tragic* that may be misleading or incorrect.
G. should be grateful for what they can do and not worry about what they are incapable of.
H. can compare themselves to other creatures and realize the many great things people are capable of.
J. can choose to change their perspectives on themselves if they want.

27. According to the passage, people have ranked birds and fish lower on the evolutionary scale than humans in order to:

A. position humans as equal to instead of better than other creatures.
B. devise a less painful way of thinking about the things humans can't do.
C. redefine the physical assets of birds and fish as being humiliating.
D. disguise the fact that fish and birds lack skills that humans have.

28. When the narrator states that the real problem with paralysis is "the physics, not the sociology" (lines 76–77), he most nearly means that the real problem is:

F. how you feel about your physical self, not how others feel about themselves.
G. how to physically get around, not how people perceive and treat you.
H. deciding where you stand on the sociological ladder, not figuring out how to defy gravity.
J. understanding the physics of space flight, not the space program's historical place in society.

29. The narrator describes his ambition to become an astronaut as:

A. a long-standing dream reawakened by the journalist in space program.
B. a recent interest sparked by NASA's recruitment efforts.
C. an effort to promote civil rights rather than satisfy any personal interest.
D. a goal threatened by the fierce competition for the single opening in NASA's shuttle program.

30. By his statements in lines 40–44, the narrator is most nearly indicating that he:

F. sometimes accepts narrow definitions of what people with disabilities can do despite having a disability himself.
G. automatically wants to argue that people with disabilities should have new opportunities.
H. eventually comes to agree with those who question the wisdom of sending him into space.
J. feels deeply guilty for not immediately questioning some people's assumptions about his capabilities.

GO ON TO THE NEXT PAGE.

Passage IV

NATURAL SCIENCE: This passage is adapted from *Fire In America: A Cultural History of Wildland and Rural Fire* by Stephen J. Pyne (©1982 by Princeton University Press).

Lightning affects electrical equilibrium on the earth. Air is a poor conductor, but some electricity constantly leaks to the atmosphere, creating an electrical potential. Electricity moves back according to the gradient [change in potential with distance]. During a thunderstorm, the gradient becomes very steep, and the electrical potential discharges as lightning. The discharge may move between any oppositely charged regions—from cloud to earth, from earth to cloud, or from cloud to cloud. It was calculated as early as 1887 that the earth would lose almost all its charge in less than an hour unless the supply were replenished; that is, on a global scale, lightning will discharge to the earth every hour a quantity of electricity equal to the earth's entire charge. Thunderstorms are thus an electromagnetic as well as a thermodynamic necessity. It has been reckoned that the earth experiences some 1,800 storms per hour, or 44,000 per day. Collectively, these storms produce 100 cloud-to-ground discharges per second, or better than 8 million per day globally. And these estimates are probably low. The total energy in lightning bolts varies greatly, but about 250 kilowatt hours of electricity are packed into each stroke. Almost 75 percent of this total energy is lost to heat during discharge.

Two types of discharge patterns are commonly identified: the cold stroke, whose main return [ground-to-cloud] stroke is of intense current but of short duration, and the hot stroke, involving lesser currents of longer duration. Cold lightning, with its high voltage, generally has mechanical or explosive effects; hot lightning is more apt to start fires. Studies in the Northern Rockies suggest that about one stroke in 25 has the electrical characteristics needed to start a fire. Whether it does or not depends strongly on the object it strikes, the fuel properties of the object, and the local weather. Ignition requires both heat and kindling. Lightning supplies the one with its current and occasionally finds the other among the fine fuels of rotten wood, needles, grass, or dustlike debris blown from a tree by the explosive shock of the bolt itself.

The consequences of lightning are complex. Any natural force of this magnitude will influence the biological no less than the geophysical environment, and the secondary effects of lightning are significant to life. Lightning helps to fix atmospheric nitrogen into a form that rain can bring to earth. In areas of heavy thunderstorm activity, lightning can function as a major predator on trees, either through direct injury or by physiological damage. In the ponderosa pine forests of Arizona, for example, one forester has estimated that lightning mortality runs between 0.7 and 1.0 percent per year. Other researchers have placed mortality as high as 25–33 percent. For southern pines, the figure may be even steeper. A study in Arkansas calculated that 70 percent of mortality, by volume, was due to lightning. These figures describe only direct injury, primarily the mechanical destruction of branches and bole; the other major causes of mortality—insects, wind, and mistletoe—are likely secondary effects brought about in trees weakened by lightning. All of these effects, in turn, may be camouflaged by fire induced by lightning.

The process of "electrocution" is increasingly recognized. Lightning scorch areas of between 0.25 and 25 acres have been identified. Nor is the process limited to trees: it has been documented for grasses, tomatoes, potatoes, cabbages, tea, and other crops. Long attributed to inscrutable "die-offs" or to infestation by insects or diseases (often a secondary effect), such sites are now recognized worldwide as a product of physiological trauma caused by lightning.

The most spectacular product of lightning is fire. Except in tropical rain forests and on ice-mantled land masses, lightning fire has occurred in every terrestrial environment on the globe, contributing to a natural mosaic of vegetation types. Even in tropical landscapes lightning bombardment by itself may frequently be severe enough to produce a mosaic pattern similar to that resulting from lightning fire. Lightning fires have ignited desert grasslands, tundra, chaparral, swamplands, marshes, grasslands, and, of course, forests. Though the intensity and frequency of these fires vary by region, their existence is undeniable.

31. The main purpose of this passage is to:
    - A. compare and contrast cold and hot lightning.
    - B. demonstrate the predatory natureof lightning.
    - C. discuss the effects of lightning on the earth.
    - D. provide statistical data from lightning research.

32. According to the passage, lightning does all of the following *EXCEPT*:
    - F. affect electrical equilibrium on the earth.
    - G. kill trees directly or indirectly.
    - H. replenish the earth's electrical charge.
    - J. cause air to leak into the at mosphere.

33. One of the main points of the third paragraph (lines 41–61) is that:
    - A. Arizona researchers record tree mortality by volume.
    - B. tree mortality rates fail to capture the true extent of lightning-inflicted damage.
    - C. ponderosa pine trees are resistant to secondary diseases.
    - D. pine tree forests draw fewer lightning strikes than many other habitat types in Arizona.

The author most likely includes the data in lines 10–24

F. describe the magnitude of lightning as a natural force.
G. present the calculations of the earth's electrical charge.
H. discuss how much electricity leaks into the atmosphere.
J. express how much energy from lightning strikes is lost to heat.

The main purpose of the second paragraph (lines 25–40) in relation to the passage as a whole is to:

A. explain how lightning starts fires.
B. refute claims presented in the first paragraph with data from Northern Rockies studies.
C. rank various objects by their effectiveness as fuel for lightning fire.
D. explain what causes cold and hot lightning.

can reasonably be inferred from the passage that of e following, which is the most likely to start a fire?

F. Cold lightning striking kindling in a marsh
G. Hot lightning striking rotten wood in a southern pine forest
H. Cold lightning striking the trunk of a healthy ponderosa pine tree
J. Hot lightning striking a grass field during a heavy rainstorm

37. The fourth paragraph (lines 62–70) indicates that what have been called "die-offs" are actually a product of lightning-induced:

A. disease infestations.
B. insect infestations.
C. physiological trauma.
D. mechanical destruction.

38. According to the passage, cold lightning differs from hot lightning in:

F. strength and duration of current.
G. number of strokes per hour.
H. the regions and habitats they affect.
J. object-striking potential.

39. The third paragraph (lines 41–61) suggests that if lightning did not fix atmospheric nitrogen, then:

A. rain could not fall to earth, leaving nitrogen in the atmosphere.
B. less nitrogen would be found on earth.
C. electrical current could not be conducted by air.
D. lightning bolts would strike the earth with less frequency.

40. The *process of "electrocution"* mentioned in line 62 most nearly refers to:

F. the ignition of rotten wood and pine needles.
G. accidental death by electrical current.
H. a lightning strike of a tree.
J. the scorching of plants by lightning.

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

The geologic time scale is divided into long time frames called *eras* and shorter time frames called *periods*. Table 1 shows the 3 most recent eras, the 11 most recent periods, their time frames, and a major biological development that occurred during each period.

Table 1

Era	Period	Time frame (mya)*	Major biological development
Cenozoic	Quaternary	2–0	rapid human population growth
	Tertiary	65–2	first ancestral humans
Mesozoic	Cretaceous	136–65	extinction of dinosaurs
	Jurassic	190–136	first birds
	Triassic	225–190	first mammals and first dinosaurs
Paleozoic	Permian	280–225	great expansion of reptiles
	Carboniferous	345–280	dominance of land by amphibians
	Devonian	395–345	first amphibians
	Silurian	430–395	first invasion of land by some arthropods
	Ordovician	500–430	first vertebrates
	Cambrian	570–500	most animal phyla present

*mya = millions of years ago

Table 1 adapted from William T. Keeton and James L. Gould, *Biological Science*. ©1986 by W. W. Norton & Company, Inc.

Figure 1 shows the major classes of vertebrates and their evolutionary relationships. In Figure 1, the widths of the darkened sections indicate the relative abundance of each class.

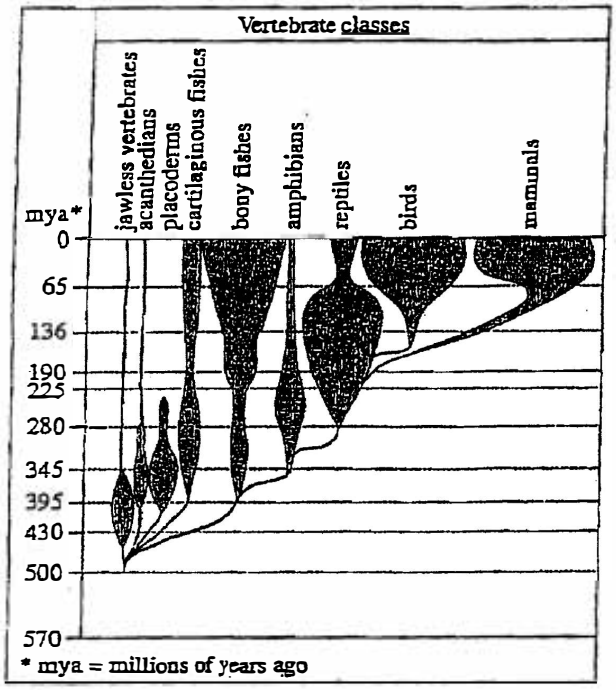


Figure 1

Figure 1 adapted from Edwin H. Colbert, *Evolution of the Vertebrates*. ©1969 by John Wiley & Sons, Inc.

1. According to Figure 1, approximately how long ago did placoderms become extinct?
   - A. 185 mya
   - B. 235 mya
   - C. 285 mya
   - D. 335 mya

2. According to Table 1, which of the following periods had the *shortest* duration?
   - F. Triassic
   - G. Carboniferous
   - H. Ordovician
   - J. Cambrian

3. Based on Figure 1, which of the following best describes the evolutionary relationship between bony fishes, amphibians, and reptiles?
   - A. Bony fishes evolved from amphibians, and amphibians evolved from reptiles.
   - B. Bony fishes evolved from reptiles, and reptiles evolved from amphibians.
   - C. Reptiles evolved from amphibians, and amphibians evolved from bony fishes.
   - D. Reptiles evolved from bony fishes, and bony fishes evolved from amphibians.

4. According to Table 1 and Figure 1, from the beginning of the Silurian period to the end of the Devonian period, the abundance of the jawless vertebrates:
   - F. increased only.
   - G. decreased only.
   - H. increased, then decreased.
   - J. decreased, then increased.

5. Flowering plants first appeared before the first humans appeared and after the first birds appeared. Based on this information and Table 1, flowering plants most likely first appeared during which of the following periods?
   - A. Quaternary
   - B. Cretaceous
   - C. Triassic
   - D. Carboniferous

Passage II

Evaporites are minerals that *precipitate* (crystallize) during the partial or total evaporation of seawater. Typical evaporites are *halite* (NaCl), *gypsum* ($CaSO_4 \cdot 2H_2O$), *calcite* ($CaCO_3$), and the mineral mixture known as *bittern salts*, which contains potassium (K) and magnesium (Mg) compounds. Figure 1 shows the order of evaporite precipitation as a column of seawater 1 km deep evaporates and the salinity of the remaining seawater as evaporation progresses. Figure 2 shows the cross section of a typical evaporite deposit formed from a 1 km deep column of seawater. Table 1 shows the solubilities and densities of some evaporites.

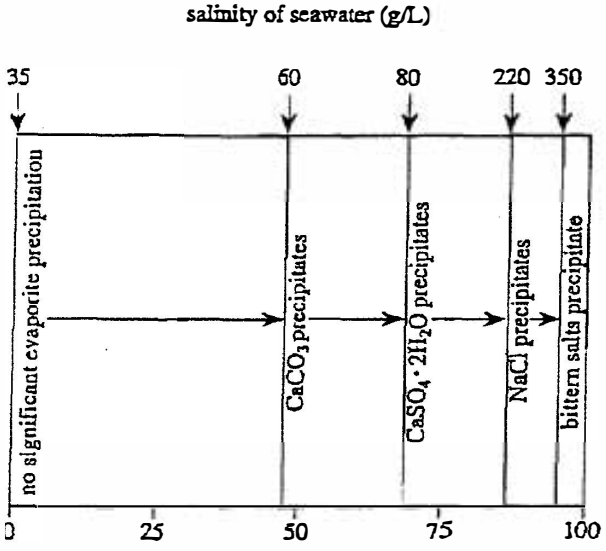
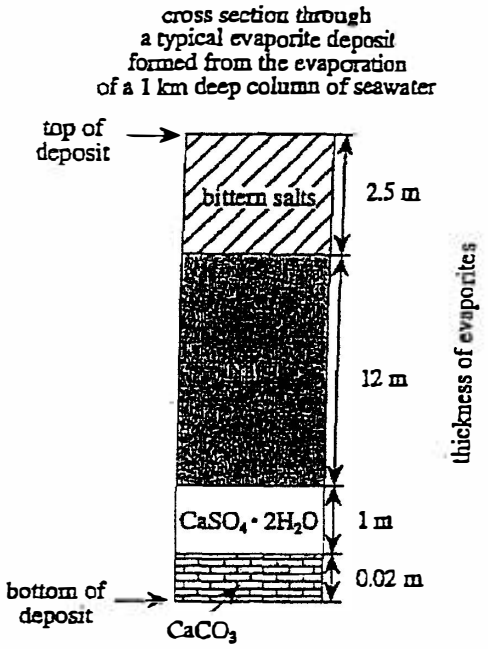


Figure 1



Note: Cross section is not to scale.

Figure 2

Figure 1 and Figure 2 adapted from J. Andrews et al., *An Introduction to Environmental Chemistry*. ©1996 by Blackwell Science, Ltd.

Table 1

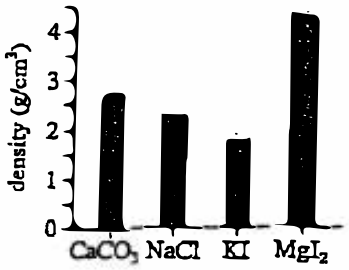
Evaporite		Solubility (g/100 cm^3)	Density (g/cm^3)
$CaCO_3$		0.0014	2.7
$CaSO_4 \cdot 2H_2O$		0.24	2.3
NaCl		35.7	2.2
Bittern salts	KBr	53.5	2.8
	KI	127.5	3.1
	$MgCl_2$	54.3	2.3
	MgI_2	148.0	4.4

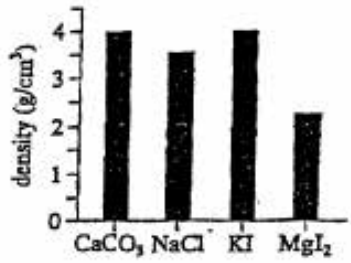
6. According to Figure 1, the seawater's salinity at the point when 25% of the seawater column had evaporated would most likely be:

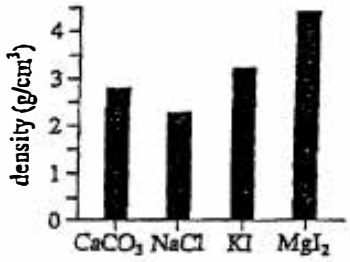
F. less than 35 g/L.
G. between 35 g/L and 60 g/L.
H. between 60 g/L and 80 g/L.
J. greater than 80 g/L.

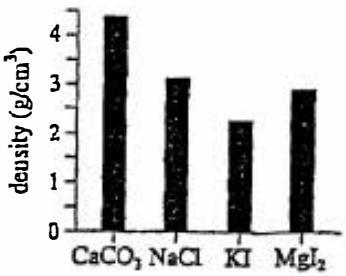
7. If Figure 2 is typical of evaporite deposits, the greatest thickness of any evaporite deposit will be composed of which 2 evaporites?
   A. Bittern salts and NaCl
   B. Bittern salts and $CaSO_4 \cdot 2H_2O$
   C. NaCl and $CaCO_3$
   D. $CaSO_4 \cdot 2H_2O$ and $CaCO_3$

8. According to Table 1, which of the following figures best represents the densities of $CaCO_3$, NaCl, KI, and MgI_2?

F.


G.


H.


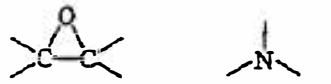
J.


9. Which of the following statements about the onset of significant evaporite precipitation is supported by the data in Figure 1 ? Significant evaporite precipitation begins:
   A. as soon as seawater first begins to evaporate.
   B. as soon as seawater is completely evaporated.
   C. when approximately 25% of the seawater has evaporated.
   D. when approximately 50% of the seawater has evaporated.

10. Which of the following statements about the precipitation of evaporites is supported by the data in Figure 1 and Table 1 ? The first evaporite to precipitate out of seawater is the evaporite with the:
   F. highest solubility.
   G. lowest solubility.
   H. highest density.
   J. lowest density.

Passage III

Epoxy resins are used as adhesives and coatings. They are formed when molecules containing two *epoxy* groups are reacted, or *cured*, with molecules containing two *amine* groups (see Figure 1).



epoxy group amine group

Figure 1

The *% cure* is a measure of the completeness of the reaction that forms an epoxy resin. An epoxy resin hardens as it cures.

Figures 2 and 3 show how the % cure changes with time when equal amounts of E1 or E2 (compounds containing two epoxy groups) are cured with A1, A2, A3, or A4 (compounds containing two amine groups) at 25°C. Figure 4 shows how temperature affects the % cure of identical reactions of E2 with A4.

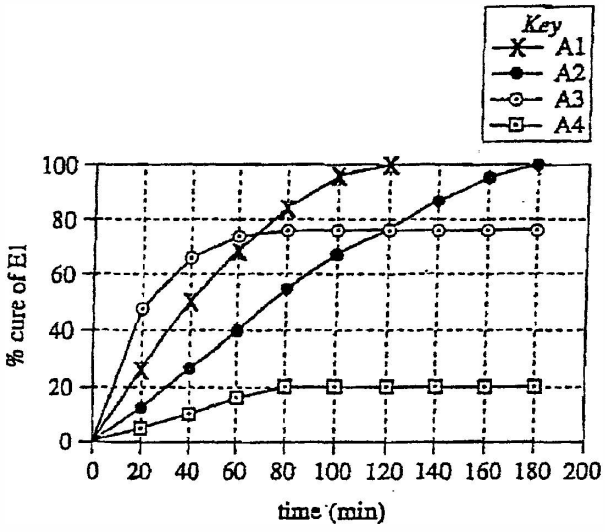


Figure 2

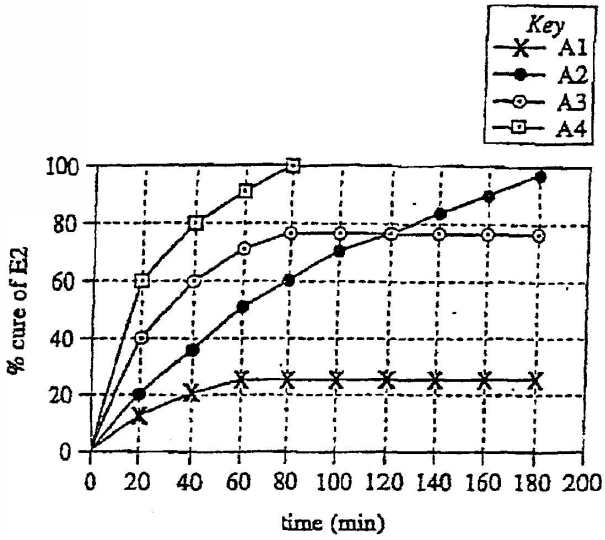


Figure 3

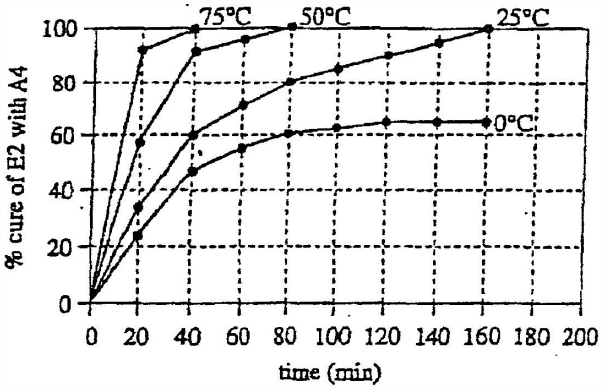


Figure 4

11. Based on the data in Figure 3, as time increased from 0 min to 180 min, the % cure of E2 cured with A1:

A. decreased only.
B. increased only.
C. decreased, then increased.
D. increased, then stayed the same.

12. Based on the data in Figure 2, the % cure of the epoxy resin made up of E1 and A2 at 110 min is closest to which of the following values?

F. 50
G. 60
H. 70
J. 80

13. Based on the data in Figure 2, which of the following correctly lists A1–A4 from lowest to highest % cure when reacted with E1 for 60 min ?

A. A1, A2, A3, A4
B. A4, A3, A2, A1
C. A3, A1, A2, A4
D. A4, A2, A1, A3

14. Based on the data in Figure 4, if a further trial with E2 and A4 had been done at 40°C, the epoxy resin would most likely have been 100% cured during which of the following time intervals?

F. Less than 20 min
G. Between 20 min and 40 min
H. Between 40 min and 80 min
J. Greater than 80 min

15. A chemist hypothesized that A4 will completely cure both E1 and E2 if enough time is allowed. Do the data in Figures 2 and 3 support his conclusion?

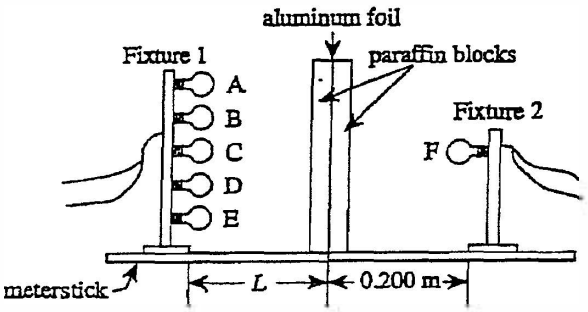
A. Yes; E1 was 100% cured in 80 min, and the trend shows that E2 will eventually be 100% cured.
B. Yes; E2 was 100% cured in 80 min, and the trend shows that E1 will eventually be 100% cured.
C. No; E1 was 100% cured in 80 min, but the trend shows that E2 will never be 100% cured.
D. No; E2 was 100% cured in 80 min, but the trend shows that E1 will never be 100% cured.

Passage IV

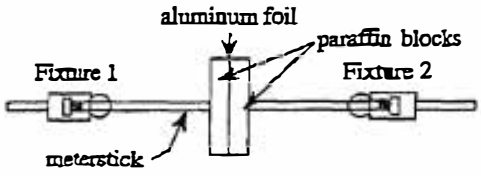
A student studied illumination using the following equipment:

- 6 identical light bulbs (Bulbs A–F)
- Fixture 1, light fixture for Bulbs A–E
- Fixture 2, light fixture for Bulb F
- 2 identical paraffin blocks
- A sheet of aluminum foil having the same length and width as a paraffin block
- A meterstick

Light could pass through each paraffin block, and each block glowed when light passed through it. The aluminum foil was placed between the 2 blocks. The light fixtures, light bulbs, blocks, foil, and the meterstick were arranged as shown in Figure 1.



side view



top view

Figure 1

In the following experiments, the base of Fixture 2 was always 0.200 m from the aluminum foil, and L was the distance from the base of Fixture 1 to the aluminum foil. The distance between adjacent bulbs in Fixture 1 was the same for all of the bulbs.

Bulb F was always lit.

Experiment 1

The student turned the room lights off, lit Bulb A, and varied L until the 2 blocks looked equally bright. This process was repeated using Bulbs B–E. The results are shown in Table 1.

Table 1

Bulb lit (in addition to Bulb F)	L (m) when the blocks looked equally bright
A	0.198
B	0.203
C	0.205
D	0.195
E	0.199

Experiment 2

The procedure from Experiment 1 was repeated using various combinations of Bulbs A–E. The results are shown in Table 2.

Table 2

Bulbs lit (in addition to Bulb F)	L (m) when the blocks looked equally bright
A and B	0.281
A, B, and C	0.347
A, B, C, and D	0.400
A, B, C, D, and E	0.446

16. According to Experiment 2, as the number of lit bulbs increased, L:

F. increased only.
G. decreased only.
H. remained the same.
J. changed, but with no general trend.

Which of the following best explains why the student urned off the room lights?

.. To ensure that only the light from Bulbs A–F illuminated the 2 paraffin blocks
. To ensure that light from outside the room illuminated the 2 paraffin blocks unequally
. To keep the 2 paraffin blocks from casting shadows, because shadows would make the meterstick harder to read
To keep the 2 light fixtures from casting shadows, because shadows would make the meterstick harder to read

ring Experiment 2, suppose the student replaced cture 1 with a new fixture. The new fixture held ight bulbs, each bulb identical to Bulb F. When all ulbs in the new fixture were lit and the paraffin cks looked equally bright, L would probably have n closest to:

0.262 m.
0.331 m.
0.415 m.
0.490 m.

main purpose of Experiment 1 was to:

calibrate the meterstick.
determine the relationship between L and the number of lit bulbs.
determine if L depended on a lit bulb's position in Fixture 1.
find the brightness of Bulb F.

20. Suppose that all of the light bulbs in Fixture 1 were replaced with a single bulb. Based on Experiments 1 and 2, if the 2 paraffin blocks looked equally bright when Fixture 2 was 0.200 m from the aluminum foil and $L = 0.446$ m, the brightness of the new light bulb was most likely:

F. $\frac{1}{6}$ the brightness of one of the original bulbs.
G. $\frac{1}{5}$ the brightness of one of the original bulbs.
H. 5 times the brightness of one of the original bulbs.
J. 6 times the brightness of one of the original bulbs.

21. In Experiment 2, suppose the student had replaced Bulb F with a much brighter light bulb, Bulb G. Compared to L when Bulb F was used, L when Bulb G was used would have been:

A. greater for every combination of lit bulbs.
B. smaller for every combination of lit bulbs.
C. smaller when Bulbs A–E were simultaneously lit and greater when other combinations of light bulbs were lit.
D. greater when both Bulbs A and B were simultaneously lit and smaller when other combinations of light bulbs were lit.

GO ON TO THE NEXT PAGE.

Passage V

Students studied how 4 metals—silver (Ag), copper (Cu), iron (Fe), and zinc (Zn)—react with their respective nitrate salts: $AgNO_3$, $Cu(NO_3)_2$, $Fe(NO_3)_3$, and $Zn(NO_3)_2$. When a nitrate salt is dissolved in water, it separates into metal ions and nitrate ions:

$$Cu(NO_3)_2 \rightleftharpoons Cu^{2+} + 2NO_3^-$$

Experiment 1

A strip of Ag was placed in 1 molar (a unit of concentration) $AgNO_3$ solution at 25°C and connected to a voltmeter. A *standard hydrogen electrode* (a hydrogen gas electrode) was placed in acid solution and connected to the voltmeter. The solutions were connected with a *salt bridge* (which allows ions to flow between solutions) to complete the circuit (see Figure 1).

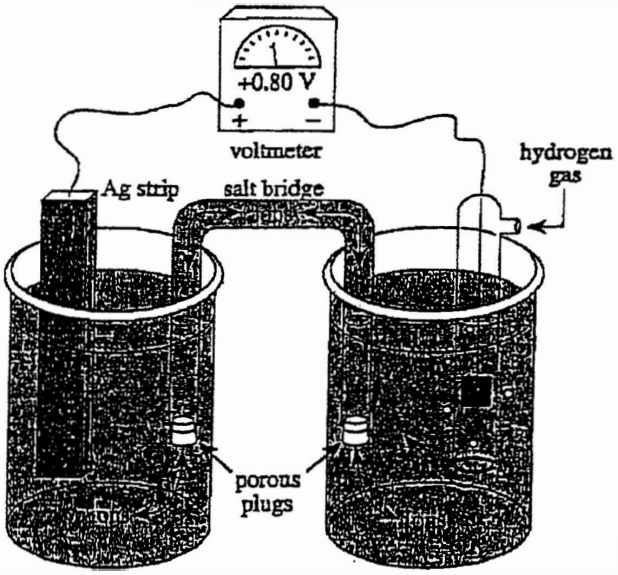


Figure 1

The measured voltage (in volts, V) is the *standard reduction potential*, E°. The higher the value of E°, the more easily the metal ions undergo *reduction* (the gain of electrons) to form a metal. The procedure was repeated for each of the other metals and their respective nitrate salt solutions (see Table 1).

Table 1

Metal	E°(V)
Ag	0.80
Cu	0.34
Fe	−0.44
Zn	−0.76

Experiment 2

A strip of Ag was placed in each of 4 different nitrate salt solutions. The students observed whether metal *plated* (formed) on the surface of the strip. The procedure was repeated for the other 3 metals (see Table 2).

Table 2

Solution	Metal strip			
	Ag	Cu	Fe	Zn
$AgNO_3$	NR	Ag plated	Ag plated	Ag plated
$Cu(NO_3)_2$	NR	NR	Cu plated	Cu plated
$Fe(NO_3)_3$	NR	NR	NR	Fe plated
$Zn(NO_3)_2$	NR	NR	NR	NR

Note: NR denotes that no reaction was observed.

Experiment 3

Experiment 2 was repeated, but instead of using nitrate salt solutions, metal strips were placed in contact with the dry (undissolved) salts in a dry environment and observed for 7 days. No reactions occurred.

22. Which of the following is the most reasonable explanation for why there were no reactions observed in Experiment 3?
    - F. The E° of each of the metals was too high for the metals to have reacted with any of the metal salts tested.
    - G. The E° of each of the metals was too low for the metals to have reacted with any of the metal salts tested.
    - H. The salts were not dissolved, so there were no free ions available to form metals.
    - J. The metal strips were not connected to a standard hydrogen electrode, so no plating occurred.

23. Based on the information in the passage, which of the following most likely happens when $Zn(NO_3)_2$ dissolves in water?
    - A. Zn metal plates onto the surface of the salt.
    - B. Cu metal plates onto the surface of the salt.
    - C. Zn^{2+} ions and NO_3^- ions are released.
    - D. Cu^{2+} ions and NO_3^- ions are released.

24. When tin is measured using a standard hydrogen electrode following the same procedure as was used in Experiment 1, a voltage is measured that is higher than those measured for Fe and Zn, but lower than those measured for Ag and Cu. Which of the following is a plausible value for the E° of tin?

F. –0.52 V
G. –0.14 V
H. 0.47 V
J. 0.93 V

25. A student claimed that when a metal strip is placed in the same metal's nitrate salt solution, no metal will form on the surface of the metal strip. Do the results of Experiment 2 support her claim?

A. Yes; no plating was observed for any of the metals when they were placed in the same metal's nitrate salt solution.
B. Yes; plating was observed for all of the metals when they were placed in the same metal's nitrate salt solution.
C. No; no plating was observed for any of the metals when they were placed in the same metal's nitrate salt solution.
D. No; plating was observed for all of the metals when they were placed in the same metal's nitrate salt solution.

26. A student claimed that Zn ions will more easily gain electrons to form a metal than will any of the other metals tested. Do the results of Experiment 1 support his claim?

F. No; Zn had a lower E° than any of the other metals tested.
G. No; Zn had a higher E° than any of the other metals tested.
H. Yes; Zn had a higher E° than any of the other metals tested.
J. Yes; Zn had a lower E° than any of the other metals tested.

27. The E° of lead (Pb) is –0.13 V. Based on the results of Experiments 1 and 2, if one strip of Pb were placed in an $AgNO_3$ solution, and one strip of Pb were placed in a $Zn(NO_3)_2$ solution, what would most likely occur?

A. Ag would plate on the Pb, but Zn would not.
B. Zn would plate on the Pb, but Ag would not.
C. Both Ag and Zn would plate on the Pb.
D. Neither Ag nor Zn would plate on the Pb.

Passage VI

In corn snakes, pigmentation is determined by Genes O and B. These genes are on separate chromosomes.

All corn snakes have 2 copies of each gene. A corn snake's coloration depends on the *alleles* (forms of a gene) it carries at these genes. Corn snakes can appear orange and black, all black, all orange, or *albinotic* (lacking in pigment). Gene O determines whether orange pigment is produced. OO and Oo corn snakes produce orange pigment; oo corn snakes do not. Gene B determines whether black pigment is produced. BB and Bb corn snakes produce black pigment; bb corn snakes do not.

A teacher showed her students the results of 3 studies to demonstrate the relationship between *genotype* (genetic makeup) and *phenotype* (appearance) in corn snakes.

Study 1

The teacher presented the results of 3 crosses in which both parents were BB at Gene B (see Table 1).

Table 1

Cross	Genotype of parents* F	M	Percent of offspring that appear: orange and black	all orange	all black	albinotic
1	OO	Oo	100	0	0	0
2	Oo	Oo	75	0	25	0
3	oo	Oo	50	0	50	0

*F = female; M = male.

Study 2

The teacher presented the results of 3 crosses in which both parents were OO at Gene O (see Table 2).

Table 2

Cross	Genotype of parents* F	M	Percent of offspring that appear: orange and black	all orange	all black	albinotic
4	Bb	BB	100	0	0	0
5	Bb	Bb	75	25	0	0
6	Bb	bb	50	50	0	0

*F = female; M = male.

Study 3

The teacher produced Table 3 showing the results of 6 crosses. Some cells were left blank so the students could predict the omitted information.

Table 3

Cross	Genotype of parents* F	M	Percent of offspring that appear: orange and black	all orange	all black	albinotic
7	oobb		100	0	0	0
8	OOBb	OOBb	75	25	0	0
9		oobb	50	50	0	0
10	oobb	oobb	0	0	0	100
11	oobb	OoBB	50	0	50	0
12	OoBb	oobb				

*F = female; M = male.

28. The information provided indicates that albinotic corn snakes have which of the following genotypes?

F. oobb
G. ooBb
H. Oobb
J. OOBB

29. With respect to Genes O and B, which of the following crosses was identical to Cross 8 ?

A. Cross 1
B. Cross 3
C. Cross 4
D. Cross 5

30. Which of the following crosses could have been used to produce the male parents in Cross 1 ?

F. oobb × oobb
G. ooBB × OOBB
H. OObb × OObb
J. OOBB × OOBB

1. What is the genotype of the orange and black offspring in Cross 11 ?

A. oobb
B. OoBb
C. OoBB
D. OOBb

32. Which of the following crosses would result in 50% offspring that were all orange and 50% offspring that were albinotic?

F. ooBb × Oobb
G. ooBb × ooBB
H. oobb × OOBB
J. oobb × Oobb

33. Which of the following correctly shows the genotype of the female parents used in Cross 2 ?

A. OOBB
B. OoBB
C. OoBb
D. Oobb

GO ON TO THE NEXT PAGE.

Passage VII

Introduction

The *nucleus* (core) of an atom contains *protons* (positively charged particles) and *neutrons* (uncharged particles). Protons and neutrons are also called *nucleons*. Nucleons are attracted to each other by *strong nuclear forces*. Two models of the nucleus are discussed below.

The Liquid Drop Model

Some nuclear properties resemble the collective properties of the molecules in a drop of pure water.

- The stability of a nucleus is related to its shape. A nucleus is most stable (unreactive) when spherical; drop-shaped nuclei are more likely to undergo *fission* (split apart) than spherical nuclei.
- The mass and volume of a nucleus are proportional to the number of nucleons in the nucleus.
- The combining of 2 nuclei resembles the combining of 2 drops of water.
- Collisions of high-energy nucleons with the nuclei of certain elements cause the nuclei to undergo fission, just as projectiles disrupt drops of water.

The Shell Model

A nucleus contains distinct bands of energy called *energy shells*. Its nucleons are restricted to these shells. Each nucleus contains many such shells, but not all shells contain nucleons. Each shell is identified by a number. Table 1 contains the capacities of the first 3 shells.

Table 1

Shell	Maximum number of: protons	neutrons	nucleons
1	2	2	4
2	6	6	12
3	12	12	24

- When every shell is either empty or contains its maximum number of protons or neutrons, a nucleus is *magic*. For example, the nucleus with a total of 20 protons and 19 neutrons has a *magic number* of protons, because the only shells that contain any protons (Shells 1, 2, and 3) contain their maximum numbers of protons. Magic nuclei are generally more stable than other nuclei. The nucleus with 20 protons and 20 neutrons is *doubly magic* (magic in both protons and neutrons). Doubly magic nuclei are the most stable nuclei and are shaped like spheres.
- Low-energy neutrons will pass through the nuclei of many elements without being impeded. This implies that the nucleons inside a nucleus will not interfere with each other and is consistent with nucleons being in shells.

34. According to the Liquid Drop Model, a nucleus is *least* likely to undergo fission under which of the following conditions?

F. When its nucleons occupy filled shells
G. When its nucleons occupy partially filled shells
H. When the nucleus is shaped like a sphere
J. When the nucleus is shaped like an ellipse

35. According to the Shell Model, if a nucleus contains 8 neutrons, a maximum of how many of its energy shells could be filled to capacity with neutrons?

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

36. In very massive stars, energy is produced when a helium nucleus and a beryllium nucleus combine to form a carbon nucleus. According to the Liquid Drop Model, the formation of a carbon nucleus can be likened to the:

F. combining of 2 liquid drops.
G. fission of a liquid drop.
H. fission of 2 liquid drops.
J. escape of a molecule from a liquid drop.

37. The 2 theories agree that the most stable nuclei are those that:

A. contain equal numbers of protons and neutrons.
B. contain partially filled shells.
C. have spherical shapes.
D. readily undergo fission.

8. In the description of the Shell Model, a nucleus with 20 protons and 19 neutrons is discussed. While the nucleus is *magic* with respect to protons, it is not *magic* with respect to neutrons, because:

   F. many of its shells contain no neutrons at all.
   G. none of its shells contains the maximum number of neutrons.
   H. one of its shells contains some neutrons but not the maximum number of neutrons.
   J. only one of its shells contains the maximum number of neutrons.

. According to the Shell Model, a nucleus would most likely be spherical if the total numbers of protons and neutrons in its first 2 shells equaled which of the following values?

(Note: Assume that Shells 3 and higher are empty.)

A. 2 protons, 3 neutrons
B. 6 protons, 6 neutrons
C. 8 protons, 7 neutrons
D. 8 protons, 8 neutrons

40. A supporter of the Liquid Drop Model favors the view that nucleons in a nucleus interact with each other like the molecules in a drop of water. A supporter of the Shell Model would refute this view using which of the following observations?

   F. Collisions between high-energy nucleons and nuclei can cause the nuclei to undergo fission.
   G. Low-energy neutrons pass through the nuclei of many elements unimpeded.
   H. Nuclei act like drops of fluid.
   J. Some nuclei are spherical.

END OF TEST 4

STOP! DO NOT RETURN TO ANY OTHER TEST.

2003年12月ACT试题（61E）答案

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