Chapter 30
Practice Exam 3

The Princeton Review®

ACT Diagnostic Test Form

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

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

HOME ADDRESS: _____
(Print)   Number and Street

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City   State   Zip

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CLASS OF: _____

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

2. TEST FORM

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3. TEST CODE

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4. PHONE NUMBER

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5. YOUR NAME

First 4 letters of last name				FIRST INIT	MID INIT
Ⓐ	Ⓐ	Ⓐ	Ⓐ	Ⓐ	Ⓐ
Ⓑ	Ⓑ	Ⓑ	Ⓑ	Ⓑ	Ⓑ
Ⓒ	Ⓒ	Ⓒ	Ⓒ	Ⓒ	Ⓒ
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6. DATE OF BIRTH

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

7. SEX

◯ MALE
◯ FEMALE

8. OTHER

1	Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ
2	Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ
3	Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ

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

ENGLISH

1 Ⓐ Ⓑ Ⓒ Ⓓ	21 Ⓐ Ⓑ Ⓒ Ⓓ	41 Ⓐ Ⓑ Ⓒ Ⓓ	61 Ⓐ Ⓑ Ⓒ Ⓓ
2 Ⓕ Ⓖ Ⓗ Ⓙ	22 Ⓕ Ⓖ Ⓗ Ⓙ	42 Ⓕ Ⓖ Ⓗ Ⓙ	62 Ⓕ Ⓖ Ⓗ Ⓙ
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4 Ⓕ Ⓖ Ⓗ Ⓙ	24 Ⓕ Ⓖ Ⓗ Ⓙ	44 Ⓕ Ⓖ Ⓗ Ⓙ	64 Ⓕ Ⓖ Ⓗ Ⓙ
5 Ⓐ Ⓑ Ⓒ Ⓓ	25 Ⓐ Ⓑ Ⓒ Ⓓ	45 Ⓐ Ⓑ Ⓒ Ⓓ	65 Ⓐ Ⓑ Ⓒ Ⓓ
6 Ⓕ Ⓖ Ⓗ Ⓙ	26 Ⓕ Ⓖ Ⓗ Ⓙ	46 Ⓕ Ⓖ Ⓗ Ⓙ	66 Ⓕ Ⓖ Ⓗ Ⓙ
7 Ⓐ Ⓑ Ⓒ Ⓓ	27 Ⓐ Ⓑ Ⓒ Ⓓ	47 Ⓐ Ⓑ Ⓒ Ⓓ	67 Ⓐ Ⓑ Ⓒ Ⓓ
8 Ⓕ Ⓖ Ⓗ Ⓙ	28 Ⓕ Ⓖ Ⓗ Ⓙ	48 Ⓕ Ⓖ Ⓗ Ⓙ	68 Ⓕ Ⓖ Ⓗ Ⓙ
9 Ⓐ Ⓑ Ⓒ Ⓓ	29 Ⓐ Ⓑ Ⓒ Ⓓ	49 Ⓐ Ⓑ Ⓒ Ⓓ	69 Ⓐ Ⓑ Ⓒ Ⓓ
10 Ⓕ Ⓖ Ⓗ Ⓙ	30 Ⓕ Ⓖ Ⓗ Ⓙ	50 Ⓕ Ⓖ Ⓗ Ⓙ	70 Ⓕ Ⓖ Ⓗ Ⓙ
11 Ⓐ Ⓑ Ⓒ Ⓓ	31 Ⓐ Ⓑ Ⓒ Ⓓ	51 Ⓐ Ⓑ Ⓒ Ⓓ	71 Ⓐ Ⓑ Ⓒ Ⓓ
12 Ⓕ Ⓖ Ⓗ Ⓙ	32 Ⓕ Ⓖ Ⓗ Ⓙ	52 Ⓕ Ⓖ Ⓗ Ⓙ	72 Ⓕ Ⓖ Ⓗ Ⓙ
13 Ⓐ Ⓑ Ⓒ Ⓓ	33 Ⓐ Ⓑ Ⓒ Ⓓ	53 Ⓐ Ⓑ Ⓒ Ⓓ	73 Ⓐ Ⓑ Ⓒ Ⓓ
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MATHEMATICS

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15 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	30 Ⓕ Ⓖ Ⓗ Ⓙ Ⓚ	45 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	60 Ⓕ Ⓖ Ⓗ Ⓙ Ⓚ

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READING

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

SCIENCE REASONING

1 Ⓐ Ⓑ Ⓒ Ⓓ	11 Ⓐ Ⓑ Ⓒ Ⓓ	21 Ⓐ Ⓑ Ⓒ Ⓓ	31 Ⓐ Ⓑ Ⓒ Ⓓ
2 Ⓕ Ⓖ Ⓗ Ⓙ	12 Ⓕ Ⓖ Ⓗ Ⓙ	22 Ⓕ Ⓖ Ⓗ Ⓙ	32 Ⓕ Ⓖ Ⓗ Ⓙ
3 Ⓐ Ⓑ Ⓒ Ⓓ	13 Ⓐ Ⓑ Ⓒ Ⓓ	23 Ⓐ Ⓑ Ⓒ Ⓓ	33 Ⓐ Ⓑ Ⓒ Ⓓ
4 Ⓕ Ⓖ Ⓗ Ⓙ	14 Ⓕ Ⓖ Ⓗ Ⓙ	24 Ⓕ Ⓖ Ⓗ Ⓙ	34 Ⓕ Ⓖ Ⓗ Ⓙ
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10 Ⓕ Ⓖ Ⓗ Ⓙ	20 Ⓕ Ⓖ Ⓗ Ⓙ	30 Ⓕ Ⓖ Ⓗ Ⓙ	40 Ⓕ Ⓖ Ⓗ Ⓙ

I hereby certify that I have truthfully identified myself on this form. I accept the consequences of falsifying my identity.

_____
Your signature

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Today's date

ENGLISH TEST

45 Minutes—75 Questions

DIRECTIONS: In the five passages that follow, certain words and phrases are underlined and numbered. In the right-hand column, you will find alternatives for each underlined part. In most cases, you are to choose the one that correctly 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 correct, choose "NO CHANGE." In some cases, you will find in the right-hand column a question about the underlined part of the passage. You are to choose the correct answer to the question.

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

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

PASSAGE I

The Rat Race

When I was a little girl, my family was deciding to move
<u>was deciding to move</u>
1

from suburban Southern California to rural Northern California. All of my friends lived in the neighborhood where I had grown

up but I didn't want to move. Classes starting in the fall and
<u>up but</u>
2

unfamiliar faces looked at me with curiosity scared me stiff.
<u>looked</u>
3

For example, I asked my parents why they were doing
<u>For example, I</u>
4

this to me. I pleaded; begging to be allowed to stay behind
<u>pleaded; begging to be allowed</u>
5
and live with my grandparents. My mother, trying to explain to me, said, "Daddy needs to get away from the rat race." I imagined my father in his car, surrounded by giant rats racing

1. A. NO CHANGE
    B. were deciding and moving
    C. were deciding to move
    D. decided to move

2. F. NO CHANGE
    G. up, because
    H. up, so
    J. up, but

3. A. NO CHANGE
    B. having looked
    C. looking
    D. DELETE the underlined portion.

4. F. NO CHANGE
    G. Nevertheless, I
    H. I, however,
    J. I

5. A. NO CHANGE
    B. pleaded, begging to be allowed
    C. pleaded, begging to be allowed,
    D. pleaded begging to be allowed

GO ON TO THE NEXT PAGE.

him home and was blocking his way. In my imagination
⁶

he didn't look scared so much as frustrated.
⁷

    I finally asked my father why he wanted us to move so far
⁸
away from home. One of his main reasons, he said, was the long
⁸

drive home after work. For him, the worst and most terrible thing,
⁹
about living in Southern California was having no time to go

fishing, one of his favorite hobbies.

    [1] My parents eventually picked Redding for our new home,

partly because there were two lakes within an hour's drive, and

we made the move. [2] Since my father's new commute was

only fifteen minutes, he would be able to go fishing after work

sometimes. [3] I was sad to say goodbye to my friends when we

finally did move. [4] However, I had to admit that my father

looked happier than he had in years. [5] Before the move, he
¹⁰
used to complain about crazy drivers while eating reheated

leftovers. [6] After the move, we had dinner and, talked about
¹¹

the weekend calmly as a family. [12]

6. **F.** NO CHANGE
    G. blocking
    H. were blocking
    J. DELETE the underlined portion.

7. At this point, the author would like to give the reader a better idea of how she thought her father felt. Given that all the choices are true, which one best accomplishes this purpose?

    A. NO CHANGE
    B. he was stuck on the highway for hours and hours.
    C. he couldn't see the rats even though I could.
    D. he looked so small compared to the giant rats.

8. Given that all the choices are true, which one provides the best opening to this paragraph?

    F. NO CHANGE
    G. The rats seemed like more of an annoyance than a danger.
    H. I didn't really understand what my mom meant by the "rat race" until years later.
    J. During holidays and long weekends, my father loved to go fishing.

9. **A.** NO CHANGE
    B. the most awfully terrible part
    C. the worst, most terrible thing
    D. the worst part

10. **F.** NO CHANGE
    G. more happier then
    H. happier then
    J. the happiest than

11. **A.** NO CHANGE
    B. dinner and talked,
    C. dinner, and talked
    D. dinner and talked

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

    F. where it is now.
    G. after Sentence 1.
    H. after Sentence 2.
    J. after Sentence 3.

GO ON TO THE NEXT PAGE.

As I got older, when we visited family and friends in Southern California. I could see the difference from the traffic at home in Redding. There weren't any huge rats on the highway,

but as I sat in the car watching the endless lines of cars, I got a glimpse of what my parents had meant. Redding might have been unpleasantly empty of familiar associations for me but that same emptiness was more pleasant for my parents, because it included empty roads, empty skies, and empty days to fill as they pleased.

13. **A.** NO CHANGE
    B. California; I
    C. California, I
    D. California and I

14. **F.** NO CHANGE
    G. the unending and interminable lines
    H. the endlessly, continuing forever, lines
    J. the lines, going on into eternity without end

Question 15 asks about the preceding passage as a whole.

---

15. Suppose the writer's goal had been to write a short essay telling the reader why, in her opinion, her family moved to Redding. Would this essay successfully fulfill that goal?

    A. Yes, because it describes her father's reasons for wanting to move, as the author understands them.
    B. Yes, because it demonstrates that children sometimes have misconceptions about the reasons for a move.
    C. No, because it fails to explain why the author was frightened by the prospect of the move.
    D. No, because it focuses more heavily on the feelings of a party other than the author.

PASSAGE II

The Latino Murals of Los Angeles

The Mexican-American artist Judith Baca credits her family for her artistic inspiration. She was raised by her mother and grandmother, themselves in a vibrant Latino community in East Los Angeles. Her art is thus a tribute to her family's past as well

as to her cultural heritage, which she believes her art embodies the spirit of Los Angeles.

Baca studied art both in Los Angeles and Cuernavaca, Mexico. Her chosen field of art, the mural, has long been a part of Mexican artistic culture, and has experienced a popular

16. **F.** NO CHANGE
    G. grandmother, themselves,
    H. grandmother related to her
    J. grandmother

17. **A.** NO CHANGE
    B. heritage; she
    C. heritage, she
    D. heritage, but she

18. **F.** NO CHANGE
    G. art, the mural—
    H. art the mural—
    J. art the mural,

GO ON TO THE NEXT PAGE.

revival in Los Angeles <u>in recent years</u>. She has gained fame for
                                    19
her colorful murals depicting episodes from Latino history, many

of which can be found in the Los Angeles area. ☐20

Moreover, the recent popularity of the mural as a form of
    21
art is often linked to the prevalence of graffiti in urban areas.

Some of the earliest examples of modern murals, such as

Willie Herrón's *The Wall That Cracked Open*, <u>was treated</u>
                                                    22
as graffiti, rather than art. Many muralists remain

anonymous, and their works tend to be in public places.

Some <u>murals political messages</u> also made people uneasy
            23
about this art form in the early days of its resurgence.

Today, however, city officials often hire known

muralists such as Baca to create masterpieces on

government property. Because of their size, murals often

require the assistance of other artists and, as <u>evidence,</u>
                                                    24
sometimes become community efforts. Murals are also

<u>a way for people to connect their cultural past with their present</u>
                                    25
<u>reality, by using traditional figures to tell modern stories.</u>
                                    25
It is this community involvement that has helped sway the

minds of officials, as well as the realization that many

murals convey positive messages. Some depict scenes

19. The underlined phrase could be placed in all the following
locations EXCEPT:

   A. where it is now.
   B. after the word *revival*.
   C. after the word *popular*.
   D. before the word *experienced*.

20. If the writer were to delete the preceding sentence, the essay
would primarily lose:

   F. an artistic evaluation of Baca's techniques compared to
traditional techniques.
   G. an explanation of the historical circumstances that led to
the development of murals as an art form.
   H. an analysis of Baca's place in the rebirth of murals with
themes from Latino history.
   J. a piece of information regarding Baca's success and one
region in which her work is popular.

21. **A.** NO CHANGE
     B. However, the
     C. The
     D. Therefore, the

22. **F.** NO CHANGE
     G. was mistakenly treated
     H. were treated
     J. was treated, by mistake,

23. **A.** NO CHANGE
     B. murals political messages,
     C. mural's political messages
     D. murals' political messages

24. **F.** NO CHANGE
     G. stated
     H. a result
     J. imagined

25. Given that all the choices are true, which one provides the
most relevant information at this point in the essay?

   A. NO CHANGE
   B. more accessible to members of the public than most art is,
because they are located in the heart of the community.
   C. often funded by government agencies that want to cover
up abandoned factories and warehouses.
   D. particularly effective for telling allegorical stories, in part
because their large size gives artists so much room.

GO ON TO THE NEXT PAGE.

of multicultural harmony, they are inspired by the
26
neighborhoods in which they are situated. Others show

scenes of past successes by members of the community. Still
27
others strive to depict the historic achievements of the generations
past.

By creating beautiful murals in her neighborhood,
Baca is working to create a sense of community pride. The bright
28

faces of the people, she paints signal the bright possibilities
29

available to the viewer. They're successes, Baca suggests, can be
30
yours.

26. **F.** NO CHANGE
    G. harmony, it was prompted
    H. harmony, that was inspired
    J. harmony, inspired

27. **A.** NO CHANGE
    B. by members of the community of past successes
    C. of past successes of the community by members
    D. of the community by members of past successes

28. **F.** NO CHANGE
    G. a sense of community pride is being created by Baca.
    H. the community is developing a sense of pride.
    J. a sense of community pride, which Baca is working to create.

29. **A.** NO CHANGE
    B. people she paints:
    C. people; she paints
    D. people she paints

30. **F.** NO CHANGE
    G. Its
    H. Their
    J. It's

PASSAGE III

The Birth of the Video Game

The last decade had saw increasingly sophisticated video
31
gaming consoles that allow players to compete at great distances,
control characters through body movements, and much more. The
possibilities of video gaming, taken for granted today, were
mind-blowing in 1972 when Nolan Bushnell and Ted Dabney
32
introduced the public to their new creation: *Pong*.

There had been other video games before *Pong*, of course. The
necessary technology had been developed as early as 1952, and
Pong were preceded by several other games, such as *Tennis for*
33
Two, *Spacewar!*, and *Computer Science*.

31. **A.** NO CHANGE
    B. has seen
    C. has saw
    D. would of seen

32. **F.** NO CHANGE
    G. 1972, where
    H. 1972, in which
    J. 1972, that

33. **A.** NO CHANGE
    B. precede
    C. was preceding
    D. was preceded

GO ON TO THE NEXT PAGE.

However, it was not until *Pong*, with its simple interface and addictive nature, that the concept of home video gaming systems really took off. [34]

[1] Looking back on *Pong* today, it seems ridiculously old-fashioned, so it's easy to contrast it with modern games. [2] It's not that *Pong* was the most advanced game of the

era: Several earlier games, in fact; were actually more technologically advanced. [3] *Pong*'s strength was its

combination of novelty and accessibility. [4] The other games, sophisticated as they were, simply proved too difficult for

the average consumer or person considering making a purchase.

[5] However, it was groundbreaking in its day, in it's own way. [40]

34. The writer is considering deleting the preceding sentence from the essay. The sentence should NOT be deleted because it:

   F. serves as a transition from the more general discussion about *Pong* to the more specific description of what made *Pong* successful.

   G. describes the technical skill required to play *Pong*, which is important to understanding the essay.

   H. demonstrates which elements of *Pong* led to its ultimate ascendance over other, more technologically sophisticated games.

   J. shows that those who claim that *Pong* was the first modern video game are basing their claim on insufficient information.

35. Given that all the choices are true, which one would best complete the sentence so that it most clearly explains the writer's reasons for calling *Pong* "old-fashioned"?

   A. NO CHANGE

   B. with its basic graphics, simplistic game play, and repetition.

   C. and some people like for things to stay that way.

   D. because of the lack of technological development and complex game-play.

36. **F.** NO CHANGE

   G. games in fact,

   H. games, in fact,

   J. games, in fact

37. Which of the following alternatives to the underlined word would be LEAST acceptable?

   A. uniqueness

   B. complexity

   C. innovation

   D. freshness

38. **F.** NO CHANGE

   G. the average consumer or individual possibly purchasing it.

   H. the average consumer or someone making a purchase, possibly.

   J. the average consumer.

39. **A.** NO CHANGE

   B. they're

   C. their

   D. its

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

   F. where it is now.

   G. after Sentence 1.

   H. after Sentence 2.

   J. after Sentence 3.

GO ON TO THE NEXT PAGE.

The history of the video game becomes more understandable when it is remembered that the creators of early games were primarily engineers and mathematicians, developing these games for their own amusement, they paid little attention to popular marketing. These pioneering developers saw the games they created as "doodling," more or less. Even when they introduced their products to the public, they usually did so as part of a showpiece, on a temporary basis.

So just think of how far video game technology has come, and don't forget that the technology continues to advance every day. In *Pong*, a player uses a single knob to send a "ball" back and forth across the screen, gaining points and trying to prevent the ball from slipping past the "paddle," a bar at the bottom of the screen. Compared to high complex games like *Super Mario Galaxy* and *Halo*, *Pong* may seem laughable.

But anyway, I still think *Pong* is fun to play sometimes.

41. **A.** NO CHANGE
    B. mathematicians only developing
    C. mathematicians. Developing
    D. mathematicians, only developing

42. **F.** NO CHANGE
    G. public, whom they met at special events,
    H. public, who wouldn't normally see their products,
    J, public, with whom they spoke at events,

43. **A.** NO CHANGE
    B. high complexity
    C. highly complexity
    D. highly complex

44. Given that all the choices are true, which one would most effectively express the writer's attitude towards the future of the video game industry?

    F. NO CHANGE.
    G. The men who created *Pong* are truly to be thanked for introducing the world to one of its most entertaining hobbies.
    H. At its core, *Pong* represents the ultimate goal of all video games: just having a good time.
    J. Still, it opened the door to all of the advances that have come since, and that will no doubt continue until the games of today seem just as ridiculous as *Pong*.

Question 45 asks about the preceding passage as a whole.

45. Suppose the writer's goal had been to write an essay demonstrating the impact a single invention can have on the development of an industry. Would this essay fulfill that goal?

    A. No, because the essay focuses too heavily on the other games that preceded *Pong* rather than its actual impact.
    B. No, because the essay concludes that *Pong* was ultimately not as influential as some assert.
    C. Yes, because the essay explains how *Pong* was able to gain widespread acceptance for video games.
    D. Yes, because the essay demonstrates that *Pong* was the first video game released to the public.

GO ON TO THE NEXT PAGE.

PASSAGE IV

The Life of a Hero

During a weekend visit a while back, I decided to show my nephew, Paul, my old comic books. The pristine copies of *Superman*, *Spider-Man*, and my favorite, *Green Lantern*, were all stored neatly in a box. I thought it would be fun to introduce him to my favorite handful of characters. I knew Superman and Spider-Man were still popular, but I figured the Green Lantern of my youth had probably went the way of other long-forgotten heroes.

John Stewart, the first African-American to serve as the Green Lantern was one of the first African-American superheroes to become widely popular. A

former Marine and a practiced and fearsome warrior. With

his ring, he was almost unstoppable. He was a fighter, leading, and, on top of everything else, acting cool. Stewart

seemed to embody everything I could have wanted for my future: the respect of others, the power to control himself,

and he was known for having a great sense of style.

46. Which choice provides the most specific information?
   F. NO CHANGE
   G. a few years ago
   H. last summer
   J. some time ago

47. A. NO CHANGE
   B. probably gone
   C. probably had left
   D. probably went out

48. F. NO CHANGE
   G. Lantern, was one,
   H. Lantern, was one
   J. Lantern was one,

49. A. NO CHANGE
   B. Marine, he practiced
   C. Marine, he was a practiced
   D. Marine, practicing

50. F. NO CHANGE
   G. was good at fighting,
   H. had an ability to fight,
   J. could fight,

51. A. NO CHANGE
   B. could of wanted
   C. could of been wanting
   D. DELETE the underlined portion

52. F. NO CHANGE
   G. he dressed with great personal style.
   H. the best sense of style ever.
   J. his sense of personal style was really great.

GO ON TO THE NEXT PAGE.

Growing up in the 1970s, I idolized Stewart. [53] I devoured the comics featuring Stewart, not just because he was a true superhero but because of his back-story. Unlike Superman, Stewart seemed like a hero I could understand.

His life had its ups and its downs; his problems were real life problems that I could relate to. He got in trouble sometimes and fought with his friends and family. He came from a bad neighborhood and hadn't always been on the road to superhero status.

For a little while in the early 1990s, there was a series that focused solely on Stewart as the Green Lantern, but after it ended, Stewart was replaced and seemed likely to be forgotten. Much to my surprise, however, Paul knew exactly who Stewart was. He was just as big a fan as I had been, but for different reasons. For me, Stewart's rocky, life story was central to his appeal. For Paul, however, Stewart's past didn't matter as much as did his actions; Paul admired Stewart because he was such a strong role model.

When I was young, Stewart was a role model that I could identify with. I assumed Paul would either have his own role models or would share my feelings about my role models.

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

> Each Green Lantern was chosen by a group called The Guardians, whose members took into consideration a number of personal qualities, including physical strength, moral fiber, and a strong sense of duty to all living beings.

Should the writer make this addition here?

A. Yes, because it provides important background information that helps the reader understand the essay.
B. Yes, because it contributes to the writer's discussion of Stewart's positive attributes.
C. No, because it undermines the author's claim that Stewart was a more realistic role model.
D. No, because it provides information that is irrelevant to the main point of the paragraph.

54. Given that all of the choices are true, which one best explains the author's belief that Stewart was a more understandable character and shows a more realistic image of Stewart?

F. NO CHANGE
G. Stewart was a more sympathetic character and I had an easier time imagining myself in his shoes.
H. The Green Lantern ring allowed Stewart to fly into space, create weapons out of thin air, and protect his friends.
J. Unlike Superman, Stewart couldn't fly without his ring because he didn't naturally have superpowers.

55. A. NO CHANGE
B. after;
C. after:
D. after,

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

F. though,
G. furthermore,
H. on the contrary
J. DELETE the underlined portion

57. A. NO CHANGE
B. Stewarts rocky
C. Stewarts' rocky,
D. Stewart's rocky

58. Which choice most effectively supports the point being made in the first part of this sentence?

F. NO CHANGE
G. of what he did, not who he was.
H. of what he represented.
J. he was able to overcome his past.

GO ON TO THE NEXT PAGE.

Instead, he shared my role models but not my reasons. To him, Stewart was simply a superhero, just like Superman. He admired them both without worrying about that. In Paul's worldview, all

59. A. NO CHANGE
B. their back-stories.
C. all that.
D. those.

superheroes are simply superheroes they're heroes, regardless of their pasts, not because of them.

60. F. NO CHANGE
G. superheroes; they're
H. superheroes, they're
J. superheroes being

PASSAGE V

Into the Trenches

It has often been suggested that, contrary to the worn-out time saying, the ocean, rather than space, is the true

61. A. NO CHANGE
B. timeworn
C. timed out
D. out of time

final frontier. There is the immense pressure that poses a serious danger to unknown geography that can injure people and vessel alike, various factors make sending human explorers very risky. Deep-sea expeditions also tend to incur prohibitive costs, with the cost increasing as the expedition ventures into deeper regions. The deepest section of the ocean is the *Marianas Trench*. ☐64 Due primarily to its depth and the potential for danger, the *Marianas Trench* remains largely unexplored to this day.

62. F. NO CHANGE
G. From
H. Just like
J. Between

63. Given that all the choices are true, which one is the most relevant to the statement that follows in this sentence?

A. NO CHANGE
B. are known for being rather difficult,
C. are dangerous to diver and sea-life alike,
D. often cause damage to human life and to equipment,

64. The writer is considering adding the following true information to the end of the preceding sentence (placing a comma after the word *Trench*):

> which begins at 20,000 feet, has points where the depth approaches seven miles, and pressure reaching eight tons per square inch.

Should the writer make this addition?

F. Yes, because it provides specific information about the *Marianas Trench* that explains why the author included this sentence.
G. Yes, because it demonstrates how valuable human-led explorations of the depths of the ocean and likely to be.
H. No, because it detracts from the writer's discussion of the potential dangers of deep-sea exploration.
J. No, because it weakens the writer's point about the correlation between increasing depth and increasing cost.

GO ON TO THE NEXT PAGE.

The shallow portions of the oceans also hold many
⎯⎯⎯⎯
65
fascinating species of plants and animals. The environment,
⎯⎯⎯⎯⎯⎯
65
hostile though it may be to man, is hospitable to others,

allowing for the development of creatures not found anywhere
⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯
66
else on the planet. The first and last exploration of the *Marianas*

Trench's floor took place in 1960. Therefore, the cost of sending
⎯⎯⎯⎯⎯⎯
67
people back has been seen as too great, the danger as too serious.

The goal, then, has been to find a way to learn about this
frontier without risking the lives of scientist-explorers. One way
that scientists had discovered new information is through the use
⎯⎯⎯⎯⎯⎯⎯⎯
68

of sonar. As sonar—which is far less expensive than a human-led
⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯
69
diving expedition is—capabilities have improved, scientists have
⎯⎯⎯⎯⎯⎯⎯⎯
69
been able to get more accurate maps of the ocean's floor based
on sound-imaging.

Another method of exploration that has become more
common in recent years, as technology has advanced revolves
⎯⎯⎯⎯⎯
70
around the use of unmanned submersibles. These include devices

as simple for cameras and as advanced as underwater robots able
⎯⎯
71
to perform a wide-range of functions. The latter have become
increasingly common in recent years as they have become ever
more advanced.

The question faced today is why these underwater robots
⎯⎯⎯
72
will be sufficient, eliminating the need to send humans back

65. Given that all the choices are true, which one best leads from the preceding paragraph to the subject of this paragraph?

   A. NO CHANGE
   B. One danger of deep-sea diving is a medical condition caused by an abrupt change in outside pressure.
   C. Some argue that the bottom of the ocean isn't truly any more dangerous than the deep rainforest or highest mountain peaks.
   D. Even knowing about all of the obstacles, however, some scientists feel the draw of the ocean's depths.

66. F. NO CHANGE
   G. to which development has been allowed
   H. which allows for the developing of
   J. development has been allowed

67. A. NO CHANGE
   B. Nevertheless,
   C. In contrast,
   D. Since then,

68. F. NO CHANGE
   G. could of discovered
   H. were discovering
   J. have discovered

69. Given that all the choices are true, which one most effectively describes what sonar is?

   A. NO CHANGE
   B. initially developed during World War I—
   C. a sound-based method of determining surroundings—
   D. not completely unlike the echolocation used by certain animals—

70. F. NO CHANGE
   G. advanced,
   H. advanced—
   J. advanced:

71. A. NO CHANGE
   B. as
   C. than
   D. DELETE the underlined portion

72. F. NO CHANGE
   G. what
   H. whether
   J. DELETE the underlined portion

GO ON TO THE NEXT PAGE.

into the depths. Most of the robots used thus far have been
"tethered," or attached in some way to a larger device with
_____
73

people aboard, the day when the robots can move independently
may not be far off. Given the extreme depths of some locations,
however, it seems likely that self-propelled robots will become
more useful and handy. If that is the case, one is forced to
_____
74

wonder: Are more complex robots truly the key, or will humans

need to venture back into the ocean's inky depths? ⬚75

73. **A.** NO CHANGE
B. Most, if not all,
C. Although most
D. All or most

74. **F.** NO CHANGE
G. practically useful.
H. useful.
J. effectively useful.

75. The writer is considering ending the essay with the following sentence:

> Perhaps one day humans will be able to create a robot able to simulate the emotional responses of a human, or even a robot with the ability to experience feelings.

Should the writer add this sentence here?

A. Yes, because it expands the essay to encompass the ethical concerns raised by the development of artificial intelligence.
B. Yes, because it explains one reason for continued reliance on robots in deep-sea explorations.
C. No, because it fails to consider the usefulness of robots in present and future deep-sea exploration, as well as whether their use is cost-effective.
D. No, because it distracts from the essay's central topic of deep-sea exploration and the issues preventing humans from leading expeditions.

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

MATHEMATICS TEST

60 Minutes—60 Questions

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

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 $\dfrac{5y-1}{3} = -6$, then which of the following must be true?

A. $y = -18$

B. $y = -\dfrac{19}{5}$

C. $y = -\dfrac{17}{5}$

D. $y = -1$

E. $y = \dfrac{17}{5}$

2. The expression $\dfrac{12z^{10}}{4z^2}$ is equivalent to:

F. $3z^5$
G. $8z^5$
H. $3z^8$
J. $8z^8$
K. $8z^{12}$

3. If $f(x) = \dfrac{x^2 - 18}{x + 2}$, then $f(12) = ?$

A. -4
B. 3
C. 9
D. 12
E. 126

GO ON TO THE NEXT PAGE.

4. In one month, Rebecca, an entertainment journalist, recorded how many movies she watched and how many articles she wrote. She plotted this data in the graphs below: Graph 1 shows the relationship between the time elapsed and the number of movies watched; Graph 2 shows the relationship between the number of movies watched and the number of articles written. According to this data, how many articles did she write in the first 3 weeks of this month?

DO YOUR FIGURING HERE.

Graph 1 — movies watched (m) vs. weeks elapsed (w)

Graph 2 — articles written (a) vs. movies watched (m)
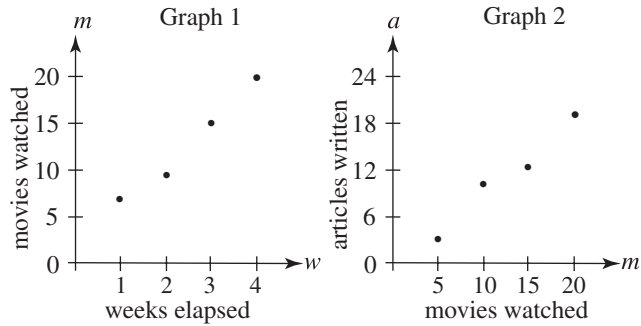
- **F.** 3
- **G.** 5
- **H.** 8
- **J.** 12
- **K.** 15

5. What is the value of $117 - 54 + 6$, rounded to the nearest ten?

- **A.** 40
- **B.** 50
- **C.** 60
- **D.** 70
- **E.** 80

6. A restaurant has 4 napkins at each table, plus 20 extra napkins held in reserve. If the restaurant has a total of 100 napkins, how many tables are in the restaurant?

- **F.** 15
- **G.** 20
- **H.** 25
- **J.** 30
- **K.** 35

7. If $4(w-2) - w = 46$, then $w = ?$

- **A.** 8
- **B.** 10
- **C.** 16
- **D.** 18
- **E.** 20

GO ON TO THE NEXT PAGE.

8. Six points (U,V,W,X,Y,Z) appear on a number line in that order, as shown in the figure below. Which of the following rays does NOT contain $\overline{WX}$?

$$\underset{\large \bullet \quad \bullet \quad \bullet \quad \bullet \quad \bullet \quad \bullet}{U \quad V \quad W \quad X \quad Y \quad Z}$$
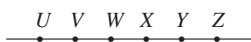
F. $\overrightarrow{UY}$
G. $\overleftrightarrow{VZ}$
H. $\overrightarrow{YV}$
J. $\overrightarrow{YZ}$
K. $\overrightarrow{ZV}$

9. If $ab = 32$, $bc = 40$, and $c = 5$, then which of the following could be the value of a ?

A. 4
B. 6
C. 8
D. 10
E. 12

10. Yunyun swam 4 laps, and her coach recorded her time for each as 43.4 seconds, 44.1 seconds, 42.9 seconds, and 45.4 seconds, respectively, for a total of 175.8 seconds. If Yunyun must swim her 5th lap in x seconds in order to make her average time for all 5 laps 43 seconds, then which of the following equations could be solved for the correct value of x ?

F. $\dfrac{175.8 + x}{5} = \dfrac{43}{60}$

G. $\dfrac{175.8 + x}{5} = 43$

H. $\dfrac{175.8 + x}{4} = 43$

J. $\dfrac{175.8}{5} + x = 43$

K. $\dfrac{175.8}{4} + x = 43$

11. For how many integers from 123 to 132 is the tens digit greater than the ones digit?

A. 2
B. 3
C. 4
D. 9
E. 10

GO ON TO THE NEXT PAGE.

12. The number of points Julie scores in a basketball game is proportional to the amount of time she practiced that week. Last week, Julie scored 20 points after practicing for 12 hours. How many hours should Julie practice this week if she wants to score 35 points?

F. 7
G. 14
H. 16
J. 20
K. 21

DO YOUR FIGURING HERE.

13. Rectangle *ABCD* is graphed in the (*x, y*) coordinate plane below. What fraction of rectangle *ABCD* lies in Quadrant IV ?
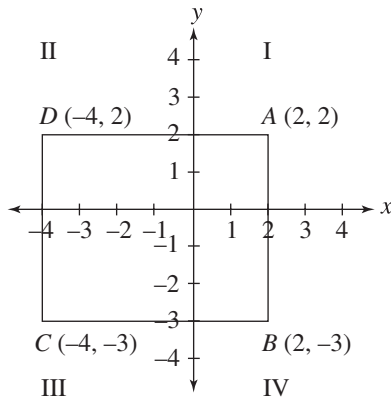
A. $\dfrac{2}{15}$

B. $\dfrac{1}{5}$

C. $\dfrac{4}{15}$

D. $\dfrac{1}{3}$

E. $\dfrac{2}{5}$

GO ON TO THE NEXT PAGE.

14. Which of the following is equivalent to the expression $\dfrac{2(z+3)-9}{5+4(z+3)}$?

F. $-\dfrac{9}{5}$

G. $-\dfrac{9}{10}$

H. $-\dfrac{7}{9}$

J. $\dfrac{-7z-21}{9z+15}$

K. $\dfrac{2z-3}{4z+17}$

15. A circle with the equation $x^2 + y^2 = 49$ is graphed in the standard (x, y) coordinate plane. At which 2 points does this circle intersect the x-axis?

    A. $(-1, 0)$ and $(1, 0)$
    B. $(-7, 0)$ and $(7, 0)$
    C. $(-14, 0)$ and $(14, 0)$
    D. $(-21, 0)$ and $(21, 0)$
    E. $(-49, 0)$ and $(49, 0)$

16. $\begin{bmatrix} 4 & -3 & | & 13 \\ 5 & 2 & | & 45 \end{bmatrix}$

    The augmented matrix above could represent which of the following systems of linear equations?

    F. $4m + 3n = 13$
       $5m - 2n = 45$

    F. $5m - 3n = 13$
       $4m + 2n = 45$

    H. $4m - 3n = 13$
       $5m + 2n = 45$

    J. $4m + 5n = 13$
       $3m + 2n = 45$

    K. $4m + 3n = 13$
       $5m - 2n = 45$

17. In 1905, the distance between the edge of a lake and Marker X was 75 meters. In 2005, the distance between the edge of this lake and Marker X was 825 meters. If the edge of this lake withdrew from Marker X at a linear rate, then what was the distance, in meters, between the edge of the lake and Marker X in 1985 ?

A. 675
B. 682.5
C. 690
D. 705
E. 750

DO YOUR FIGURING HERE.

18. For a decorating project, Beatrice found the area and perimeter of a drawing she made of a beach scene. She found that the area of her rectangular drawing was 144 square inches and that the perimeter was 80 inches. When she arrived at the craft store to purchase a frame for her drawing, she discovered that she had forgotten to write down the dimensions of her drawing. What are the dimensions of Beatrice's drawing, in inches?

F. 4 by 36
G. 6 by 24
H. 8 by 18
J. 9 by 16
K. 12 by 12

19. Which of the following is equivalent to $\dfrac{6.0 \times 10^5}{1.5 \times 10^7}$?

A. 4.0×10^2
B. 4.0×10^{-2}
C. 4.0×10^{12}
D. 4.5×10^{12}
E. 4.5×10^{-2}

20. All 7-digit phone numbers at a university start with the same 3-digit prefix. How many phone numbers can be generated for the university before a new prefix must be used?

F. 10^7
G. 7^{10}
H. 4^9
J. 9^4
K. 10^4

GO ON TO THE NEXT PAGE.

21. The cost to rent headphones at the listening library is $3.50 for the first hour (or any fraction thereof), $2.50 for the second hour (or any fraction thereof), and $1.25 for each additional hour (or any fraction thereof) beyond the first two. If you rent headphones at 2:12 P.M. and are charged $9.75 when you return them, then which of the following could be the time you return the headphones?

(Note: Assume that this listening library does not charge additional taxes or fees.)

A. 5:30 P.M.
B. 6:30 P.M.
C. 7:30 P.M.
D. 8:00 P.M.
E. 8:30 P.M.

22. The degree measures of the 4 angles of quadrilateral *LMNO*, shown below, form a geometric sequence with a common ratio of 2. What is the last term of the sequence?
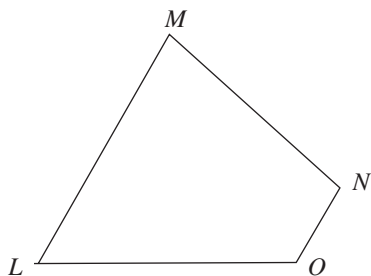
F. 24°
G. 96°
H. 160°
J. 192°
K. 216°

23. Ray $\overrightarrow{FH}$ bisects ∠*EFG* and the measure of ∠*EFH* is (2*n* + 34). If the measure of ∠*EFG* is 140 , what is the value of *n*?

A. 17°
B. 18°
C. 36°
D. 52°
E. 70°

DO YOUR FIGURING HERE.

GO ON TO THE NEXT PAGE.

24. If $6x + 10y = 14$ and $3x + 4y = 2$, then what is the value of $5x + 7y$?

- **F.** 5
- **G.** 2
- **H.** −5
- **J.** −7
- **K.** −12

25. Which of the following correctly solves the equation $\dfrac{a-b}{2} = 6$ for any b ?

- **A.** $b = 12a$
- **B.** $b = 12 - a$
- **C.** $b = 3 - a$
- **D.** $b = a - 3$
- **E.** $b = a - 12$

26. The product of which of the following results in a negative odd number?

- **F.** A positive even number and a negative even number
- **G.** Two negative odd numbers
- **H.** A positive even number and a negative odd number
- **J.** A negative even number and a negative odd number
- **K.** A positive odd number and a negative odd number

27. A bag contains 11 purple marbles, 11 yellow marbles, 11 red marbles, and 11 black marbles. John begins removing marbles at random from the bag, and the first 4 marbles removed are all purple. What is the probability that the fifth marble removed will also be purple?

- **A.** $\dfrac{7}{44}$
- **B.** $\dfrac{7}{40}$
- **C.** $\dfrac{1}{4}$
- **D.** $\dfrac{5}{11}$
- **E.** $\dfrac{7}{11}$

GO ON TO THE NEXT PAGE.

DO YOUR FIGURING HERE.

28. A student in Miss Ruane's class must repeat a test if that student earns less than 70% of the points available on that test. There were 30 points available on the first test of this semester. If Oliver scored p points on this test and therefore must repeat it, then which of the following is true?

F. $p < 20$
G. $p > 20$
H. $p < 21$
J. $p = 21$
K. $p > 21$

29. A work crew paints a broken yellow line down the middle of a straight road $16\frac{1}{9}$ miles long over the course of 3 days. On Day 1, the crew records $5\frac{8}{27}$ miles of road painted. On Day 2, the crew forgets to measure how much road was painted, but on Day 3, the crew records $3\frac{2}{3}$ miles painted to finish the job. According to the measurements available, how many miles of road did the crew paint on Day 2 ?

road

painted on Day 1
$5\frac{8}{27}$ miles

painted on
Day 2
? miles

$16\frac{1}{9}$ miles

painted on Day 3
$3\frac{2}{3}$ miles
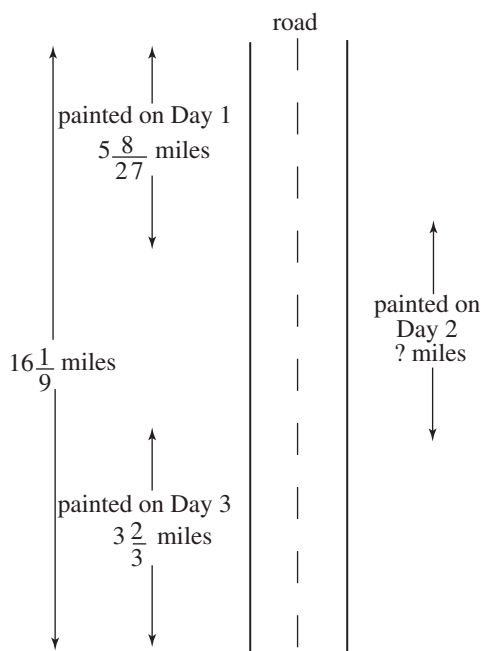
A. $7\frac{7}{27}$

B. $7\frac{4}{27}$

C. 7

D. $6\frac{7}{27}$

E. $6\frac{4}{27}$

GO ON TO THE NEXT PAGE.

30. The owners of the Movie Palace use the *Illuminator 100* light bulb in their projectors, but are now considering switching to the *Illuminator 100 Plus*, a more powerful light bulb that projects movies onto larger screens farther away. The *Illuminator 100 Plus* projects movies onto screens 108 feet wide and 180 feet from the projector, while the *Illuminator 100* projects movies onto screens only 81 feet wide, as shown in the figure below. How much farther from the projector, in feet, is the screen for the *Illuminator 100 Plus* than the screen for the *Illuminator 100* ?
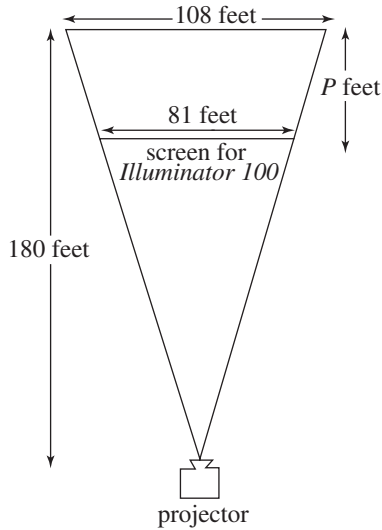
F. 27
G. 40
H. 45
J. 50
K. 55

31. What is the distance, in coordinate units, between points $J(-5, 4)$ and $K(6, -2)$ in the standard (x, y) coordinate plane?

A. $\sqrt{15}$
B. $\sqrt{17}$
C. $\sqrt{157}$
D. 10
E. 17

GO ON TO THE NEXT PAGE.

32. Cynthia decorates the ceiling of her bedroom with stars that glow in the dark. She puts 1 star on the ceiling on the 1st day of decorating, 2 stars on the ceiling on the 2nd day of decorating, 3 stars on the 3rd day, and so on. If she puts stars on the ceiling in this pattern for 30 days (so she puts 30 stars on the ceiling on the 30th day), then what will be the total number of stars on the ceiling at the end of the 30 days?

   F.   155
   G. 435
   H. 450
   J.   465
   K. 480

33. In $\triangle PQR$, side $\overline{PQ}$ is 12 inches long and side $\overline{QR}$ is 41 inches long. Which of the following CANNOT be the length, in inches, of side $\overline{PR}$?

   A. 17
   B. 30
   C. 38
   D. 44
   E. 52

34. Which of the following is equivalent to the expression $\dfrac{5d^2 - 2}{20d}$?

   F. $\dfrac{3}{20}$

   G. $\dfrac{1}{5d^2}$

   H. d

   J. $\dfrac{d}{4} - \dfrac{1}{10d}$

   K. $\dfrac{d^2 - 1}{10d}$

DO YOUR FIGURING HERE.

GO ON TO THE NEXT PAGE.

Use the following information to answer questions 35–37.

Merav's school has an Olympic-size pool that is 50 meters long, 25 meters wide, and 2 meters deep. The pool is surrounded by special non-slip tiles, as shown in the figure below.
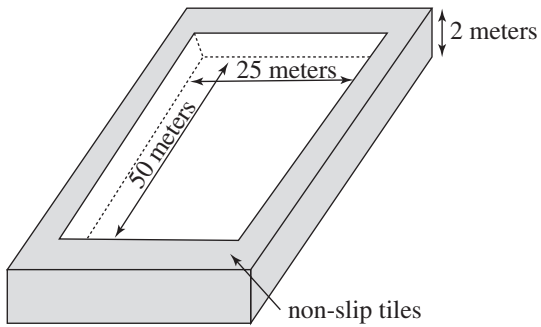
35. Merav's school laid non-slip tiles on the floor around its pool to reduce injuries among its athletes. These non-slip tiles extend 5 meters beyond the pool on all sides. What is the area, in square meters, of the floor space that has the non-slip tiles?

A. 800
B. 850
C. 900
D. 950
E. 1,000

36. For the synchronized swimming team, each swimmer needs an area within the pool to perform her routine without colliding with a teammate. Each area is 5 meters wide and 5 meters long. What is the maximum number of synchronized swimmers in the pool who can perform the routine without any collisions?

F. 75
G. 50
H. 25
J. 15
K. 10

37. Merav pays $4.00 for a ticket to her school's first swim meet to watch her classmates compete. While there, Merav buys a slice of pizza and a soda. She pays $3.75 for the pizza and $1.75 for the soda, plus 10% sales tax for both of these items. What is the total amount Merav pays for her ticket, pizza, and soda?

A. $ 3.75
B. $ 9.50
C. $10.05
D. $10.45
E. $10.75

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38. Points *G* and *H* lie on circle *F* as shown below. If the measure of ∠*FGH* is 40°, then what is the measure of central angle ∠*GFH* ?
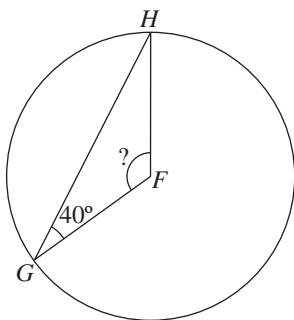
- **F.** 60°
- **G.** 80°
- **H.** 100°
- **J.** 120°
- **K.** Cannot be determined from the information given

39. The pie chart below shows the operating expenses of Stephanie's office for the month of July, during which time the expenses totaled $10,000.
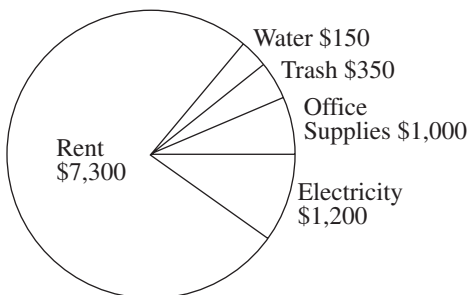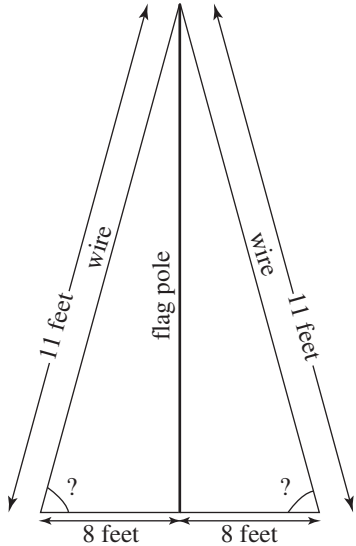

Stephanie tries to reduce her operating expenses for August by making her office more energy efficient and asking her landlord to lower her rent. She hopes to reduce her electricity expenses by $700 and her rent by $1,300. If she is successful in both of these goals and the rest of her expenses are unchanged, then what percent of her August expenses will be for office supplies?

- **A.** 5.0%
- **B.** 7.5%
- **C.** 10.0%
- **D.** 12.5%
- **E.** 15.0%

40. Assuming *q* is a positive integer, then the difference between 14*q* and 5*q* is always divisible by:

- **F.** 5
- **G.** 9
- **H.** 14
- **J.** 19
- **K.** 70

GO ON TO THE NEXT PAGE.

DO YOUR FIGURING HERE.

41. Ron earns $1,800 for a 6-week assignment. While working a 6-week assignment, Ron works a minimum of 20 hours each week. Ron's hourly rate of pay, therefore, depends upon how many hours he works. If r is Ron's average hourly pay, in dollars, for a 6-week assignment, then which of the following best describes r ?

    A. $r \leq$ $15.00
    B. $r \geq$ $15.00
    C. $r \leq$ $90.00
    D. $r \geq$ $90.00
    E. $r \geq$ $180.00

42. P and Q both represent numbers complex numbers. If $P = 2 + i$ and $Q = 6 + 4i$, what is the distance in coordinate units between P and Q in the complex plane?

    F. $\sqrt{5}$
    G. $\sqrt{7}$
    H. 4
    J. 5
    K. 7

43. Two wires connect the top of a flagpole to the ground, as shown below. Each wire has a length of 11 feet and attaches to the ground at a point 8 feet from the flagpole. Which of the following expressions gives the angle measure, in degrees, of the angle that the wire makes with the ground?

    A. $\tan^{-1}\left(\dfrac{11}{8}\right)$

    B. $\tan^{-1}\left(\dfrac{8}{11}\right)$

    C. $\cos^{-1}\left(\dfrac{8}{11}\right)$

    D. $\cos^{-1}\left(\dfrac{11}{8}\right)$

    E. $\sin^{-1}\left(\dfrac{8}{11}\right)$
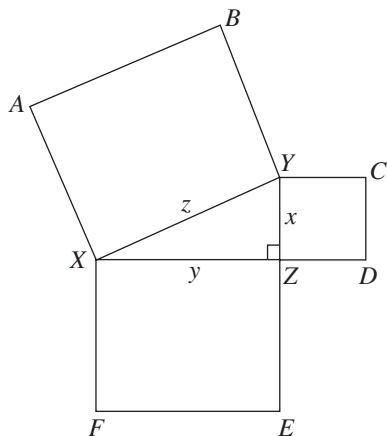
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Use the following information to answer
questions 44–46.

As shown in the figure below, ΔXYZ is a right triangle with legs
of length x units and y units and hypotenuse of z units, such that
$0 < x < y$. Quadrilaterals $ABYX$, $CDZY$, and $EFXZ$ are squares.

44. What is the perimeter, in units, of polygon $CDZXY$?

   F. $3x + y + z$
   G. $3x + 2y + z$
   H. $3x + 3y + 3z$
   J. $4x + y + z$
   K. $4x + 4y + 4z$

45. Given that $0 < x < y$, which of the following correctly lists the
angles $\angle BYC$, $\angle AXF$, and $\angle EZD$ in order of their measures
from least to greatest?

   A. $\angle AXF$, $\angle EZD$, $\angle BYC$
   B. $\angle BYC$, $\angle EZD$, $\angle AXF$
   C. $\angle BYC$, $\angle AXF$, $\angle EZD$
   D. $\angle EZD$, $\angle AXF$, $\angle BYC$
   E. $\angle EZD$, $\angle BYC$, $\angle AXF$

46. If $2x = z$, then what is the value of $\cos\left(\angle XYZ\right)$?

   F. $\dfrac{1}{2}$

   G. $\dfrac{\sqrt{3}}{2}$

   H. $\dfrac{2\sqrt{3}}{3}$

   J. $\sqrt{3}$
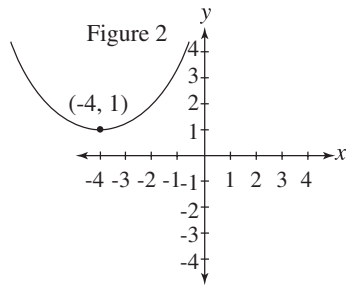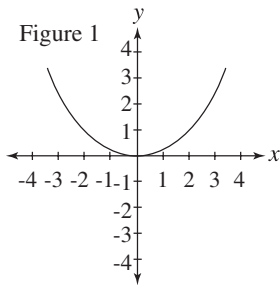
   K. 2

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47. The sum of 4 consecutive even integers is t. What is the sum, in terms of t, of the 2 larger of these integers?

A. $\dfrac{t}{2} - 4$

B. $\dfrac{t}{2}$

C. $\dfrac{t}{2} + 4$

D. $t + 2$

E. $t + 4$

48. Figure 1 below shows the graph of $y = x^2$ in the standard (x, y) coordinate plane. Which of the following is the equation for the graph in Figure 2 ?

F. $y = (x - 4)^2 - 1$

G. $y = (x - 4)^2 + 1$

H. $y = (x + 1)^2 - 4$

J. $y = (x + 4)^2 - 1$

K. $y = (x + 4)^2 + 1$

49. In a piggy bank, there are pennies, nickels, dimes, and quarters that total $5.29 in value. If there are 3 times as many dimes as there are pennies, 1 more dime than nickels, and 2 more quarters than dimes, then how many nickels are in the piggy bank?

A. 11
B. 13
C. 17
D. 21
E. 23

GO ON TO THE NEXT PAGE.

DO YOUR FIGURING HERE.

50. The mean of 5 numbers is 87. The smallest of the 5 numbers is 75. What is the mean of the other 4 numbers?

F. 72

G. 87

H. $88\frac{2}{5}$

J. 90

K. $108\frac{3}{4}$

51. "If Jenny is home, then her car is in the driveway." If the previous statement is true, then which of the following must also be true?

A. "If Jenny's car is in the driveway, then she is home."
B. "If Jenny is not home, then her car is in the driveway."
C. "If Jenny is not home, then her car is not in the driveway."
D. "If Jenny's car is not in the driveway, then she is home."
E. "If Jenny's car is not in the driveway, then she is not home."

52. If $\left(y^{0.2}\right)^{a^2-20} = y$ and $y \neq 0$, then what is the solution set of a ?

F. {1}

G. $\{-\sqrt{10}, \sqrt{10}\}$

H. {5}

J. {−5, 5}

K. {25

53. If $g(x) = \csc x \tan x$, then which of the following trigonometric functions is equivalent to $g(x)$?

(Note: $\csc x = \dfrac{1}{\sin x}$, $\sec x = \dfrac{1}{\cos x}$, and $\cot x = \dfrac{1}{\tan x}$)

A. $g(x) = \sin x$
B. $g(x) = \cos x$
C. $g(x) = \tan x$
D. $g(x) = \csc x$
E. $g(x) = \sec x$

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54. Evan and Ron play a game of Rock, Paper, Scissors. Each round has three equally likely outcomes for Evan: win, lose, or tie. Evan earns 2 points for a win, but he earns nothing for a loss or a tie. Let the random variable N represent the total number of points he has after 5 rounds. What is the expected value of N?

F. $\dfrac{5}{3}$

G. 2

H. 3

J. $\dfrac{10}{3}$

K. 5

DO YOUR FIGURING HERE.

55. If the volume of a sphere is 288π cubic inches, then which of the following is the surface area, in square inches, of the same sphere?

(Note: For a sphere with radius r, the volume is $\dfrac{4}{3}\pi r^3$ and the surface area is $4\pi r^2$.)

A. 6π
B. 8π
C. 24π
D. 36π
E. 144π

56. When $x > 1$, $3\log_x x^{-2} = ?$

F. -6

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

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

J. 1

K. $\dfrac{3}{2}$

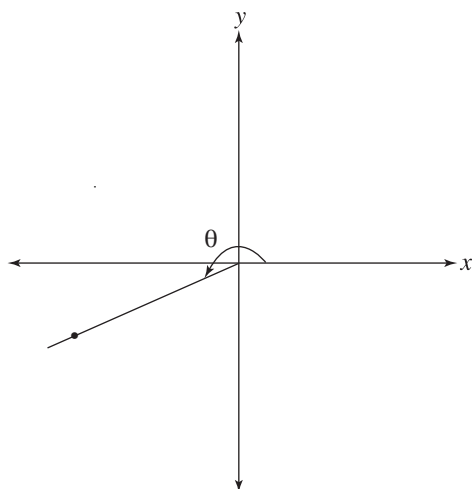**GO ON TO THE NEXT PAGE.**

DO YOUR FIGURING HERE.

57. Jamie drew a triangle bounded by the lines $y = -x$, $x = -2$, and $y = 8$ and shaded the interior, as shown in the figure below. Then Jamie decided to reflect this triangle across the y-axis and shade the interior of the new triangle. Which of the following would describe the shaded region of Jamie's new triangle?
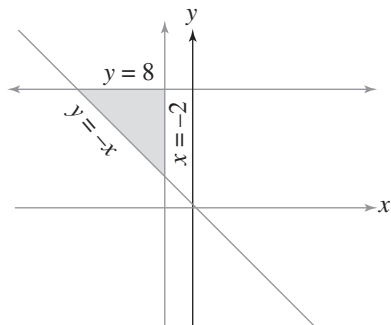
A. $x \geq 2$, $y \leq 8$, $y \leq x$
B. $x \geq 2$, $y \leq 8$, $y \geq x$
C. $x \geq 2$, $y \leq -8$, $y \leq x$
D. $x \geq -2$, $y \leq 8$, $y \geq x$
E. $x \leq -2$, $y \leq -8$, $y \leq x$

58. An angle with vertex at the origin and measure θ is shown in the standard (x, y) coordinate plane below. If one side of the angle includes the positive x-axis and the other side passes through $(-12, -5)$, then what is the sine of θ ?
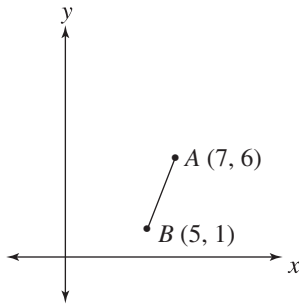

F. $-\dfrac{12}{5}$

G. $-\dfrac{12}{13}$

H. $-\dfrac{5}{13}$

J. $\dfrac{5}{12}$

K. $\dfrac{13}{12}$

GO ON TO THE NEXT PAGE.

DO YOUR FIGURING HERE.

59. Side $\overline{AB}$ of parallelogram $ABCD$ is shown in the figure below. If the coordinates of A are $(7, 6)$ and those of B are $(5, 1)$, then $\overline{CD}$ could lie on which of the following lines?

A. $y = \dfrac{5}{2}x + 9$

B. $y = x + 5$

C. $y = \dfrac{2}{5}x - 4$

D. $y = -\dfrac{2}{5}x + 4$

E. $y = -\dfrac{5}{2}x - 9$

60. If the function $f(x,y)$ is defined as $f(x,y) = (x - y)^2 + (x + y)^2$, then, for all values of c and d, $f(c^2, d^2) = ?$

F. $4c^2d^2$
G. $2c^4 + 2d^4$
H. $2c^4 - 2d^4$
J. 1
K. $-4c^2d^2$

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

READING TEST

35 Minutes—40 Questions

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

Passage I

PROSE FICTION: This passage is adapted from the novel *Thick Skinned* by Grace McCloud, (©2005 by Grace McCloud). The setting is a forest in Oregon in 1935.

The dusk descends upon the earth like a series of linens slowly tucking a child into bed. The first sheet is just a soft lens that dampens the harsh glow of sunlight and reveals the untainted essence of the landscape. Colors seem richer, and subtle details
5 are easier to perceive. The final layer of dusk comes on thick like a quilt, burrowing the world in darkness and allowing all the daytime creatures the glorious serenity in letting go.

As my father and I gathered twigs and leaves for our camp-fire, it was still the earliest stage of evening. The vibrant forms
10 of daytime—flowers, trees, and radiant water—still flooded our eyes, but all the earth's activity took on the falling action of a story that had passed its climax. The tension had been resolved; the expectations now clear; the progression calm. My mother was playing her role, setting up tents and laying out pillows and
15 sleeping bags inside of them. Here, amid these familiar habits, the possibility of Dad losing his job at the plant, as so many of his friends had, began to evaporate with the disappearing sunlight.

The Wood River rolled by our campsite with a gentle gurgle. My father taught me to look at the river as he does: a metaphor
20 for the human body. "The shape of it basically stays the same," he said, "even though the underlying substance is always changing."

My father was now attempting to start the fire with the first load of kindling. As he teased bits of leaves, sticks, and dry pine needles into a stack underneath the firewood, I went to look a
25 second time for more of the same. Whenever you're trying to ignite damp, untreated wood, you need to keep some tiny flame alive by finding a steady supply of easier things to burn.

I set off from the campsite in the opposite direction from the one I had gone before, just as a fisherman would sail down-
30 stream after catching the first load of fish. The snaps and pops of the burning tinder started to come with greater frequency. Then, without even turning to look towards the campsite, I knew things were under way.

Just like the grand finale of a 4th of July fireworks display,
35 the sound of a blazing fire is a conversation of too many individual sparks to hear each of them speak.

"Honey, do you want me to start boiling some water?" my father yelled.

Even though it sounded like a question, it was really a re-
40 quest for my mother to hand him the pot. We always boil some water for the sake of the hot cocoa we would eventually sip by the fire, once all the work had been done to prepare the campsite for sleeping and the campfire for burning.

"Are you ready for your sandwich?" responded my mother,
45 as she began pulling the water pot and other food supplies out of a paper bag.

I sometimes marveled at the well-grooved partnership my parents had carved out. It seemed so familiar to both of them. Often, I considered it a sign that the once-heaving seas of young
50 love had quieted within them to something more like the standing water of a pond. However, right now the familiar habit of camp-ing with my family was a welcome reprieve from the strange new presence at home: fear of the uncertain future. What sort of job would Dad get if he needed to find work? Would we have to
55 move away from Eugene or back into the dusty basements of my aunts' and uncles' houses where I had spent my earliest years?

"Myra, do you want your usual two?" my mom asked as she measured the amount of water we would need for our cocoa into the cooking pot. I used to sigh so mournfully at the end of
60 my cup that my mom would offer me the rest of hers. Soon, she realized she could just make me extra so that she didn't have to sacrifice her own.

"Yes, please," I replied.

After my mom had set the pot down on the flames, she stood
65 up, handed a sandwich to my father and leaned in with the same motion to get a kiss on the lips.

"Nice fire," she complimented.

GO ON TO THE NEXT PAGE.

My dad smiled in return, his face illuminated by firelight but projecting its own warmth. This time, the familiarity exchanged
70 between my parents seemed like a wonderful gift they had earned by being together for so long. Like a river, their relationship maintained a constant appearance while the substance that flowed through it continually changed.

The river next to our campsite began to disappear into thicker
75 darkness, while its sound continued throughout the night. Drifting off to sleep, I felt some peace knowing my worries would be carried away by the current.

1. As it is used in line 3, the word *untainted* can reasonably be said to mean all of the following EXCEPT:

    A. natural.
    B. non-toxic.
    C. undistorted.
    D. true.

2. The passage does NOT mention which of the following as something that at least one member of the family is doing?

    F. Wading in the Wood River
    G. Setting up a tent
    H. Gathering pine needles
    J. Igniting damp wood

3. The narrator describes her father as doing all of the following EXCEPT:

    A. sharing his hot cocoa with Myra during past camping excursions.
    B. exuding a sense of warmth once the campfire is ignited.
    C. describing to Myra a similarity between a river and a human body.
    D. helping to gather materials for use with starting the campfire.

4. The point of view from which the passage is told is best described as an adolescent girl who:

    F. knows her father only has a limited amount of time left at his job and worries that her life will fall apart once his job ends.
    G. hopes that her father's unemployment situation will have the upside of allowing her parents to repair their troubled marriage.
    H. realizes that her father's job is in jeopardy but feels like he worries too much about things that are beyond his control.
    J. recognizes the possibility of her father's unemployment and speculates about the effects it may have on the family.

5. In order to help light a fire, the passage most strongly suggests that the family has gathered:

    A. dry pine needles only.
    B. dry pine needles and sticks only.
    C. dry pine needles, sticks, and leaves only.
    D. dry pine needles, sticks, leaves, and twigs.

6. Which of the following does the narrator NOT directly mention as something seen during the earliest stages of dusk?

    F. Shining water
    G. Fish
    H. Flowers
    J. Trees

7. When the narrator's mother hands her husband a sandwich and compliments him on the fire, the narrator reacts to this interaction with a feeling of familiarity that:

    A. she often finds depressing.
    B. distracts her from the river.
    C. she worries will not last.
    D. thoroughly comforts her.

8. As it is used in line 33, the word *things* most precisely refers to the sound of:

    F. 4th of July fireworks.
    G. water boiling.
    H. the campfire fully igniting.
    J. the snaps and pops of kindling.

9. As it is used in line 10, the word *flooded* most nearly means:

    A. spilled.
    B. devastated.
    C. filled.
    D. soaked.

10. The narrator's statement in lines 49–51 most nearly means she believes her parents' relationship has:

    F. not been the same since the threat of her father losing his job began to put a strain on their marriage.
    G. become more stable and predictable than it was in the earlier part of their relationship.
    H. degraded into something disease ridden and murky, like a mosquito infested pond.
    J. somehow managed to grow more passionate and spontaneous with each passing year.

GO ON TO THE NEXT PAGE.

Passage II

Traditionally, when people think of charitable giving, there are only a few images that spring to mind. They probably envision dropping change into the Salvation Army basket outside retail stores around the holidays, or into a basket passed around at their
5 places of worship, or even into the hands of a homeless person whose pitiable appearance and humble request for "anything you can spare" is hard to deny. But can't we do better?

Religious institutions have typically been the societal force that drives philanthropy. This is most likely because religion
10 is vitally intertwined with morality, and charitable generosity has forever been exalted as one of the highest forms of moral behavior. Typically, churches collect alms for the poor at their church services and organize such hunger relief activities as soup kitchens.

15 Ted Stumbacher, head of the Global Empowerment Initiative, believes that truly effective philanthropy will need to have at its roots a more economic mindset. He feels religious organizations often provide only a temporary reprieve from suffering related to food, clothing, or shelter. While a noble end, this type of
20 charity succeeds more in establishing a life-long commitment to philanthropy among the churchgoing public than it does in remedying any of the systemic problems that face the world's impoverished masses.

Stumbacher points to several transformations taking place
25 over the past two decades as harbingers of the new paradigm of philanthropic organizations. Some organizations are devoting increased attention to their marketing images, using meticulous branding and celebrity endorsements to solidify consumer awareness. Despite the fact that charities are nonprofit entities, they
30 can still approach the task of maximizing their "market share" the way that other big corporations do. More commonly, nonprofits are finding non-monetary forms of assistance to tap, such as stationing clothing-recycling drop boxes around dense cities. These drop boxes not only allow used clothing to be funneled
35 to those in need but also prevent needless environmental stress by keeping these textiles out of the world's trash.

Similarly, Stumbacher notes the way charities are looking to increase the consumer choice aspect of giving. Rather than using the traditional model of citizens simply dropping money
40 into a basket intended for some generic form of relief to the poor, organizations like Donors Choose are giving philanthropists much more decision-making power in how their money is used. The website for Donors Choose allows donors to sift through a list of charitable projects, enabling them to fund the cause they find most
45 worthy. This model has proven to motivate giving by providing the giver with concrete imagery of where his money is going.

Other philanthropists, such as Karen Pitts, founder of Taste of Giving, say they are, "seeking to engage donors by merging their charitable giving with other activities they enjoy." Ms. Pitts
50 has organized wine tastings that successfully raise tens of thousands of dollars for charities. This is essentially a win-win-win situation. The wineries receive the excellent promotional context of a charitable event, the affluent wine drinkers are delighted to help others while enjoying themselves, and the charities enjoy
55 a healthy slice of the financial proceeds.

Perhaps the most forward-minded approach is that of Jacqueline Novogratz, founder of the Acumen Fund. Endeavoring to extinguish poverty at its roots, the Acumen Fund collects donations in a typical way but then treats its pool of resources
60 as investment capital. Instead of providing immediate relief of suffering, the Acumen Fund provides micro-loans to small businesses throughout third-world countries. Novogratz believes that this capitalistic approach is a more tenable form of long-term aid.

The old Chinese proverb, "give a man a fish and you'll
65 feed him for a day; teach a man to fish and you'll feed him for a lifetime" seems to be at the root of Novogratz's philosophy. By providing poor people with investment capital rather than food or clothing, she hopes to nourish and sustain them economically so that they can provide for themselves. Moreover, the Acumen
70 Fund is a very hands-on enterprise, making regular inspections of the businesses they fund to verify that money is being spent shrewdly, efficiently, and honestly.

Unfortunately, what makes so many of these innovative philanthropic approaches inspiring and effective is their adapta-
75 tion to the specific needs of their locales. Naysayers are quick to point out that these progressive business models will not be tenable on a large scale. As these ambitious charities grow with success, they may ultimately become lumbering organizational giants, such as UNICEF and the Rockefeller Foundation, and lose
80 the flexibility, creativity, and personality that made them great.

However, even if these new tactics cannot be used in all contexts, they are still very valuable. By redefining what forms charity can take, these new approaches are widening the base of donors. By employing innovative methods, these philanthropic
85 entrepreneurs are helping larger charitable organizations to reexamine and refine their own approach.

11. The passage indicates that in their attempt to promote philanthropy, religious institutions provide all of the benefits or services EXCEPT:

   A. instructing homeless people on how to live moral lives.
   B. collecting alms for the poor from churchgoers.
   C. organizing events that feed those who are hungry.
   D. providing temporary relief from suffering related to lack of shelter.

GO ON TO THE NEXT PAGE.

12. The author mentions clothing-recycling drop boxes and celebrity endorsements as two examples of:

  F. philanthropic approaches that are gaining popularity.
  G. problems Stumbacher cites with modern philanthropy.
  H. ways Karen Pitts has raised money for the needy.
  J. the best way to reverse environmental problems.

13. The main function of the first paragraph is to:

  A. urge people to feel sympathy for and generosity towards homeless people.
  B. cause the reader to picture himself in a charitable giving context.
  C. discuss typical methods of charity and imply an alternative.
  D. argue that the traditional methods of charity do nothing.

14. As the author describes it, when the churchgoing public performs charity through its religious organizations, it feels:

  F. severe guilt.
  G. moral superiority.
  H. reluctant shame.
  J. augmented pride.

15. When Karen Pitts talks about "other activities they enjoy" (line 49), she is most likely referring to:

  A. finding positive promotional contexts for wineries in their community.
  B. partaking in social events such as that of a wine tasting.
  C. giving tens of thousands of dollars to charities that Pitts represents.
  D. finding win-win opportunities with other donors in the wine industry.

16. The author most likely places the words "market share" in quotation marks in (line 30) to:

  F. suggest that only big corporations understand how to build a successful business model.
  G. imply a different sense of market share from that of corporations seeking to maximize their profits.
  H. emphasize that nonprofit entities must learn to coexist with each other to avoid collective failure.
  J. caution readers that nonprofits can also sometimes attain a monopoly in their markets.

17. Stumbacher feels that "religious organizations often provide only a temporary reprieve from suffering" (lines 17–18) due to their:

  A. inability to boost the self-esteem of the impoverished.
  B. failure to address the systemic roots of poverty.
  C. overemphasis on noble ends.
  D. lack of branding and celebrity endorsements.

18. According to the passage, which of the following is true about the practices of the Acumen Fund?

  F. Its method of distributing funds is less typical than its method of collecting funds.
  G. It attempts but fails to treat the systemic roots of poverty.
  H. It endeavors to temporarily relieve impoverished people of their suffering.
  J. It collects most of its donations from small third-world businesses.

19. The passage mentions which of the following as a reason some innovative philanthropic approaches are effective?

  A. They integrate charity with activities the recipients enjoy.
  B. They do not temporarily relieve suffering.
  C. They are less expensive than traditional methods.
  D. They can adapt to specific local needs.

20. In the context of the tenth paragraph (lines 81–86), the statement in lines 75–77 most nearly means that:

  F. new modes of providing charity will succeed only in large measures.
  G. philanthropists do not have a realistic sense of the scale of some problems.
  H. some ways of doing business locally may not work similarly globally.
  J. large communities tend to have similar needs to those of smaller communities.

GO ON TO THE NEXT PAGE.

Passage III

Passage A

Richard Wright's achievement as an author is almost inconceivable. Although slavery ended in 1865, the period from the 1880s to the beginning of the Second World War in the 1940s might have been even worse for African-Americans in the United
5　States. There was a certain additional cruelty to the fact that African-Americans had been given their freedom from bondage but were still isolated and alienated from American political and cultural life. Richard Wright managed to rise above this oppression to become the first major African-American writer and still
10　one of the best loved.

Wright was born near Natchez, Mississippi, in 1908, and his early family life was tumultuous. His father left when he was 6, his mother was incapacitated with a stroke, and Richard moved in with his uncle. Because of all these moves and his family's difficult
15　economic circumstances, Richard did not complete a full year of school until he was 12 years old. The fact that he was valedictorian of his junior high only three years later is just one in a long string of truly stunning events in this exceptional man's life.

Wright's writing career also began around this time, when
20　as a 15-year-old he published his first story, "The Voodoo of Hell's Half-Acre," in the *Southern Register*. In 1927, Wright left the south for Chicago, where he worked as a postal clerk and read the great works during free moments. Here he also became involved with the Communist Party, which was one of the more
25　racially progressive institutions of the time. His association with left-wing politics brought him into contact with the work of Bertolt Brecht, a German playwright and theorist. The particular political slant of Brecht's plays and essays shaped the course that Wright's work would take in the next few years.

30　It was thus seemingly out of nowhere that Wright became an overnight success with the publication of his great novel *Native Son* in 1940. The novel's reception exceeded any reasonable expectation for an African-American author of the time. Rising theater and film star Orson Welles bought the rights to bring the
35　dramatized version of the book to stage and screen. The national Book of the Month Club selected *Native Son* in 1941, the first time in its then fifteen-year history that it had selected a book by an African-American author.

Wright's career only grew larger from there. French celebrity
40　philosopher Jean-Paul Sartre began to champion Wright's works abroad, and *Native Son* was translated into many languages throughout the world. A boy with no formal schooling before the age of 12, whose race seemed to expressly forbid his access to the world of letters, that such a person could achieve Wright's
45　level of success and admiration, which have now outlived him by more than 50 years, is awe-inspiring.

Passage B

No one will dispute that Richard Wright is a great author or that his success was groundbreaking. The idea, however, that Richard Wright emerged from some kind of void would be pre-
50　posterous if it were not for the fact that Wright himself seemed to believe it. Studying Wright's works can bear a good deal of fruit, but studying his life can lead us to only one conclusion: Wright was one of the greatest and most image-conscious strategists of 20th-century letters. His capacity for self-mythologizing rivals
55　only that of Ernest Hemingway, whose adventurous, romantic lifestyle abroad continues to inspire many who read him, and just as many who don't.

Although Richard Wright was clearly influenced by the works of white authors Gertrude Stein, Bertolt Brecht, and, of
60　course, Karl Marx, he was also writing into a tradition of African-American literature that, by the 1930s, was over a century old. Wright's story of his impoverished childhood and his sudden and full-fledged entry into the world of letters was actually a theme extending back to Frederick Douglass in the 1840s and Booker
65　T. Washington in the 1890s. All three of these men achieved a kind of "freedom," whether from slavery, sharecropping, or simply the oppressive shackles of race prejudice, through their education and literacy. Wright was surely cognizant of those who had come before him, but he must have been equally cognizant
70　of the fact that citing them would dilute his own myth.

Then, as anyone familiar with early 20th century literature knows, Wright was publishing shortly after one of the greatest moments in African-American literature: the Harlem Renaissance. In fact, Wright was a vibrant presence within the Harlem
75　scene. Indeed, the success of Wright's first book *Uncle Tom's Children* (1938) gave him the means to move to the epicenter of African-American culture, Harlem, New York. In fact, *Native Son*, that work we are led to believe had emerged from a vacuum, emerged from precisely this close contact Wright had with the
80　other great minds of his generation.

Literary critics, in fact, should know better. Anyone who studies the history of African-American literature knows that it was critics themselves who were out of the loop, not the writers. Critics were unaware of Hurston's *Their Eyes Were Watching God*,
85　for instance, for forty years, and now it is universally acknowledged as one of the great books of the century. As a result, critics should know how self-serving this attitude of Wright's should be, but they should also know how dreadfully wrong critics of the past had a tendency to be. Indeed, it was not that Wright was
90　working in a void; it was instead that the critics themselves were unprepared, or downright unwilling, to see the rich tapestry of influences that had produced him.

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Questions 21–23 ask about Passage A.

Questions 24–27 ask about Passage B.

21. The fourth paragraph of Passage A (lines 30–38) marks a shift in the passage from:

   A. an extended metaphor of the author's difficulties to a literal description of his biography.

   B. a discussion of the author's background to a discussion of his public successes.

   C. a biographical sketch to a piece of detailed literary criticism and analysis.

   D. an analysis of the author's motives to an explanation of the author's results.

22. In Passage A, the author's descriptions of Wright suggest that the author sees Wright as ultimately:

   F. impressive and brave.

   G. troubled and derivative.

   H. gifted and sociable.

   J. shrewd and calculating.

23. The author of Passage A most nearly suggests that Bertolt Brecht was an important influence on Wright because Brecht:

   A. worked with Wright during Wright's travels in Germany.

   B. introduced Wright to national audiences and high-profile publishers.

   C. inspired Wright to write in a particular way.

   D. was one of the first people to introduce Wright to communism.

24. The author's statement "Literary critics, in fact, should know better" (line 81) is most nearly meant to:

   F. indicate the author's irritation with some critics for perpetuating a falsehood.

   G. state the author's approval of those who do not work in literary criticism.

   H. support Wright's bold claim that he worked entirely without influences.

   J. reflect Wright's position toward the literary establishment that analyzed his works.

25. Passage B indicates that compared to how Richard Wright has traditionally been understood within literary history, Wright's context and influences were:

   A. dissimilar; Wright was exceptionally intelligent, but he had more formal schooling than was initially believed.

   B. dissimilar; Wright did achieve a great deal, but he did not do so without influences and support.

   C. similar; Wright was a brilliant author, and he worked with virtually no influences.

   D. similar; Wright had a troubled childhood, and his writing explored and expressed his conflicted feelings.

26. Based on the passage, the information about *Their Eyes Were Watching God* provided in lines 83–85 is most likely meant to represent:

   F. the risk of pairing authors of fiction with their fictional characters.

   G. the difficulty of identifying the sources of influence in the arts.

   H. an example of the ways that critics can leave obvious gaps in literary history.

   J. an author whose influence is much more powerful and more widely accepted than Wright's.

27. According to the passage, Richard Wright is similar to Ernest Hemingway in that both authors:

   A. were misunderstood for many years by critics who were unaware of their works.

   B. stated openly that they had no literary influences and no formal education.

   C. wrote their greatest works shortly after the Harlem Renaissance.

   D. had public personalities that were separate from the books they wrote.

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Questions 28–30 ask about both passages.

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28. Which of the following statements provides the most accurate comparison of the tone of each passage?

   F. Passage A is respectful and reverential, while Passage B is measured and skeptical.

   G. Passage A is elated and amicable, while Passage B is pessimistic and contrarian.

   H. Both passages begin artistic and loose but conclude with technical and precise arguments

   J. Both passages begin to doubting conventional wisdom but conclude by accepting that wisdom.

29. Compared to the author of Passage A, the author of Passage B provides more detail about:

   A. Wright's immediate context and professional strategy.

   B. Wright's background and education.

   C. the direct influences of Bertolt Brecht and Ernest Hemingway.

   D. the contemporary political influences on Wright's life.

30. It can reasonably be inferred that when thinking about Richard Wright's success as an author, compared to the author of Passage B, the author of Passage A feels:

   F. less skeptical of how political events shape authors' professional lives.

   G. less dismissive of the literary career of Ernest Hemingway.

   H. more impressed that Wright was able to overcome his difficult past.

   J. more neutral as to whether Wright's success could properly be called his own.

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Passage IV

NATURAL SCIENCE: This passage is adapted from the article "Unearthing the Greatest Fossil Ever Found" by Stanley Walsh, (©2009 by Stanley Walsh).

Evolutionary biologists can finally breathe a sigh of relief. Those who have been bursting at the seams to blurt out the "big secret" can finally shout it from the mountaintops, and those who have been hunting tirelessly for a "missing link" to solidify the
5　Darwinian theory of evolution can finally rest easily.

The "big secret" and "missing link" are one and the same: a 47-million-year-old, uncannily preserved fossil of an ancient ancestor of the primate family, nicknamed Ida. After two years of secretly performing research on the fossil, experts are ready
10　to present their findings to the world. They firmly believe that the lemur monkey they have preserved in polyester resin is conclusive evidence of a transitional species, a fork in the road where the genetic tree branches off in the direction that eventually gives rise to such simian species as monkeys, apes, and humans.

15　Two things make this particular specimen so valuable. It is older than any previously found primate fossil, vastly predating the previous record-holder, Lucy, which is a 3.18-million-year-old fossil. Furthermore, it is one of the most complete fossils ever found, with 95% of the skeleton preserved. In fact, the fos-
20　silization conditions were so perfect in Ida's case that scientists could actually still analyze the last meal Ida had before apparently falling into a crater and dying of carbon dioxide poisoning. By contrast, Lucy's remains were only 40% complete, lacking a skull among other important features.

25　Ironically, for such a monumentally important fossil, Ida has actually been flying under the radar for the past 25 years. An amateur fossil hunter first discovered her in 1983, in a volcanic crater-lake called the Messel Pit, just outside of Frankfurt, Germany. Because the Messel Pit was already considered a bounti-
30　ful source of fossils, Ida's discoverer did not assume there was anything distinctive about the discovery and hung Ida on his wall as a display piece for the next 20 years. He revered it as a piece of natural art, not recognizing its exceedingly old age as a fossil.

Eventually, the piece made its way to a display in the 2006
35　Hamburg Fossil and Mineral Fair in Germany. A researcher from Norway's National History Museum, Professor Jorn Hurum, was immediately entranced upon seeing Ida. Unfortunately, his enthusiasm meant that the fossil dealer could charge an outlandish price of roughly 1 million dollars. Determined to secure this
40　landmark specimen for the sake of scientific inquiry, Professor Hurum quickly raised the needed bounty and brought Ida home to Oslo, Norway.

For the next two years, a team of top scientists studied Ida's features and attempted to integrate the information into the
45　genetic tree of the primates. All the while, the scientists knew they were on the cusp of providing the most conclusive evidence

yet of the accuracy of Darwin's theory of evolution. However, they had all signed non-disclosure agreements that prevented them from discussing these tentative findings with others in the
50　field or the media.

Charles Darwin's revolutionary book *The Origin of Species*, published in 1859, first detailed the theory of natural selection. It was extremely controversial in its time, and its contention that humans evolved from a lineage of monkeys remains an
55　uncomfortable idea to many even to this day. Despite the 98.4% genetic similarity that humans have to chimpanzees, many of Darwin's skeptics have routinely rested their cases on the fact that there was a gigantic hole in the fossil evidence that relates to where the branch of higher primates begins.

60　Around 50 million years ago, the first primates are thought to have emerged, two different species called *tarsidae* and *adapidae*. Scientists have been unsure which species ultimately led to the higher primates (monkeys and humans). The discovery of Ida, an *adapid* with several human-like features, suggests that
65　*adapidae* are the ancestors of modern humans.

With so many anatomical features vividly preserved in Ida's fossilized remains, scientists have been able to identify several telltale similarities Ida has to modern humans. One feature that distinguishes Ida's species from non-anthropoid primates is
70　the talus bone, a bone that turns the corner between the leg and the foot. Her eyes face forward, which makes her visual fields overlap, a requirement for accurate depth perception. Her hands and feet have nails, rather than claws, and opposable thumbs. Both characteristics allow for the use of appendages in a more
75　refined way, whether it be peeling fruit, climbing, or, in the case of humans and their closer ancestors, using tools.

The debate over evolution is likely to continue for many years. However, the discovery of Ida has given evolutionary scientists a stronger supporting piece of evidence than they
80　ever dreamed was possible. As Harold Zemeckels, a professor of evolutionary biology at Emerson University, puts it, "This fossil is essentially a prayer answered, a perfect time capsule that's been miraculously gift-wrapped for posterity."

31. The language of the first paragraph is most likely intended to convey a sense of:

A. warning that a secret will be revealed.
B. anguish for an ongoing scientific struggle.
C. reluctance to accept a theory of evolution.
D. anticipation for the topic the passage will discuss.

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32. According to the passage, "the big secret" and the "missing link" refer to:

- **F.** Ida only.
- **G.** Lucy only.
- **H.** Ida, and the more recently discovered Lucy.
- **J.** Lucy, and the more recently discovered Ida.

33. The passage characterizes the idea that Ida was a transitional species which later resulted in simians as:

- **A.** a conclusion that results from an extended period of studying the fossil.
- **B.** a conclusion that stems from analyzing the polyester resin.
- **C.** a speculation based on ruling out *tarsidae* as simian ancestors.
- **D.** a speculation that springs from scientists' desire to find a "missing link."

34. The passage implies that the price that was paid to obtain Ida's fossil from the private collector was:

- **F.** outlandish because Lucy, an even older fossil, was cheaper.
- **G.** higher than is customary due to the buyer's obvious interest.
- **H.** unusual given how little the private collector valued it.
- **J.** high due to its being discovered in a rare site for fossils.

35. In the passage, the amateur fossil hunter who found Ida in the Messel Pit is said to have:

- **A.** not immediately assumed Ida was special and so kept it for himself.
- **B.** not immediately assumed Ida was special and so showed it to fellow scientists.
- **C.** immediately assumed Ida was special and so brought it to the Fossil and Mineral Fair.
- **D.** immediately assumed Ida was special and so brought it to Oslo, Norway.

36. Which of the following best summarizes the objection of those who remain skeptical of Darwin's theory of evolution?

- **F.** 98.4% is not a close enough genetic similarity to suggest genetic relation.
- **G.** They are uncomfortable with the idea that chimpanzees evolved from lemurs.
- **H.** There are not enough fossils available that date before 1859.
- **J.** There is some explanation missing as to how and when higher primates evolved.

37. The passage states that Lucy was not:

- **A.** at one point the oldest fossil known to man.
- **B.** found in worse condition than was Ida.
- **C.** found with a well preserved head.
- **D.** only 40% complete as a fossil.

38. It can most reasonably be inferred that the word *enthusiasm* in line 38 refers to Professor Hurum's enthusiasm for:

- **F.** the fossil dealer.
- **G.** the specimen.
- **H.** his home in Oslo.
- **J.** the Fossil and Mineral Fair.

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39. The author points out that scientists "could actually still analyze the last meal Ida had" (line 21) primarily to:

   A. foreshadow the valuable clues scientists derived from her last meal.
   B. explain why comparatively little was learned from Lucy's fossil.
   C. underscore how well preserved Ida's fossil was by its environment.
   D. argue for a new theory on the diets of early primates.

40. As it relates to the passage, the eighth paragraph (lines 60–65) serves mainly to:

   F. explain the misconceptions that led some to doubt Darwin's theory.
   G. demonstrate the confusion that results from classifying ancient fossils.
   H. illustrate a scientific context in which Ida's fossil has proven helpful.
   J. argue against the prevailing theory that humans came from *tarsidae*.

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 several passages in this test. Each passage is followed by several questions. After reading a passage, choose the correct 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

Recombination of genes is usually associated with the sexual reproduction of cells, or meiosis. However, it can also occur when cells that undergo asexual reproduction, or mitosis, need to be repaired, such as after radiation exposure. This repair process, known as *homologous recombination*, aligns two copies of the same double strand of DNA, one with the error and one without. As seen in Figure 1, correct genes are transplanted from the correct strand to the one with errors (genes with errors are represented with a *).
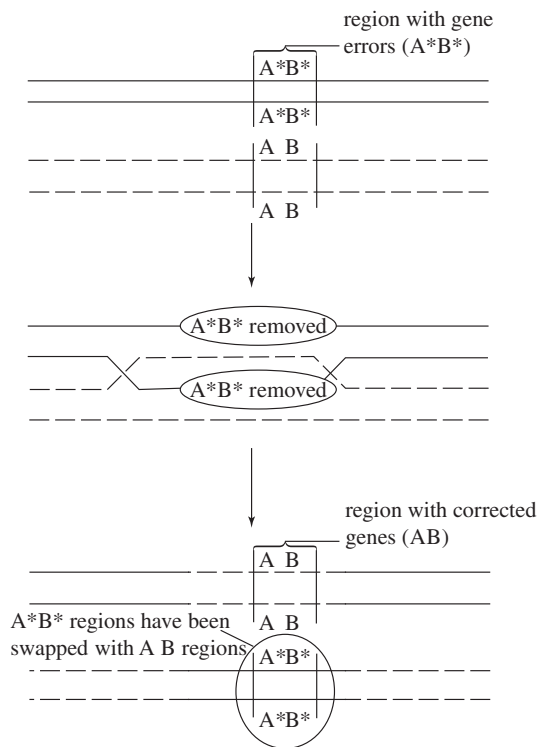

Figure 1

The activities of some genes have been found to promote homologous recombination (HR). In an experiment to quantify the genetic control over HR, 4 scientists measured the frequency of HR per hour over a 24-hour period in isolated connective tissue cells from rats placed in growth media. They then lysed the cells, separated out the entire protein content, and used gel electrophoresis to count the amount of protein present in the cells (see Figure 2).
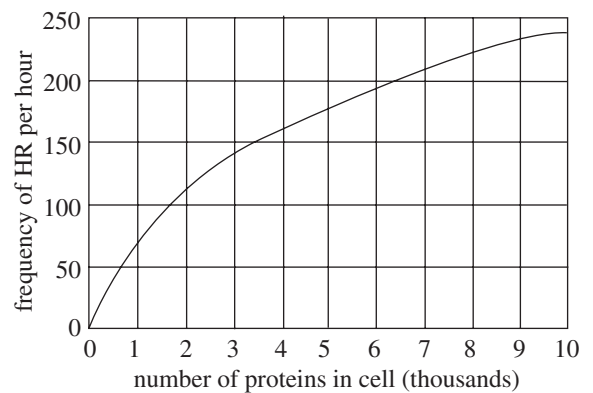

Figure 2

These scientists noticed that only a few specific proteins appeared to be responsible for promoting HR, and labeled the genes encoding them as W, X, Y, and Z. They engineered cells to express combinations of two active genes and recorded the HR. They then analyzed the DNA content of the lysed cells and calculated distances between four genes that encoded the relevant proteins (see Table 1).

Table 1		
Genes	HR (events per hour)	Distance between genes (centimorgans)
W and X	75	20
X and Y	125	30
W and Z	60	15

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Each of the 4 scientists then proposed individual models for the positions of the genes they studied, taking into account the findings in Table 1. Each model shows where genes may be located along a strand of DNA (see Figure 3). Each model correctly assumes that the lengths of the genes are insignificant compared to the length of the DNA.

Scientist	Model
1	Z W X Y
2	W Z X Y
3	ZY W X
4	Y W ZX

Figure 3

A final experiment showed that rat connective tissue cells in which genes W and Y were active had an HR frequency of 45 times per hour.

1. All 4 models agree on the distance between which of the following pairs of genes?

   A. Genes W and X
   B. Genes W and Y
   C. Genes X and Z
   D. Genes Y and Z

2. According to Figure 2, if some of the connective tissue cells had a protein content of 3,500 molecules per cell, the HR of these cells is most likely closest to which of the following?

   F. 50 events per hour
   G. 100 events per hour
   H. 150 events per hour
   J. 200 events per hour

3. If Scientist 2's model is correct and an additional gene, Gene V, is 10 centimorgans from Gene X and 15 centimorgans from Gene Z, then Gene V is most likely between:

   A. Genes W and X.
   B. Genes W and Z.
   C. Genes X and Y.
   D. Genes X and Z.

4. The result of the final experiment studying the distance between Genes W and Y is consistent with models proposed by which of the following scientists?

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

5. Based on the information provided, HR would occur when connective tissue cells are exposed to:

   A. growth media.
   B. sexual reproduction.
   C. asexual reproduction.
   D. X-rays.

6. Which scientist's model proposes that Genes Y and Z are separated by 65 centimorgans?

   F. Scientist 1's
   G. Scientist 2's
   H. Scientist 3's
   J. Scientist 4's

7. Genes A and B are separated by 10 centimorgans on a chromosome. An organism has alleles A and B* on 1 chromosome and alleles A* and B on the homologous chromosome. If a single HR event occurred between these 2 genes as shown in Figure 1, the genotype of Genes A and B for the 2 chromatids involved in the crossover would be:

   A. AB and AB.
   B. AB and A*B*.
   C. A*B and AB*.
   D. A*B* and A*B*.

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Passage II

Groundwater is water stored beneath the surface of Earth. Groundwater chemistry in 2 bodies of water—drawn from an *aquifer* and from beneath a *wetland*—was studied during a 2000 summer drought and again during the next summer, which had normal rainfall. Figure 1 shows the methane (CH_4) gas concentration in the groundwater at various depths in the aquifer and wetland. Figures 2 and 3 show the groundwater *conductivity* (directly proportional to the concentration of the dissolved ions) and pH at various depths in the aquifer and wetland, respectively. Also shown are the locations of the water table and the depths of the aquifer and wetland below this level.
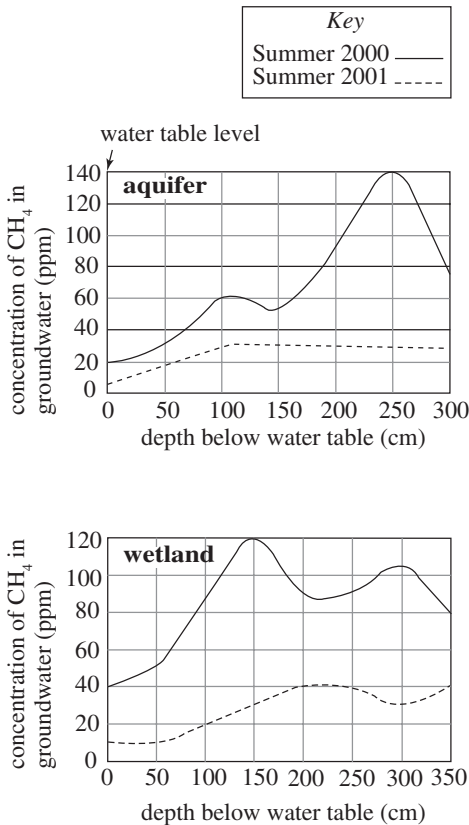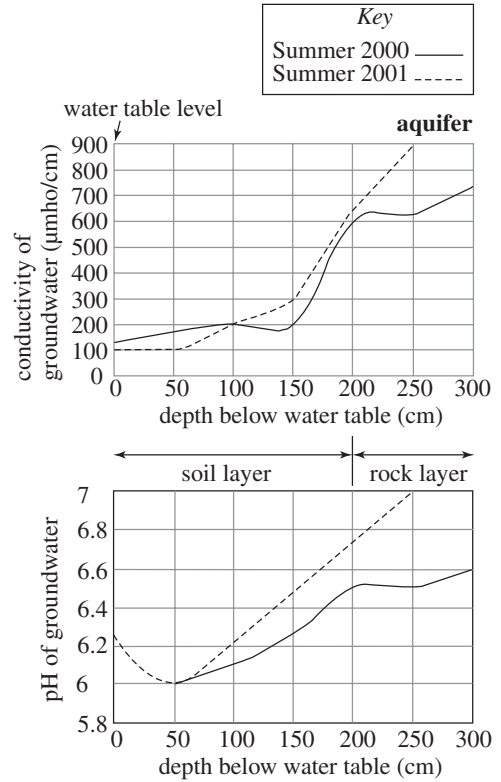
Key
Summer 2000 ——
Summer 2001 - - - - -

water table level

aquifer

conductivity of groundwater (μmho/cm) vs. depth below water table (cm)

soil layer | rock layer

pH of groundwater vs. depth below water table (cm)

Figure 2

Key
Summer 2000 ——
Summer 2001 - - - - -

water table level

aquifer

concentration of CH_4 in groundwater (ppm) vs. depth below water table (cm)

wetland

concentration of CH_4 in groundwater (ppm) vs. depth below water table (cm)

Figure 1

Key
Summer 2000 ——
Summer 2001 - - - - -

water table level

wetland

conductivity of groundwater (μmho/cm) vs. depth below water table (cm)

soil layer | rock layer

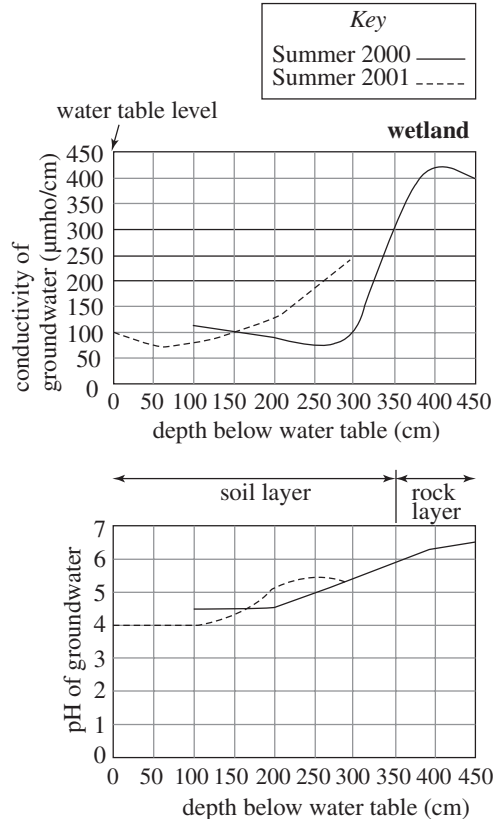pH of groundwater vs. depth below water table (cm)

Figure 3

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8. In the summer of 2000, at the depth where the methane concentration reached its highest concentration in the wetland, the conductivity of the groundwater in the wetland was closest to:

    F.   75 μmho/cm
    G. 100 μmho/cm
    H. 120 μmho/cm
    J.   150 μmho/cm

9. According to Figure 2, the conductivity of aquifer groundwater in 2000 at a depth of 250 cm was closest to which of the following?

    A. 350 μmho/cm
    B. 475 μmho/cm
    C. 625 μmho/cm
    D. 725 μmho/cm

10. Based on Figure 2, if the pH of aquifer groundwater at a depth of 260 cm had been measured in the summer of 2001, it would most likely have been closest to which of the following?

    F. 4.2
    G. 5.5
    H. 7.2
    J. 8.5

11. Which of the following is the most likely explanation for the difference in the depth of wetland groundwater in the 2 years?

    A. The amount of groundwater discharged to the wetland was higher during the drought, so the wetland received more water than normal.
    B. The amount of groundwater discharged to the wetland was higher during the drought, so the wetland received less water than normal.
    C. The amount of rainfall received by the wetland was higher during the drought, so the wetland received more water than normal.
    D. The amount of rainfall received by the wetland was lower during the drought, so the wetland received less water than normal.

12. If the data in Figures 2 and 3 are typical of aquifers and wetlands in general, one would most likely make which of the following conclusions about the soil layer in an aquifer and in a wetland?

    F. The soil layer in both an aquifer and a wetland is completely above the water table at all times.
    G. The soil layer in both an aquifer and a wetland is completely below the water table at all times.
    H. The soil layer in an aquifer is thicker than the soil layer in a wetland.
    J. The soil layer in an aquifer is thinner than the soil layer in a wetland.

13. According to Figure 1, the average concentration of CH_4 over the depths of 0 to 300 cm was higher during the summer of:

    A. normal rainfall than during the summer of drought in both the aquifer and the wetland.
    B. normal rainfall than during the summer of drought in the aquifer only.
    C. drought than during the summer of normal rainfall in both the aquifer and the wetland.
    D. drought than during the summer of normal rainfall in the wetland only.

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Passage III

Polyatomic ions can be represented by the combination of symbols

$$(X_aZ_b)^n$$

where a is the number of atoms of Element X, b is the number of atoms of Element Z, and n is the total positive or negative charge for the entire polyatomic ion. If a or b is equal to 1, then the number 1 is omitted. If n is equal to 0, indicating a net neutral charge, then the number 0 is also omitted. For example, $(NH_4)^{+1}$ represents an ammonium ion, which contains 1 nitrogen atom (the number 1 is omitted), 4 hydrogen atoms, and a net polyatomic ion charge of +1. Since polyatomic ions carry a charge, they are very soluble in water, as opposed to neutral molecules.

Some atoms that comprise polyatomic ions are able to donate or accept different numbers of electrons, depending on the atoms with which they interact. In these different situations, they are said to have different *oxidation states*. For instance, while oxygen (O) typically has a constant oxidation state of –2, meaning it typically only accepts 2 extra electrons, chlorine (Cl) can have oxidation states of –1, +1, +3, +5, and +7, meaning that it has the ability to either accept 1 extra electron (–1) or donate either 1, 3, 5, or 7 electrons. The specific ions that feature the different oxidation states of chlorine are listed below.

The energy required to remove an electron from an atom, thereby giving that atom a more positive oxidation state, is known as an *ionization energy*. The ionization energies for removing each of the first four electrons from elements with atomic numbers 11–15, as measured in electron-volts (eV), are shown in Figure 1.
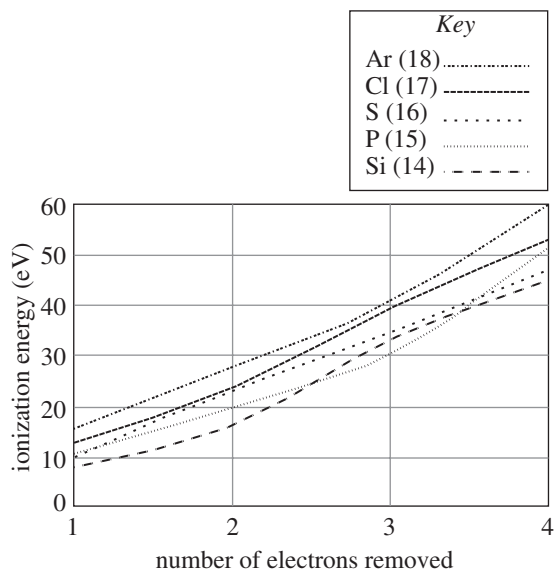

Key
Ar (18) ....
Cl (17) -------------
S (16) ....
P (15) ....
Si (14) – – – –

Figure 1

14. Which of the following symbols correctly represents the negatively charged polyatomic ion containing seven oxygen atoms and two chromium (Cr) atoms?

   F. $(CrO_4)^{-1}$
   G. $(Cr_2O_2)^{-7}$
   H. $(Cr_7O_2)^{-2}$
   J. $(Cr_2O_7)^{-2}$

15. According to Table 1, what is the total charge for the polyatomic ion chlorite?

   A.   –1
   B.   +1
   C.   +2
   D.   +3

Table 1		
Name	Ion	Oxidation state of chlorine atom
Chloride	$(Cl)^{-1}$	–1
Hypochlorite	$(ClO)^{-1}$	+1
Chlorite	$(ClO_2)^{-}$	+3
Chlorate	$(ClO_3)^{-}$	+5
Perchlorate	$(ClO_4)^{-}$	+7

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16. Based on Figure 1, the ionization energy required to remove 4 electrons from P (atomic number 15) is approximately twice the ionization energy required for which of the following?

    F.   Removing 1 electron from S

    G. Removing 2 electrons from Ar

    H. Removing 3 electrons from Si

    J.   Removing 4 electrons from Cl

17. A sample of bleach contains a mixture of chlorite and hypo-chlorite. Based on Table 1 and Figure 1, what is the ionization energy for the chlorine atom in each of these polyatomic ions?

    A. Chlorite: IE of chlorine = 24 eV, Hypochlorite: IE of chlorine = 53 eV

    B. Chlorite: IE of chlorine = 53 eV, Hypochlorite: IE of chlorine = 24 eV

    C. Chlorite: IE of chlorine = 13 eV, Hypochlorite: IE of chlorine = 40 eV

    D. Chlorite: IE of chlorine = 40 eV, Hypochlorite: IE of chlorine = 13 eV

18. Suppose a chloride ion is isolated and accelerated at a constant rate. How would the net force acting on the chloride ion compare with the net force acting on a perchlorate ion that is accelerated at the same constant rate?

    F.   It would be smaller, because chloride is more massive than perchlorate.

    G. It would be smaller, because chloride is less massive than perchlorate.

    H. It would be larger, because chloride is more massive than perchlorate.

    J.   It would be larger, because chloride is less massive than perchlorate.

19. Based on the information in the passage, what is the oxidation state of the oxygen atom in hypochlorite?

    A. −2

    B. −1

    C.   1

    D.   2

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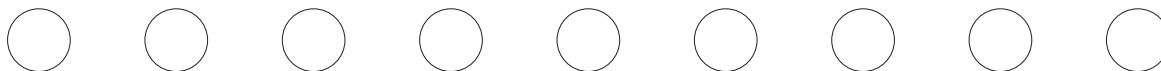
Passage IV

Simple diffusion (SD) is the process by which an uncharged solute in water migrates directly across an uncharged membrane, while *facilitated diffusion* (FD) is the process by which a charged or polar solute travels through a channel or transporter that crosses the membrane. Figure 1 illustrates how two solutes can diffuse, one by SD and one by FD.
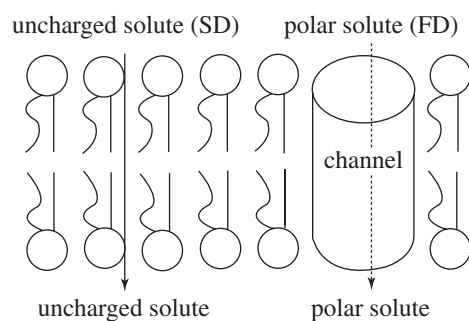

Figure 1

Solutes that cross a membrane by SD or by FD show different rates of flow across a membrane, also known as *flux*. As a solute crosses a membrane by SD, the flux follows a linear pattern over time, with smaller solutes having the greatest increase in flux over time. As a solute crosses a membrane by FD, the flux follows a logarithmic pattern, leveling off at a maximum flux since there are only a limited number of channels or transporters through which the solute can travel.

Experiment 1

In five separate trials, one scientist introduced five different solutes of the same concentration at a constant temperature to separate membranes of identical composition and structure. The molecular masses of these solutes are shown in Table 1.

Table 1	
Solute	Molecular mass (amu)
#1	160
#2	800
#3	2,000
#4	10,000
#5	40,000

This scientist then measured the time it took for the solute to reach *equilibrium*, which is a state of equal concentration of the solute on both sides of the membrane. The results are shown in Figure 2.
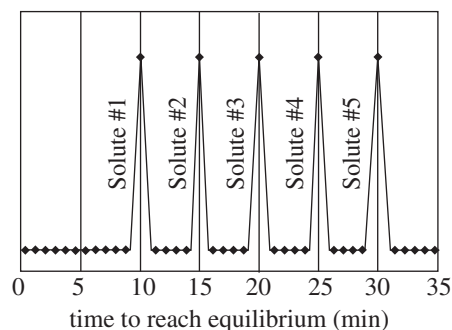

Figure 2

Experiment 2

The scientist then created 3 mixtures from any of the five solutes from Experiment 1 and one additional solute of unknown mass. Mixtures of solutes are subsequently introduced near different membranes with the same properties as those used in Experiment 1. The results of these three trials are presented in Figure 3.
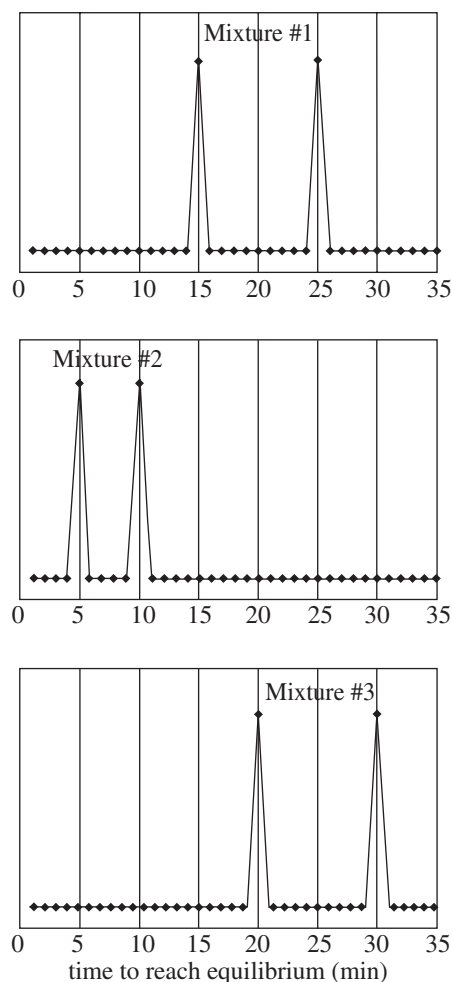

Figure 3

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20. Based on the results of Experiments 1 and 2, which of the following is likely closest to the molecular mass of the unknown solute used in Experiment 2?

    F.   60 amu
    G. 200 amu
    H. 1600 amu
    J.   8000 amu

21. Based on the results of Experiments 1 and 2, Mixture #3 is likely to consist of which solutes from Experiment 1 ?

    A. Solute #1 only
    B. Solutes #1 and #3 only
    C. Solutes #3 and #5 only
    D. Solutes #2, #4, and #5 only

22. In Experiment 1, which solute spends the least amount of time flowing across the membrane before reaching equilibrium?

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

23. Based on the results of Experiments 1 and 2, which of the following ranks Solute #3, Solute #4, and Mixture #2 in order of smallest to largest average molecular mass?

    A. Solute #3, Solute #4, Mixture #2
    B. Solute #4, Mixture #2, Solute #3
    C. Mixture #2, Solute #3, Solute #4
    D. Mixture #2, Solute #4, Solute #3

24. In Experiment 1, on average, did molecules of Solute #3 or molecules of Solute #4 more easily diffuse across the membrane?

    F.   Solute #3, because it has a larger molecular mass.
    G. Solute #3, because it has a smaller molecular mass
    H. Solute #4, because it has a larger molecular mass.
    J.   Solute #4, because it has a smaller molecular mass.

25. In which mixture is the average molecular mass of the solutes most likely less than 160 amu ?

    A. Mixture 1
    B. Mixture 2
    C. Mixture 3
    D. Neither Mixture 1, 2, or 3

26. How does the number of molecules in 1 gram of Solute #1 compare with the number of molecules in 1 gram of Solute #5 ? The number of molecules in 1 gram of Solute #1 is:

    F.   less, because Solute #1 has a larger molecular mass than Solute #5.
    G. less, because Solute #1 has a smaller molecular mass than Solute #5.
    H. more, because Solute #1 has a larger molecular mass than Solute #5.
    J.   more, because Solute #1 has a smaller molecular mass than Solute #5.

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Passage V

The term "evolution" is often used in the context of biological changes in organism populations over time, but it can also be applied to the change in the chemical composition of Earth's atmosphere. The hypotheses of two studies claim that this *chemical evolution* has altered the types of chemicals found in the atmosphere between the early stages of Earth's existence and the present day.

Study 1

Based on the hypothesis that volcanic eruptions were the source of gases in the early Earth's atmosphere, scientists recreated four model volcanic eruptions in closed chambers, each containing different percentages of the same volcanic particulate matter. They then observed the gases in the air above this model over time. The percent composition of this air after 1 day, when the air achieved a *steady state* of constant gas concentrations, is represented in Table 1.

Since the experiment provided only a suggestion of the gas levels in the early Earth's atmosphere, the scientists then analyzed the amount of trapped gases in sediment layers, which indicate the changing atmospheric levels of gases over billions of years. The data collected on O_2 and H_2O vapor are presented in Figure 1.

Table 1					
Volcanic eruption models		Percent composition of gas			
		1	2	3	4
Study 1 (low H_2 atmosphere)	H_2	3	2	1	0
	H_2O vapor	85	80	75	70
	CO_2	10	10	10	15
	H_2S	2	5	7	8
	N_2	0.5	1	2	2
	CH_4	0.3	0.3	0.3	0.3
	CO	0.05	0.05	0.05	0.05
Study 2 (high H_2 atmosphere)	H_2	45	40	35	30
	H_2O vapor	40	40	35	35
	CO_2	10	10	10	15
	H_2S	2	5	7	8
	N_2	0.5	1	2	2
	CH_4	0.3	0.3	0.3	0.3
	CO	0.05	0.05	0.05	0.05

Key

- – . –– . –– Study 1 H_2O Level
- .... Study 2 H_2O Level
- .–..–..–.. Study 1 O_2 Level
- ———— Study 2 O_2 Level

Figure 1

Study 2

A separate study used the same volcanic models as in Study 1, but it hypothesized that the scientists in Study 1 underestimated the amount of H_2 in the early Earth atmosphere. They proposed a different composition of gases, highlighting an increased H_2 level in the atmosphere, also represented in Table 1. Based on these new data, the scientists proposed an alternative graph for the changing atmospheric levels of O_2 and H_2O vapor, also shown in Figure 1.
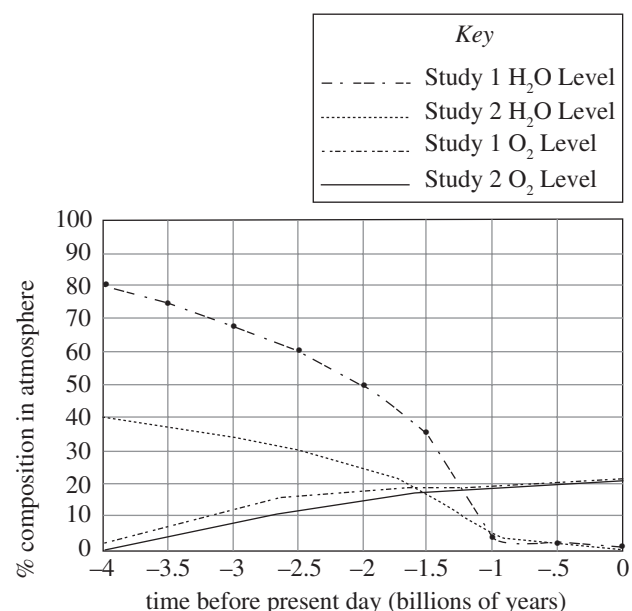
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27. According to the results of Study 2, between 4 and 3 billion years before the present day, the percent composition of O_2 in the atmosphere:

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

28. According to the results of Study 1, the percent composition of H_2O vapor in the atmosphere decreased most rapidly over what period of time?

   F.   Between 2.5 and 2 billion years ago
   G.   Between 2 and 1.5 billion years ago
   H.   Between 1.5 and 1 billion years ago
   J.   Between 1 and 0.5 billion years ago

29. Suppose that the actual early Earth atmosphere had a high H_2 composition of 42%. Based on Study 2, is it likely that the corresponding H_2S and N_2 compositions of this atmosphere were each 3%?

	3% H_2S	3% N_2
A.	Yes	Yes
B.	Yes	No
C.	No	Yes
D.	No	No

30. Suppose that in a new trial in Study 2, the percent composition of H_2 in the atmosphere was set at 33%, and the percent composition of N_2 was found to be 2%. The percent composition of H_2O vapor in this trial would most likely be:

   F.   greater than 40%.
   G.   greater than 35% and less than 40%.
   H.   exactly 35%.
   J.   greater than 30% and less than 35%.

31. Consider an early Earth environment that featured micro-organisms. Based on the results of Study 2, is it more likely that *aerobic organisms* (those that require O_2 to survive) or *anaerobic organisms* (those that do not require O_2 to survive) would have existed on Earth 4 billion years ago?

   A.   Aerobic organisms, because of the high H_2O level 4 billion years ago
   B.   Aerobic organisms, because of the low O_2 level 4 billion years ago
   C.   Anaerobic organisms, because of the high H_2O level 4 billion years ago
   D.   Anaerobic organisms, because of the low O_2 level 4 billion years ago

32. According to Study 2, how long did it take the H_2O vapor level to decrease to 75% of its composition 4 billion years before the present day?

   F.   500 million years
   G.   1 billion years
   H.   1.5 billion years
   J.   2 billion years

33. In which study did the composition fall to 10% less than its initial value in the shortest amount of time?

   A.   Study 1; in Study 1 the % composition dropped from 80% to 70% in approximately 3.2 billion years.
   B.   Study 2; in Study 2 the % composition dropped from 40% to 30% in approximately 2.5 billion years.
   C.   Study 1; in Study 1 the % composition dropped from 80% to 70% in approximately 0.8 billion years.
   D.   Study 2; in Study 2 the % composition dropped from 40% to 30% in approximately 1.5 billion years.

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Passage VI

Engineers studied the trajectories of a cannonball launched from a cannon under various conditions.

Study 1

On a level surface during a mild day, engineers launched a cannonball from a cannon as shown in Figure 1.
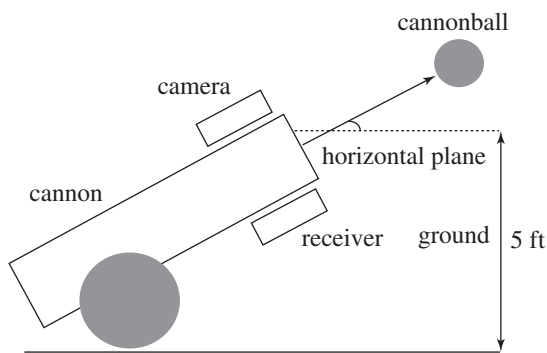

Figure 1

A camera was fixed atop the cannon so that it would point in the direction of the cannonball's launch. A receiver was also fixed to the cannon to record the cannonball's position as recorded by the camera.

As the cannonball traveled through the air, angle θ, which is defined in Figure 1, consistently changed. The change in θ was captured by the camera every 0.25 seconds after launch until the cannonball landed. For each recorded image, θ was measured (Figure 2).
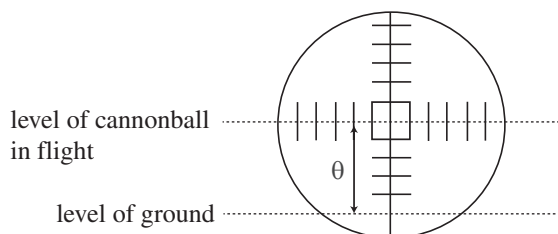
Figure 2

Furthermore, every 0.25 sec after launch, the receiver sent out a radar pulse, part of which was reflected by the cannonball to the receiver. The roundtrip travel time of each pulse was recorded to determine the distance, d, between the receiver and the ball at any given time (see Figure 3).
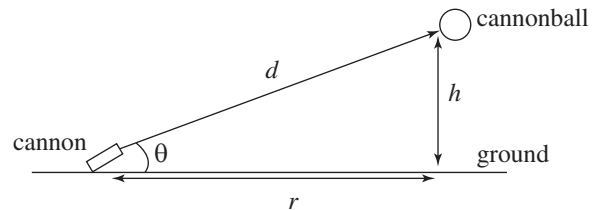

Figure 3

Using d and θ, the engineers determined the ball's height, h, and distance, r, at the end of each 0.25 sec interval. A curve plotting h versus r was constructed.

This procedure was followed using cannonball launch starting speeds of 135 ft/sec, 150 ft/sec, and 180 ft/sec. For each launch speed, the ball was launched at θ = 30 . The curves representing h and r for each of the launch speeds were connected by lines for time, t = 2 sec, 3 sec, 4 sec, and 5 sec after launch (see Figure 4).
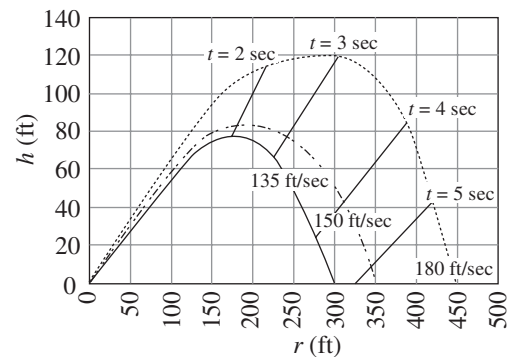

Figure 4

Study 2

Using an algorithm, the engineers calculated h and r at 0.25 sec intervals for the same cannonball launched in a vacuum in otherwise similar conditions to those in Study 1. The results are plotted in Figure 5.
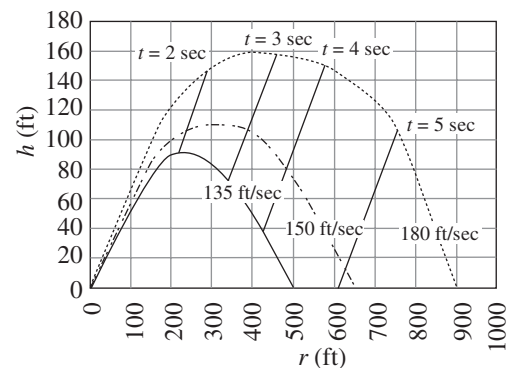

Figure 5

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34. Based on Figure 4, after 4 seconds, approximately how much further had the cannonball that was launched at 180 ft/sec traveled than the cannonball that was launched at 135 ft/sec?

F. 90 feet
G. 110 feet
H. 150 feet
J. 300 feet

35. Suppose the cannonball were launched at 30° in a vacuum from a height of 5 ft. Based on Figure 5, the cannonball would land approximately how many feet farther from the cannon if it were launched at 150 ft/sec than if it were launched at 135 ft/sec?

A. 50 ft
B. 150 ft
C. 500 ft
D. 650 ft

36. While the cannonball was in flight, how often did the camera record the position of the ball?

F. Once per second
G. Twice per second
H. Three times per second
J. Four times per second

37. The cannon was an instrumental weapon used during the Ottoman invasion of the city of Constantinople in 1453. Assume that cannonballs identical to those used in Study 1 were launched on a windless day with a starting height of 5 ft above the ground and an angle of θ = 30°. If the launch speed of each cannonball were 180 ft/sec, how close would the cannon have needed to be to the 40-ft-tall wall surrounding Constantinople in order to travel over it?

A. 425 ft
B. 575 ft
C. 700 ft
D. 850 ft

38. Based on Figure 4, as the initial speed of the launched cannonball was increased, how did the values of h and r change at t = 4 sec?

	h	r
F.	decreased	decreased
G.	decreased	increased
H.	increased	decreased
J.	increased	increased

39. Based on Figure 5, if the ball were launched in a vacuum from a height of 5 ft at 135 ft/sec and θ = 30°, how long would the cannonball most likely be in flight from launch to landing?

A. Between 4 sec and 5 sec
B. Between 5 sec and 6 sec
C. Between 6 sec and 7 sec
D. Between 7 sec and 8 sec

40. Based on Figure 3, if c represents the speed of light, which of the following represents the time taken by each radar pulse to make the roundtrip between the receiver and the ball?

F. $2c/d$
G. $2d/c$
H. c/r
J. r/c

END OF TEST 4

STOP! DO NOT RETURN TO ANY OTHER TEST.