

FULL-LENGTH PRACTICE TEST 22



ENGLISH TEST

35 Minutes—50 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

Crocheting Makes a Good Hobby

Crocheting is the art of making fabric by twisting yarn or thread with a hook. Although many associate it by¹ older people,

- 1. A. NO CHANGE**
B. to
C. on
D. with

crocheting can be a fun hobby for people of all ages.² Once you start crocheting, you won't be able to put down the hook; you'll have a hobby for life. **3**

- 2. F. NO CHANGE**
G. people of all ages, young and old.
H. young and old people of all ages.
J. people of all ages, both young and old people alike.

- 3. At this point, the author is considering adding the following true statement:**

Irish nuns helped save lives with crocheting when they used it as a way to make a living during the Great Irish Potato Famine of 1846.

Should the writer add this sentence here?

- A. Yes, because it is essential to know when crocheting became internationally prominent and how it did so.**
B. Yes, because the reference to the Great Irish Potato Famine demonstrates that the author is conscious of historical events.
C. No, because the reference to the Great Irish Potato Famine is not relevant to the main topic of this essay.
D. No, because many people who left Ireland in 1846 brought crocheting with them to the United States and Australia.

Time-honored and easily taught₄ to all, crocheting is an easy hobby to pick up. Instructional books are readily available, and

4. F. NO CHANGE

- G.** teaches
- H.** taughted
- J.** teached

once you've learned a few basic stitches. Picking₅ up the more advanced ones is a snap. Once you learn how to crochet, you can

5. A. NO CHANGE

- B.** stitches; picking
- C.** stitches, picking
- D.** stitches since picking

purchase store-bought books that detail crocheting patterns₆ that tell you exactly how to make the projects that interest you. Even if you want to try several projects, the supplies required for

6. F. NO CHANGE

- G.** buy books and other pamphlets at craft and book stores detailing certain specific patterns
- H.** buy pattern books
- J.** acquire store-bought pattern books

it's₇ completion are minimal; all you need are a crochet hook, yarn, and a pair of scissors. You don't need to worry about making a big investment, either; fifteen dollars will buy you no fewer than₈ three starter kits!

7. A. NO CHANGE

- B. its**
- C. its'**
- D. their**

8. F. NO CHANGE

- G. fewer than**
- H. less than**
- J. less then**

[1] As you grow more proficient, you can expand your supplies by purchasing hooks of different types, to vary the size of your stitches. [2] Crochet hooks are available in all

9. A. NO CHANGE

- B. types;**
- C. types:**
- D. types,**

sizes, ranging,¹⁰ from very small to very large, with everything in between. [3] Some are so big that you need to use two strands of yarn. [4] Other hooks are very tiny, so small that you must use thread. [5] These hooks are suitable for making smaller, more delicate things such as lace doilies, tablecloths, and bedspreads. [6] These hooks make big stitches, so you can finish a project with them very quickly. [7] It is best to start with hooks that are medium in size; these are the easiest to manipulate and require only one strand of yarn. **11**

10. F. NO CHANGE

- G. sizes, ranging**
- H. sizes; ranging**
- J. sizes ranging,**

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

- A. where it is now.
- B. after Sentence 1.
- C. after Sentence 3.
- D. after Sentence 7.

Because it seems like there are a million hooks to keep track of,¹² crocheting makes a good hobby because it requires only time and patience, not attention or tremendous investment. You can crochet while watching television, listening to music, or visiting with other people. It is fun and relaxing and allows you to express your creative side in an easy way. Also, you¹³ have finished a project, you have a cherished keepsake. Whether you

12. Given that all the choices are true, which one provides the most effective transition from the preceding paragraph to this one?

- F. NO CHANGE
- G. Because it can take a long time to finish a project,
- H. With such a simple and inexpensive set of materials,
- J. No longer a field dominated primarily by older women,

13. A. NO CHANGE

- B. finally you
- C. despite the fact you
- D. once you

have made an afghan to keep you warm on¹⁴ cold winter nights or a lace tablecloth to add a touch of elegance to your dining room, your creation is sure to be cherished for a long time to come.

14. F. NO CHANGE

- G. at
- H. of
- J. within

Question 15 asks about the preceding passage as a whole.

15. Suppose the writer’s goal had been to write an essay that demonstrates the commercial potential of crocheting. Would this essay successfully accomplish that goal?

- A. Yes, because it gives examples of end products of crocheting and shows the different kinds of materials needed to produce a wide range of products.
- B. Yes, because it discusses the supplies necessary to create crocheted products, and it shows the usefulness of many of them during the cold winter months.
- C. No, because it does not mention the market value of crocheted products or how one might go about selling them.
- D. No, because it describes other industries and hobbies that would be more commercially successful.

PASSAGE II

Seurat’s Masterpiece

[1] How can I describe the wonder I felt the first time I saw my favorite painting, Georges Seurat’s *A Sunday on La Grande*

Jatte? [2] I had admired the work for years in art books, but I never thought I saw₁₆ the actual painting, which was housed in Chicago, many miles from where I lived. [3] I finally got my

16. F. NO CHANGE

- G. would see
- H. had seen
- J. was seeing

chance to₁₇ when I met someone else who loved the painting as much as I did. [4] We both had three days off at the same time, so we decided to make a road trip to Chicago so we could see the painting in all it's₁₈ grandeur. [5] We packed our bags,

17. A. NO CHANGE

- B. at the moment
- C. just to
- D. DELETE the underlined portion.

18. F. NO CHANGE

- G. our
- H. its
- J. its'

jumped into the car, and headed₁₉ on our way toward Chicago.

20

19. A. NO CHANGE

- B. jumped into the car, and had headed
- C. jumped into the car, and head
- D. had jumped into the car, and headed

20. Upon reviewing this paragraph and noticing that some information has been left out, the writer composes the following sentence,

incorporating the information:

Her name was Lisa; she lived in my dorm, and a mutual friend had introduced us to each other, knowing how much both of us loved art.

For the sake of the logic of this paragraph, this sentence should be placed after Sentence:

F. 2.

G. 3.

H. 4.

J. 5.

[1] The first thing that struck me as we entered the room where the painting was displayed;²¹ was the size of the painting. [2] A common size for canvases is 24 by 36 inches. [3] It was enormous! [4] It covered a large part of an even larger wall. [5] The painting's size amazed me since it was painted with dots, a technique called pointillism. [6] To create a painting of such magnitude using this technique seemed an almost impossible task.²² [7] Seurat had done it, though, and had made it look easy! 23

21. A. NO CHANGE

B. displayed:

C. displayed,

D. displayed

22. F. NO CHANGE

G. task and difficult to complete.

H. task, difficult to complete.

J. task, overwhelming in its difficulty.

23. Which of the following sentences is LEAST relevant to the development of this paragraph and therefore could be deleted?

- A. Sentence 2
- B. Sentence 4
- C. Sentence 5
- D. Sentence 6

Even more impressive, however, was²⁴ the beauty of the painting. Viewed from a distance, the colors looked muted, capturing the idyllic mood of a summer day in the park.

24. Given that all of the choices are accurate, which provides the most effective and logical transition from the preceding paragraph to this one?

- F. NO CHANGE
- G. One thing that struck me was
- H. Many art critics have written about
- J. The debate rages on over

When I approached the painting, though,²⁵ its colors exploded into myriad hues, illustrating the artist's skill in combining colors to create a mood. Even the parts of the painting that appeared white from a distance were vibrantly multicolored when viewed up close. ²⁶ The effect was incredible;

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

- A. As I approached the painting, though,
- B. However, as I approached the painting,
- C. I approached the painting, though,
- D. However, when I approached the painting,

26. If the writer were to delete the phrase “from a distance” from the preceding sentence, the paragraph would primarily lose:

- F.** an essential point explaining the author’s love of the painting.
- G.** the first part of the contrast in this sentence, which the author uses to describe viewing the painting.
- H.** a further indication of the length of the road trip taken by the author and her friend.
- J.** nothing, because the information provided by this phrase is stated more clearly elsewhere in the paragraph.

he²⁷ sat and stared at the painting in wonder for a good portion of

27. **A.** NO CHANGE

- B.** one
- C.** they
- D.** we

the afternoon. **28**

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

The Art Institute of Chicago contains many other famous paintings, among them Edvard Munch’s *The Scream* and Grant Wood’s *American Gothic*.

Should the writer make this addition here?

- F.** Yes, because it gives additional details essential to understanding the collection at the museum.
- G.** Yes, because it demonstrates a contrast between the author’s favorite painting and those in this sentence.

- H. No, because it provides information that is not relevant at this point in the paragraph and essay.
- J. No, because it is contradicted by other information presented in this essay.

My friend and I saw many other sights,²⁹ on our trip to Chicago, but the best part by far was being able to see our favorite work of art. The image is forever imprinted in my mind

29. A. NO CHANGE

- B. sights, which
C. sights;
D. sights

at the museum gift shop,³⁰ even when I'm not looking at the souvenir print I bought.

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

- F. where it is now.
G. after the word *image*.
H. after the word *looking*.
J. after the word *bought* (ending the sentence with a period).

PASSAGE III

The Language of Cats

Many people believe that language is the domain of human beings. However, cats have developed an intricate language³¹ not for each other, but for the human beings who

31. A. NO CHANGE

- B. developed, an intricate language
- C. developed an intricate language,
- D. developed; an intricate language

have adopted them as pets.³²

32. Which choice would most clearly and effectively express the ownership relationship between humans and cats?

- F. NO CHANGE
- G. like to have cats around.
- H. often have dogs as well.
- J. are naturally inclined to like cats.

When communicating with each other, cats’ “talk” is a complex system of nonverbal signals.³³ In particular, their tails,

33. A. NO CHANGE

- B. a complicated system of nonverbal signals is used by cats to “talk.”
- C. cats “talk” with a complex system of nonverbal signals.
- D. “talking” is done by them with a system of complex nonverbal signals.

rather than any kind of “speech,” provide³⁴ cats’ chief means of expression. They also use physical contact to express their feelings. With other cats, cats will use their voices only to express pain. 35

34. F. NO CHANGE

- G. having provided
- H. has provided
- J. were provided by

35. If the preceding sentence were deleted, the essay would primarily lose:

- A. a redundant point made elsewhere in the essay.
- B. another description of the ways in which cats communicate nonverbally.
- C. an exception to the general trend described in this paragraph.
- D. a brief summary of the information contained in the essay up to this point.

Next, incredibly,³⁶ all of that changes when a human walks into the room. Cats use a wide range of vocal expressions when they communicate with a person, from affectionate meows to

36. F. NO CHANGE

- G. (Do NOT begin new paragraph) Incredibly,
- H. (Begin new paragraph) Next incredibly,
- J. (Begin new paragraph) Incredibly,

menacing hisses. Since cats verbal expressions³⁷ are not used to

37. A. NO CHANGE

- B. cat's verbal expressions
- C. cats' verbal expressions
- D. cats verbal expressions,

communicate with other cats, it is logical and reasonable³⁸ to conclude that cats developed this “language” expressly to communicate with their human owners.

This fact is demonstrated more clear since³⁹ one observes households that have only one cat. An only cat is usually very vocal, since the only creature around with whom the cat can communicate is its owner. Cats with other feline companions,

though, are much quieter. If they want to have a conversation, they need only go to their fellow cats and communicate in their natural way. [40]

38. F. NO CHANGE

- G.** logical and well-reasoned
- H.** logical to a startling degree
- J.** logical

39. A. NO CHANGE

- B.** clear when
- C.** clearly since
- D.** clearly when

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

On the other hand, the natural way for most birds to communicate is vocally, by way of the “bird song.”

Should the writer add this sentence here?

- F.** Yes, because it shows that cats are truly unique in communicating nonverbally.
- G.** Yes, because it adds a relevant and enlightening detail about another animal.
- H.** No, because it basically repeats information given earlier in the essay.
- J.** No, because it does not contribute to the development of this paragraph and the essay as a whole.

Since cats learned to meow for the sole purpose of communicating with human beings, owners should take the time to learn what their different meows mean. If an owner

knows, to⁴¹ name just a few examples, which meow means the cat is hungry, which means the cat wants to be petted, and which means the cat wants to have a little “conversation,” the bond between cat and owner will grow deeper. ⁴² Certainly, after a time, owners will see that communicating with their pets, not just cats, is every bit as important to forging good relationships

41. A. NO CHANGE

- B. knows, to,
- C. knows to,
- D. knows to

42. If the writer wanted to emphasize that cats communicate vocally with their owners to express a large number of different emotions in addition to those listed in the previous sentence, which of the following true statements should be added at this point?

- F. Many animals communicate hunger similarly to cats.
- G. Cats will tell their owners when they feel pain, sadness, irritation, or love.
- H. Cats communicate these emotions differently to other cats.
- J. Humans have the easiest time communicating with other mammals.

as to communicate⁴³ with other humans. Once, as an owner, you know that the cat is not just

43. A. NO CHANGE

- B. as being communicative
- C. as communicating
- D. through communicating

making senseless noises without any rhyme or reason⁴⁴ but is making an attempt to communicate, you can make an effort to

communicate back. After all, your cat isn't meowing just for the sake of making noise; however, cats are less communicative than many other animals.⁴⁵

44. F. NO CHANGE

G. making senseless noises

H. senselessly making noises with no thought involved

J. making senseless noises, having no idea what they mean,

45. Which choice would best summarize the main point the essay makes about cats' communication with their human owners?

A. NO CHANGE

B. rather, there's a good chance your cat is trying to tell you something.

C. instead, your cat is probably trying to communicate with other cats by meowing.

D. on the other hand, it is better to have more than one cat so they can undergo a natural development.

PASSAGE IV

Visiting Mackinac Island

Visiting Mackinac (pronounced "Mackinaw") Island is like taking a step back to the past⁴⁶ in time. Victorian

46. F. NO CHANGE

G. moving in a past-related direction

H. going back to the past, not the future,

J. stepping back

houses⁴⁷ and a fort dating back to the War of 1812 surround the historic downtown, where horses and buggies still pull passengers down the road.

The only way to get to⁴⁸ Mackinac Island is by boat or private plane, and you may not bring your car. Automobiles are

47. A. NO CHANGE

B. house's

C. houses

D. houses,

48. F. NO CHANGE

G. your sweet self over to

H. yourself on down to

J. over to

outlawed on the little, isolated, Michigan, island,⁴⁹ so visitors can

49. A. NO CHANGE

B. isolated Michigan island

C. isolated Michigan island,

D. isolated, Michigan, island

see the sights only by horse, carriage, or by riding a bicycle⁵⁰— or on foot. Luckily, the island is small enough that cars are not

50. F. NO CHANGE

G. by bicycle

H. riding on a bicycle

J. bicycle

**MATHEMATICS TEST**

50 Minutes—45 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.

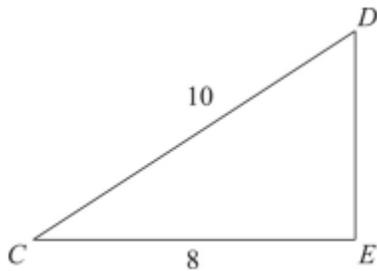
Note: Unless otherwise stated, all of the following should be assumed:

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.
-

1. Point X is located at -15 on the real number line. If point Y is located at -11 , what is the midpoint of line segment XY?

- A. -13
- B. -4
- C. -2
- D. 2

2. Given triangle CDE (shown below) with a right angle at point E, what is the length of leg DE?



- F. $\sqrt{2}$
- G. 2
- H. 6
- J. $\sqrt{164}$

3. Lucy is studying her ant farm. She needs to approximate the number of ants in the population, and she realizes that the number of ants, N , is close to 50 more than double the volume of the ant farm, V . Which of the formulas below expresses that approximation?

- A. $N \approx \frac{1}{2}V + 50$
- B. $N \approx \frac{1}{2}(V + 50)$
- C. $N \approx 2V + 50$
- D. $N \approx 2(V + 50)$

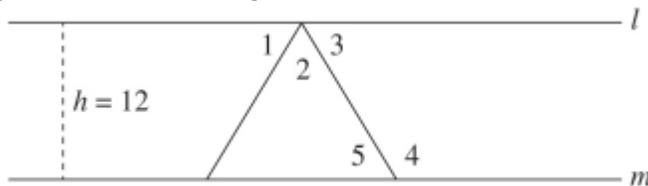
4. Lisa has 5 fiction books and 7 nonfiction books on a table by her front door. As she rushes out the door one day, she takes a book at random. What is the probability that the book she takes is fiction?

- F. $\frac{1}{5}$
- G. $\frac{5}{7}$
- H. $\frac{1}{12}$
- J. $\frac{5}{12}$

5. In the spring semester of her math class, Katie's test scores were 108, 81, 79, 99, 85, and 82. What was her average test score in the spring semester?

- A. 534
- B. 108
- C. 89
- D. 84

6. [DIAGRAM NEEDED - Question 6] Given parallel lines l and m , which of the following choices lists a pair of angles that must be congruent?

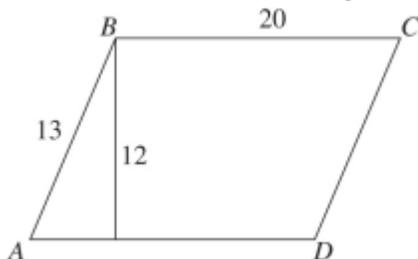


- F. $\angle 1$ and $\angle 2$
- G. $\angle 1$ and $\angle 3$
- H. $\angle 2$ and $\angle 3$
- J. $\angle 2$ and $\angle 5$

7. Gregor works as a political intern and receives a monthly paycheck. He spends 20% of his paycheck on rent and deposits the remainder into a savings account. If his deposit is \$3,200, how much does he receive as his monthly pay?

- A. \$4,000
- B. \$5,760
- C. \$7,200
- D. \$8,000

8. [DIAGRAM NEEDED - Question 8] Given parallelogram ABCD below and parallelogram EFGH (not shown) are similar, which of the following statements must be true about the two shapes?



- F. Their perimeters are equal.
- G. Side AB is congruent to side EF.
- H. Diagonal AC is congruent to diagonal EG.
- J. Their corresponding angles are congruent.

9. A size 8 dress that usually sells for \$60 is on sale for 30% off. Victoria has a store credit card that entitles her to an additional 10% off the reduced price of any item in the store. Excluding sales tax, what is the price Victoria pays for the dress?

- A. \$24.75
- B. \$34.00
- C. \$36.00
- D. \$37.80

10. Erin and Amy are playing poker. At a certain point in the game, Erin has 3 more chips than Amy. On the next hand, Erin wins 4 chips from Amy. Now how many more chips does Erin have than Amy?

- F. -1
- G. 4
- H. 7
- J. 11

11. If $y = 4$, then $|1 - y| = ?$

- A. -5
- B. -3
- C. 3
- D. 4

12. $(3a + 2b)(a - b^2)$ is equivalent to:

- F. $3a^2 - 2b^3$
- G. $3a^2 + 2ab + 2b^3$
- H. $3a^2 - 3ab^2 + a^2b^2$
- J. $3a^2 - 3ab^2 + 2ab - 2b^3$

13. For all real values of y , $3 - 2(4 - y) = ?$

- A. $-2y - 9$
- B. $-2y + 8$
- C. $-2y - 1$
- D. $2y - 5$

14. Which of the following is equivalent to $(y^3)^8$?

- F. y^{11}
- G. y^{24}
- H. $8y^3$
- J. $8y^{11}$

15. If the first day of the year is a Monday, what is the 260th day?

- A. Monday
- B. Tuesday
- C. Wednesday
- D. Thursday

16. If a square has an area of 64 square units, what is the area of the largest circle that can be inscribed inside the square?

- F. 4π
- G. 8π
- H. 16π
- J. 64

17. What is the product of the solutions of the equation $x^2 - 5x - 14 = 0$?

- A. -14
- B. -2
- C. 0
- D. 5

18. Factoring the polynomial $x^{12} - 9$ reveals a number of factors for the expression. Which of these is NOT one of the possible factors?

- F. $x^6 + 3$
- G. $x^3 + \sqrt{3}$
- H. $x^3 - \sqrt{3}$
- J. $x - \sqrt{3}$

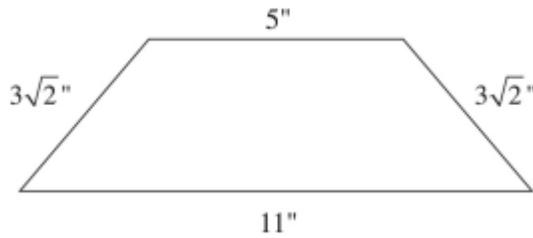
19. What is the value of $(2x + 4)/(3x)$ when $x = 1/6$?

- A. $4\frac{1}{3}$
- B. 2
- C. $26/3$
- D. 12

20. If you drive 60 miles at 90 miles an hour, how many minutes will the trip take you?

- F. 15
- G. 30
- H. 40
- J. 60

21. The area of a trapezoid is found by multiplying the height by the average of the bases: $A = \frac{1}{2}h(b_1 + b_2)$. Given the side measurements below, what is the area, in square inches, of the trapezoid?

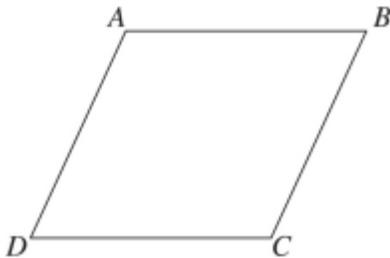


- A. $15\sqrt{2}$
- B. 22
- C. 24
- D. $24\sqrt{2}$

22. If $x = -2/3$ and $x = 1/4$ are the roots of the quadratic equation $ax^2 + bx + c = 0$, then which of the following could represent the two factors of $ax^2 + bx + c$?

- F. $(3x + 2)$ and $(4x - 1)$
- G. $(3x + 1)$ and $(4x - 2)$
- H. $(3x - 1)$ and $(4x + 2)$
- J. $(3x - 2)$ and $(4x + 1)$

23. In the rhombus below, diagonal $AC = 6$ and diagonal $BD = 8$. What is the length of each of the four sides?



- A. $\sqrt{7}$
- B. $\sqrt{14}$
- C. 5
- D. 7

24. A rectangular rug has an area of 80 square feet, and its width is exactly 2 feet shorter than its length. What is the length, in feet, of the rug?

- F. 8
- G. 10
- H. 16
- J. 18

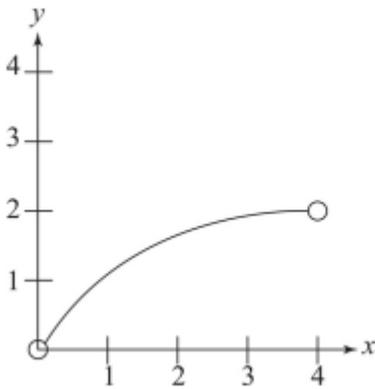
25. In the standard (x,y) coordinate plane, a line runs through points $(1,-5)$ and $(5,10)$. Which of the following represents the slope of that line?

- A. $4/5$
- B. 1
- C. $5/4$
- D. $15/4$

26. The equation of a circle in the standard (x,y) coordinate plane is given by the equation $(x + 5)^2 + (y - 5)^2 = 5$. What is the center of the circle?

- F. $(-5, 5)$
- G. $(-5, -5)$
- H. $(5, -5)$
- J. $(5, 5)$

27. [DIAGRAM NEEDED - Question 27] The graph below shows the function $f(x)$ in the standard (x,y) coordinate plane. Which of the following choices best describes the domain of this function?

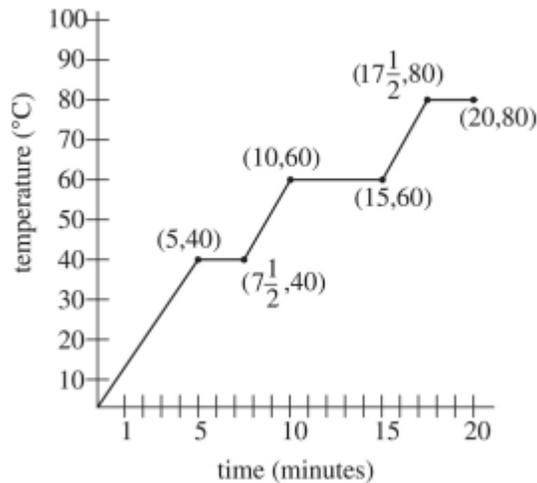


- A. $\{0, 1, 2, 3, 4\}$
- B. $\{0, 1, 2\}$
- C. $\{x: 0 < x < 2\}$
- D. $\{x: 0 < x < 4\}$

28. Amber decides to graph her office and the nearest coffee shop in the standard (x,y) plane. If her office is at point $(-1,-5)$ and the coffee shop is at point $(3,3)$, what are the coordinates of the point exactly halfway between those of her office and the shop? (You may assume Amber is able to walk a straight line between them.)

- F. $(1, -1)$
- G. $(1, 4)$
- H. $(2, -1)$
- J. $(2, 4)$

29. [DIAGRAM NEEDED - Question 29] For a chemistry class, Sanjay is doing an experiment that involves periodically heating a container of liquid. The graph below shows the temperature of the liquid at different times during the experiment. What is the average rate of change of temperature (in degrees Celsius per minute) during the times in which the temperature is increasing?



- A. 4
- B. 5
- C. 8
- D. 10

30. If $(a^x)/(a^y) = a^5$, for $a \neq 0$ and $a \neq 1$, which of the following statements must be true?

- F. $x \neq 0$ and $y \neq 0$
- G. $x + y = 5$
- H. $x - y = 5$
- J. $xy = 5$

31. What is the slope of the line given by the equation $8 = 3y - 5x$?

- A. $-5/3$
- B. $-3/5$
- C. $3/5$
- D. $5/3$

32. When adding fractions, a useful first step is to find the least common denominator (LCD) of the fractions. What is the LCD for these fractions?

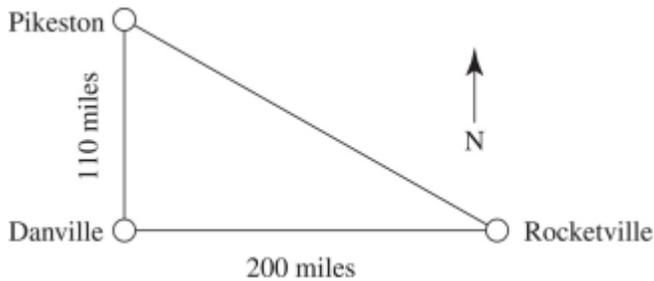
$$2/(3^2 \times 5), 13/(5^2 \times 7 \times 11), 2/(3 \times 11^3)$$

- F. $3 \times 5 \times 7 \times 11$
- G. $3^2 \times 5^2 \times 7 \times 11$
- H. $3^2 \times 5^2 \times 11^3$
- J. $3^2 \times 5^2 \times 7 \times 11^3$

33. $(1/4) \times (2/5) \times (3/6) \times (4/7) \times (5/8) \times (6/9) \times (7/10) = ?$

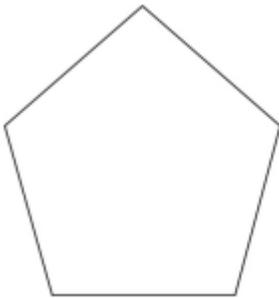
- A. 1/720
- B. 1/360
- C. 1/120
- D. 27/49

34. [DIAGRAM NEEDED - Question 34] Dave is in Pikeston and needs to go to Danville, which is about 110 miles due south of Pikeston. From Danville, he'll head east to Rocketville, about 200 miles from Danville. As he sets out on his trip, a plane takes off from the Pikeston airport and flies directly to Rocketville. Approximately how far, in miles, does the plane fly?



- F. $\sqrt{310}$
- G. $\sqrt{27,900}$
- H. $\sqrt{30,000}$
- J. $\sqrt{52,100}$

35. [DIAGRAM NEEDED - Question 35] The figure below is a pentagon (5-sided figure). Suppose a second pentagon were overlaid on this pentagon. At most, the two figures could have how many points of intersection?

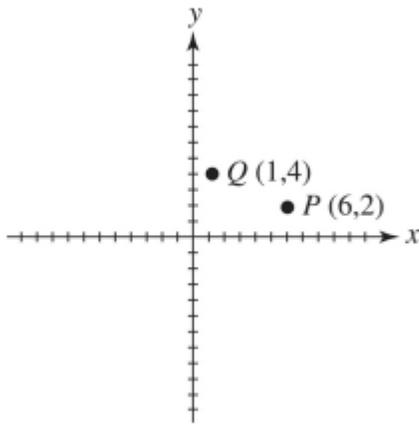


- A. 1
- B. 2
- C. 5
- D. 10

36. MicroCorp will hold its annual company picnic next week and will assign planning duties to 3 of its employees. One person selected will reserve a venue, another will arrange catering, and a third will plan activities. There are 10 employees eligible to fulfill these duties, and no employee can be assigned more than one duty. How many different ways are there for duties to be assigned to employees?

- F. 9^3
- G. 10^3
- H. $9 \times 8 \times 7$
- J. $10 \times 9 \times 8$

37. In the (x,y) coordinate plane below, points $P(6,2)$ and $Q(1,4)$ are two vertices of $\triangle PQR$. If $\angle PQR$ is a right angle, then which of the following could be the coordinates of R ?



- A. (3, 0)
- B. (2, 1)
- C. (2, 4)
- D. (3, 9)

38. If $y = 0.25(100 - y)$, then what is the value of y ?

- F. 200
- G. 75
- H. 25
- J. 20

39. If $0^\circ \leq x \leq 180^\circ$ and $4\cos^2 x = 1$, then $x = ?$

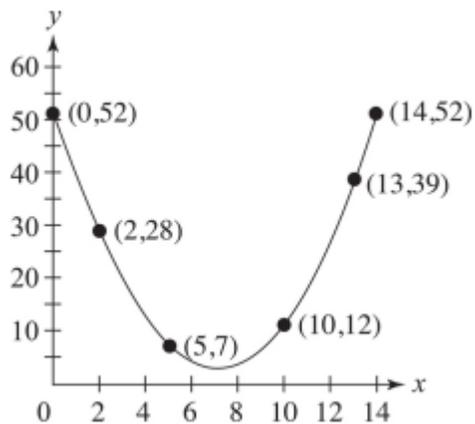
- A. 0°
- B. 60°
- C. 90°
- D. 150°

40. Danielle's living room is a rectangle with the dimensions 16 feet by 18 feet. If she partially covers the bare floor with a circular throw rug with a diameter of 12 feet, what is the approximate area of bare floor, in square feet, that remains exposed?

(Note: Assume the rug lies completely flat and does not touch any wall.)

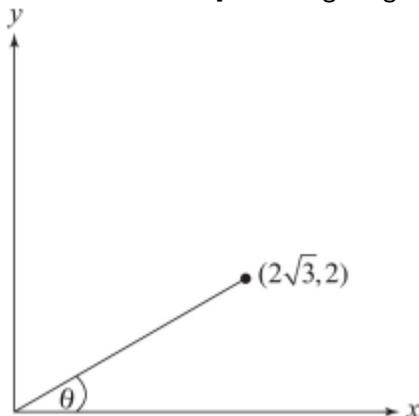
- F. 113
- G. 144
- H. 175
- J. 288

41. [DIAGRAM NEEDED - Question 41] A portion of a parabola is shown below. Over which of the following intervals is the average rate of change the greatest?



- A. $0 \leq x \leq 2$
- B. $2 \leq x \leq 5$
- C. $5 \leq x \leq 10$
- D. $10 \leq x \leq 13$

42. [DIAGRAM NEEDED - Question 42] In the figure given below, what is $\sin \theta$?



- F. $1/2$
- G. $\sqrt{3}/3$
- H. $\sqrt{3}/2$
- J. 1

43. The magnitude of an earthquake on the Richter Scale is determined by the equation $R = \log(A/A_0)$, in which A is the maximum amplitude measured at a sensor and A_0 is the threshold amplitude, dependent only on the sensor distance from the epicenter. What is the approximate magnitude, on the Richter Scale, of an earthquake with a measured amplitude 3,000 times the value of A_0 ?

- A. 2.5
- B. 3
- C. 3.5
- D. 4

44. Set P and Set Q are shown below. If m is randomly selected from Set P and n is randomly selected from Set Q, what is the probability that mn is an even integer?

Set P = {2, 3, 5.5, 6} Set Q = {1, 2, 3, 4}

- F. $3/4$
- G. $11/16$
- H. $9/16$
- J. $1/4$

45. Which choice below is the complete solution set of $|2z - 3| \geq 7$?

- A. $z \geq 5$
- B. $z \leq -2$ or $z \geq 5$
- C. $-5 \leq z \leq 5$
- D. $z \leq -6$ or $z \geq 2$

READING TEST*40 Minutes—36 Questions*

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

Passage I

LITERARY NARRATIVE: Passage A is adapted from the essay “What Baseball Taught Us” by Richard Brown (©2007 by Richard Brown). Passage B is adapted from the essay “The Major Leagues” by Jack Bryant (©1998 by Jack Bryant).

Passage A by Richard Brown

April 15, 1947: I happen to be home sick from school, and my grandfather is delighted to have someone to share his anticipation with. He's been pacing the house all morning, occasionally sitting down but quickly hopping back up, adjusting the TV
5 antennas, cleaning his glasses, flicking an imaginary piece of lint off the television screen. Amidst my mother's protestations, I am brought out of my stuffy, dark bedroom where I have been confined to fight my fever and propped up on the sofa with four quilts over me, at least three more than I really need. Fever or
10 no, my grandfather wants me to witness history.

Jackie Robinson is making his major league debut for the Brooklyn Dodgers, the first African-American player in the Major League Baseball. I'm not sure what's more stifling, the quilts, or my grandfather's tense excitement that has us all on edge. I'm
15 proud that Robinson is playing—there's been a long build-up to this day, and he has taken people's prejudice and abuse like a gentleman, never losing his cool. I know he'll do the same today. I wonder, through my fever and quilts, just what my grandfather thinks will happen.

20 We were not Dodgers fans before Jackie Robinson. Our

team was the Memphis Red Sox, in the Negro League. But now we are watching the small, jerky figures take the field hundreds of miles away in Brooklyn. At first base, number 42, is a black man. My grandfather has finally settled down, staring at the television in disbelief. My mother has tears in her eyes. The Braves are at bat, and Robinson gets the first man out, on a ground ball thrown from third. The crowd cheers. In the bottom of the first inning, he grounds out. I let out a loud groan. My grandfather turns to look at me, his eyes ablaze. He quietly tells my mother to take me back to bed.

Later, I try to apologize to my grandfather, and I blame my outburst on the fever. It's partly true—I needed to break the tension, which I probably felt more keenly because of my illness, but he doesn't buy it. *He needs our support, son. Take a cue from the way he's stood up to his critics, and stand up for him. What matters is how he plays the whole game, not an occasional out.* I realize then that I had been nervous, too. I had expected the impossible—I had wanted him to bat a thousand.

Passage B by Jack Bryant

Opening Day, 1947—some friends and I cut school and in-
40 stead made our way to Ebbets Field to see Jackie Robinson make
his major league debut. We hadn't expected to get in; everyone
thought the game would be sold out, with crowds overflowing
into the streets near the stadium. We just wanted to be part of that
crowd. We had been saving up money, just in case, and it paid
45 off. The game was not sold out, and we got in. I hadn't been to
a major league game before, and inside the stadium I felt I was
in some utopian society that existed without segregation and
racism. The crowd, which was more than half black, cheered
as Jackie made the first out of the game at first base. Though
50 he didn't get a hit in the game, he scored a run after drawing a
walk, and got eleven put-outs at first base.

My friends and I were flying high as we left the stadium.
If a black man was now playing for the Brooklyn Dodgers, we
felt there was nothing we couldn't do. Later that same season,
55 Larry Doby signed with the Cleveland Indians to become the first
African American player in the American league. Change, we
thought, was rapidly coming. To a certain extent that was true,
but racism and injustice also persisted. Other teams treated Jackie
badly, calling him names, threatening to strike if he played, and
60 handling him roughly. When the Dodgers were on the road, he

often was not allowed to stay at the hotels where the rest of the team stayed. These injustices weren't new, but somehow I had thought they would go away when he took the field, that when Branch Rickey had offered him a contract, he was extending
65 an olive branch to all African Americans on behalf of white Americans.

Twenty-one years later, I remembered that day as I grieved the death of Dr. Martin Luther King, Jr., a victim of the struggle for racial equality that was ongoing. I had been so young, and
70 so hopeful, and so hopelessly naïve. At times it felt like nothing had been accomplished in those 21 years. But that isn't entirely true. In baseball, getting a hit three out of every ten at bats is considered a good record. While I wish the struggle for equality were more like golf, in which the professionals hit the ball every
75 time, we have come a long way since that day in 1947. But the season is 162 games long, and we are only part way through it.

Questions 1–3 ask about Passage A.

- 1.** The last paragraph of Passage A (lines 31–38) marks a shift in the passage from:
- A.** the time when baseball was segregated to after African Americans started playing in the major leagues.
 - B.** the narrator seeing things through a fever-induced delirium to his understanding of how he had misinterpreted events.
 - C.** a description of the experience of a historical moment to a lesson learned from that moment.

- D.** the narrator’s grandfather’s happy anticipation of an event to his anger at how the event unfolded.
- 2.** In Passage A, the narrator’s descriptions of Jackie Robinson suggest that he sees him as ultimately:
- F.** a gentleman and a hero.
 - G.** capable of doing the impossible.
 - H.** a disappointing player.
 - J.** overly excited and tense.
- 3.** The narrator of Passage A most nearly suggests that his grandfather is annoyed with him for groaning because:
- A.** his grandfather believes the narrator shouldn’t have criticized Robinson.
 - B.** his grandfather was disappointed that Robinson grounded out but didn’t want to say so.
 - C.** the noise disturbed his grandfather’s concentration on the game.
 - D.** the narrator was too sick to be out of bed and watching baseball.

Questions 4–7 ask about Passage B.

- 4.** The narrator’s statement “inside the stadium I felt I was in some utopian society that existed without segregation and racism” (lines 46–48) is most nearly meant to:
- F.** describe the way people interact with each other inside a baseball stadium.
 - G.** express the narrator’s feelings of the momentousness of the occasion.

- H.** illustrate the way that Jackie Robinson changed society by playing in the major leagues.
- J.** foreshadow the way the narrator would feel 21 years later.
- 5.** Passage B indicates that compared to the narrator's expectation about how Jackie Robinson's appearance in Major League Baseball would affect segregation, its actual effect was:
- A.** different; the narrator had thought the crowd at the game would be bigger than it was.
 - B.** different; the narrator had thought segregation would quickly disappear.
 - C.** similar; the narrator had thought Robinson was a good choice for the Dodgers.
 - D.** similar; the narrator had thought racism and injustice would last for a long time.
- 6.** Based on the passage, the information about Dr. Martin Luther King, Jr. provided in lines 67–69 is most likely included to:
- F.** show that not all of the narrator's role models were baseball players.
 - G.** provide historical context for the importance of Jackie Robinson's role in baseball.
 - H.** illustrate how little progress the narrator felt had been made in the struggle for racial equality.
 - J.** convey the idea that Jackie Robinson's influence was felt far beyond the world of sports.
- 7.** The narrator of Passage B makes a comparison between:
- A.** the struggle for racial equality and the baseball season.
 - B.** professional golf and major league baseball.
 - C.** tense excitement and bed covers.

D. striking out in baseball and experiencing injustice.

Questions 8–10 ask about both passages.

- 8.** Which of the following statements provides the most accurate comparison of the tone of each passage?
- F. Passage A is hopeful and cheery, while Passage B is dreary and pessimistic.
 - G. Passage A is objectively factual, while Passage B is descriptive and detailed.
 - H. Both passages maintain a sense of disappointment throughout.
 - J. Both passages begin with a sense of optimism and end with a sense that expectations had been too high.
- 9.** Compared to the narrator of Passage A, the narrator of Passage B provides more information about:
- A. the play-by-play analysis of Jackie Robinson’s first major league game.
 - B. the long-term effects of Jackie Robinson’s appearance in the major leagues.
 - C. Jackie Robinson’s baseball career before signing with the Dodgers.
 - D. the role of Negro League baseball in the early 20th century.
- 10.** It can reasonably be inferred that after seeing Jackie Robinson play, compared to the narrator of Passage B, the narrator of Passage A felt:
- F. less optimistic about how race relations would change.
 - G. less interested in continuing to follow the Dodgers.
 - H. more disappointed that he hadn’t played better.

J. more excited about the future for African-American baseball players.

Passage II

SOCIAL SCIENCE: This passage is adapted from T. H. Watkins' *The Great Depression* (©1993, Little, Brown and Co.; Blackside Inc.).

One of the most durable and well regarded of all the New Deal's programs came from President Roosevelt himself, who had his own share of inventiveness. If the president cared about the fate of people, he also cared about the fate of trees, having
5 practiced the art of silviculture on his Hyde Park estate with such enthusiasm that on various official forms he was fond of listing his occupation as "tree farmer." It was in early March, 1933, that he proceeded to bring the two concerns together—enlisting young unemployed men in a kind of volunteer "army" to be put to
10 work in the national forests, national parks, and on other federal public lands. When he went to Congress for authorization of the program, he called the new agency the Civilian Corps Reforestation Youth Rehabilitation Movement, but before sinking under the weight of an acronym like CCRYRM, it was soon changed
15 to the Civilian Conservation Corps (known forever after as the CCC). Congress chose not to handle the details itself. It simply authorized the president to create the program and structure it as he saw fit by executive order; it was to last two years. Responsibility was divided up among the Labor Department, which was
20 to screen and select the enrollees, the War Department, which

would house and feed them in their nonworking hours, and the Departments of Agriculture and Interior, which would design and supervise projects in regional and national forests, national parks, and other public lands. The men would be paid \$30 a
25 month, anywhere from \$23 to \$25 of it to be sent to their families.

The CCC officially began on April 5, 1933, calling for an enrollment of 250,000 to be housed in 1,468 camps around the country. The cost for the first year was estimated at \$500 million. The men had to be US citizens between the ages of seventeen
30 and twenty-seven (later, twenty-four), out of school, out of work, capable of physical labor, over 60 inches but under 78 inches in height, more than 107 pounds in weight, and had to possess no fewer than “three serviceable natural masticating teeth above and below.” They would serve terms of no more than nine months
35 so that as many as possible could be accommodated over the course of time.

Among the earliest enrollees were some veterans who had returned to Washington, setting up camp and demanding payment of their bonuses for service during the war. While making
40 it clear that he opposed the payments on economic grounds, FDR

provided tents, showers, mess halls, and latrines, and, waiving the age restriction for them, invited the members of this new Bonus Army to join his new agency. What was more, Eleanor Roosevelt dropped by one rainy day for a visit, slogging through
45 ankle-deep mud to meet and talk with the men. “Hoover sent the army,” said one veteran of the previous summer’s BEF disaster, “Roosevelt sent his wife.” When it became clear that no bonus would be forthcoming, about twenty-five hundred of the men took Roosevelt up on his offer and joined the CCC.

50 In the summer of 1934, Roosevelt expanded the size of the CCC to 350,000 and would raise it to 500,000 in 1935. Congress continued to reauthorize it faithfully over the next seven years, and by the time it was closed out in 1942, the CCC had put more than three million young “soil soldiers” to work. In the national
55 forests alone they built 3,470 fire towers, installed 65,100 miles of telephone lines, scraped and graded thousands of fire breaks, roads, and trails, and built 97,000 miles of truck trails and roads, spent 4.1 million man-hours fighting fires, and cut down and hauled out millions of diseased trees and planted more than 1.3
60 billion young trees in the first major reforestation campaign in

the country's history. For the National Park Service, they built roads, campgrounds, bridges, and recreation and administration facilities; for the Biological Survey (a predecessor of today's Fish and Wildlife Service), they conducted wildlife surveys and improved wildlife refuge lands; and for the Army Corps of Engineers, they built flood control projects in West Virginia, Vermont, and New York State.

In return, the CCC, at its best, took at least some young men out of the urban tangle of hopelessness where so many resided, introduced them to the intricacies and healing joy of the outdoors, and clothed and fed them better than many had been for years. Moreover, the program taught more than a hundred thousand to read and write, passed out twenty-five thousand eighth-grade diplomas and five thousand high-school diplomas, gave structure and discipline to lives that had experienced little of either, strengthened bodies and minds, and for many provided a dose of self-esteem they had never known.

11. The main idea of the passage is that:

- A.** the CCC forced unemployed young men to work in the national forests, national parks, and on other federal public lands for no payment or bonus.
- B.** it was only after President Roosevelt created the CCC that veterans had suitable employment during the Great Depression.
- C.** research into the history of the New Deal shows that the idea for the CCC came from Congress.
- D.** among the programs of the New Deal, the CCC employed young men to build public works projects on public lands in return for modest wages, food, clothing, and some education.

12. The main idea of the third paragraph (lines 37–49) is that:

- F. President Hoover had dispatched the army to meet with disgruntled veterans, but President Roosevelt sent his wife, Eleanor, to meet with the Bonus Army.
- G. when they realized President Roosevelt would not pay the bonus, many veterans abandoned the Bonus Army and accepted his invitation to join the CCC.
- H. President Roosevelt supplied shelter and food to the veterans before paying the bonus the veterans demanded.
- J. many of the veterans were above the age requirement of the CCC.

13. As it is used in line 7 to describe President Roosevelt, the term *tree farmer* most nearly means that Roosevelt:

- A. had supported his family by growing trees before he entered politics.
- B. believed in an agrarian economy over urban industrialization.
- C. continued his successful business selling trees while in office.
- D. had a great interest in trees and knew a good deal about them.

14. According to the passage, which of the following was a project the CCC performed for the National Park Service?

- F. Building fire towers
- G. Building campground facilities
- H. Installing telephone lines
- J. Conducting wildlife surveys

15. According to the passage, which of the following statements is true about the CCC?

- A. The agency provided enrollees with academic instruction.
- B. The agency provided enrollees with urban job training.
- C. The agency accepted only men with six teeth.
- D. The agency offered courses in nutrition and self-esteem.

16. Information in the fourth paragraph (lines 50–67) makes it clear that the CCC:

- F.** was voluntary and therefore did not pay members anything.
- G.** ran for more years and employed more men than was originally intended.
- H.** employed 4.1 million men.
- J.** battled fires in West Virginia, Vermont, and New York.

17. The passage most strongly suggests that before the 1930s, the national forests:

- A.** received no federal support or aid for projects to clear diseased trees.
- B.** included land reserved for wildlife refuges.
- C.** had never undergone a major reforestation campaign.
- D.** experienced more floods than forest fires.

18. According to the passage, when did the CCC change its name?

- F.** After President Roosevelt received authorization from Congress
- G.** After Congress protested that CCRYRM was too difficult to say
- H.** In the same year the size expanded to 500,000 men
- J.** After the Bonus Army disbanded

19. The passage states that the same year the CCC was authorized enrollees had to be:

- A.** over 78 inches in height.
- B.** in school.
- C.** between the ages of seventeen and twenty-seven.
- D.** between the ages of seventeen and twenty-four.

20. According to the passage, CCC programs in national parks and forests were:

- F.** conducted far from where the members were fed and housed.
- G.** under the control of the Departments of Agriculture and the Interior.
- H.** supervised by the Labor Department.
- J.** minimum-wage jobs.

Passage III

HUMANITIES: This passage is adapted from John Gattuso, ed., *Native America* (©1993, Houghton Mifflin Co.).

Northwest natives are carvers by tradition, but it was the natives of the far north, in what is now British Columbia and Alaska, who first carved totem poles. The history of these fascinating works is surprisingly brief, for it wasn't until the mid-18th century, when European explorers first encountered these remote tribes, that the unique sculptures began to appear. Although the natives were already expert carvers of canoes, tools, longhouses, and furniture, they lacked the iron tools necessary to fell a massive tree in one piece and carve its entire length.

10 With the iron axes they got in trade for their baskets, boxes, and pelts, the coastal tribes of the far north could take advantage of the trees that grew so tall and straight in their wet climate. Initially, the poles were made to stand against the front of a house, with figures facing out and a door cut through the base, so all
15 would enter the house through the pole. In this case, the totem pole functioned as a family crest, recounting genealogies, stories, or legends that in some way identified the owner. Towards the end of the 19th century, the poles stood free on the beach or in the village outside the carvers' homes. Some villages were virtual
20 forests of dozens, sometimes hundreds, of poles.

The family that carved the pole gave a potlatch with feasting, games, and much gift-giving. The guests, in return, raised the pole. These gatherings were costly and required a great deal of preparation and participation. The custom frustrated whites
25 trying to “civilize” the Indians, especially missionaries who solved the problem by knocking the poles down. Employers, too, complained that their Indian workers were unreliable when a pole was being carved or a potlatch planned. Eventually, both the Canadian and United States governments banned potlatches,
30 and pole carving nearly died out. The ban was lifted in the 1950s.

The Tlingit, on the southeastern coast of Alaska, and the Haidas and Tsimshian of western Canada are known for their pole carving. On a tour in 1899, a group of Seattle businessmen visited the Tlingit village of Tongas and, finding no one there, took
35 one of the poles. They erected it in Seattle where, at a towering 50 ft., it became one of the city’s most distinctive monuments. In 1938, Tlingit carvers copied the pole after the original was destroyed by fire, and it remains in Pioneer Square today.

Poles serve the important purpose of recording the lore of
40 a clan, much as a book would. The top figure on the pole identi-

fies the owner's clan, and succeeding characters (read from top to bottom) tell their stories. Raven, the trickster, might tell the story of how he fooled the Creator into giving him the sun, or Frog might tell how he wooed a human woman. With slight
45 variations between villages, everyone knew these stories, and potlatch guests dramatized them at the pole-raising with masks, drumming, and songs. And so the legends were preserved from one generation to the next.

There is a story behind almost every image on the pole. For
50 example, if an animal had the power to transform itself into other beings, the carver would portray it in all its forms. If Raven were sometimes bird, sometimes human, he would be carved with both wings and limbs, or have a human face with a raven's beak. Other images are used to describe the spirits' special abilities.
55 Eyes are frequently used to suggest acuteness or skill. So, for example, if an eye appears in an animal's ear, it might indicate that that animal has a sharp sense of hearing. And human figures in unexpected places, like an ear or nose, might mean that the animal has great powers.

60 Learning to read totem poles is like learning to read a language. They speak of history, mythology, social structure, and spirituality. They serve many purposes and continue to be carved by the descendants of the original carvers.

Today, Haida, Tlingit, Tsimshian, Kwakiutl and other na-
65 tive craftsmen carve, predominantly for the tourist trade, small "souvenir" totem poles in wood and black slate (or argillite). They also carve extraordinarily beautiful masks, effigies, boxes, house posts, and fixtures....

21. Which of the following statements best expresses the main idea of the passage?

- A.** Many Native American tribes created totem poles with meaningful symbols, but these poles were less important than the canoes carved before the mid-18th century.
- B.** Although the Tlingit village was deserted, the Seattle businessmen who took the totem pole were not right to take it without permission.
- C.** The history of totem pole carving dates back to only the mid-18th century, but these poles have played an important role in Native American culture since that time.
- D.** The ban issued by the Canadian and United States governments against potlatches was lifted in the 1950s, but interest in totem-pole carving had diminished by that time.

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

- F.** In terms of geographical region, which were the first groups to carve totem poles?
- G.** What is the tallest totem pole in North America?
- H.** What is the predominant use of the small totem poles carved today?
- J.** What prevented Native American tribes from carving totem poles before the 18th century?

23. The passage suggests that one of the main purposes of totem poles is the way in which they:

- A.** demonstrate the artistic skill of the carvers.
- B.** function as landmarks in major North American cities.
- C.** document the history and mythology of various clans.
- D.** complement the festivities of the potlatch.

24. The main function of the sixth paragraph (lines 49–59) is to:

- F.** identify the origins of the stories behind every image on a totem pole.

- G.** describe and explain some of the images that might appear on a totem pole.
- H.** contrast the images on the totem poles of the Northwest natives with those of British Columbia and Alaska.
- J.** explain the role of the Raven in Native American mythology.
- 25.** All of the following are used in the passage as illustrations of the role totem poles play in Native American culture EXCEPT the:
- A.** function of the top figure on the pole.
 - B.** descriptions of the Raven and Frog as characters on the pole.
 - C.** reference to the popularity of totem poles in the tourist industries of many tribes.
 - D.** placement of the Tlingit totem pole in Seattle’s Pioneer Square.
- 26.** The second paragraph (lines 10–20) establishes all of the following about the totem poles carved by the coastal tribes of the far north EXCEPT that they were:
- F.** initially used as the entryways of houses.
 - G.** fashioned from tall, straight trees.
 - H.** used to identify the owners of the poles.
 - J.** produced only by clans with family crests.
- 27.** One of the main points of the fifth paragraph (lines 39–48) is that the various characters on a totem pole are meant to represent:
- A.** the owner of the totem pole.
 - B.** the lore of the owner’s clan.
 - C.** Raven, the trickster, fooling the Creator.
 - D.** Frog wooing a human woman.
- 28.** According to the passage, which of the following places is home to the Tlingit?

- F. Seattle
- G. Western Canada
- H. Pioneer Square
- J. Alaska

29. The author most likely includes the information in lines 60–63 to suggest that:

- A. totem poles are notable for reasons beyond physical beauty.
- B. totem poles have replaced books for Native American tribes.
- C. Native American tribes have no spoken or written language.
- D. the descendants of the original carvers of totem poles carve copies of older poles.

30. Which of the following words best describes the attitude of the employers referred to in the third paragraph (lines 21–30) in reaction to potlatches?

- F. Patient
- G. Accepting
- H. Irritated
- J. Civilized

Passage IV

NATURAL SCIENCE: This passage is adapted from the article “The Pioneer Mission to Venus” by Janet G. Luhmann, James B. Pollack, and Lawrence Colin (©1994, Scientific American).

Venus is sometimes referred to as the Earth’s “twin” because it resembles the Earth in size and in distance from the sun. Over its 14 years of operation, the National Aeronautics and Space Administration’s *Pioneer Venus* mission revealed that the relation
5 between the two worlds is more analogous to Dr. Jekyll and Mr. Hyde. The surface of Venus bakes under a dense carbon dioxide atmosphere, the overlying clouds consist of noxious sulfuric acid, and the planet’s lack of a magnetic field exposes the upper atmosphere to the continuous hail of charged particles from the
10 sun. Our opportunity to explore the hostile Venusian environment came to an abrupt close in October 1992, when the *Pioneer Venus Orbiter* burned up like a meteor in the thick Venusian atmosphere. The craft’s demise marked the end of an era for the U.S. space program; in the present climate of fiscal austerity, there is no
15 telling when humans will next get a good look at Earth’s nearest planetary neighbor.

The information gleaned by *Pioneer Venus* complements the well-publicized radar images recently sent back by the *Magellan* spacecraft. *Magellan* concentrated on studies of Venus’s surface
20 geology and interior structure. *Pioneer Venus*, in comparison,

gathered data on the composition and dynamics of the planet's atmosphere and interplanetary surroundings. These findings illustrate how seemingly small differences in physical conditions have sent Venus and the Earth hurtling down very different evolutionary paths. Such knowledge will help scientists intelligently evaluate how human activity may be changing the environment on the Earth.

Well before the arrival of *Pioneer Venus*, astronomers had learned that Venus does not live up to its image as Earth's near-twin. Whereas Earth maintains conditions ideal for liquid water and life, Venus's surface temperature of 450 degrees Celsius is hotter than the melting point of lead. Atmospheric pressure at the ground is some 93 times that at sea level on Earth.

Even aside from the heat and the pressure, the air on Venus would be utterly unbreathable to humans. The Earth's atmosphere is about 78 percent nitrogen and 21 percent oxygen. Venus's much thicker atmosphere, in contrast, is composed almost entirely of carbon dioxide. Nitrogen, the next most abundant gas, makes up only about 3.5 percent of the gas molecules. Both planets possess about the same amount of gaseous nitrogen, but Venus's

atmosphere contains some 30,000 times as much carbon dioxide as does Earth's. In fact, Earth does hold a quantity of carbon dioxide comparable to that in the Venusian atmosphere. On Earth, however, the carbon dioxide is locked away in carbonate
45 rocks, not in gaseous form in the air. The crucial distinction is responsible for many of the drastic environmental differences that exist between the two planets.

The large *Pioneer Venus* atmospheric probe carried a mass spectrometer and gas chromatograph, devices that measured the
50 exact composition of the atmosphere of Venus. One of the most stunning aspects of the Venusian atmosphere is that it is extremely dry. It possesses only a hundred thousandth as much water as Earth has in its oceans. If all of Venus's water could somehow be condensed onto the surface, it would make a global puddle
55 only a couple of centimeters deep.

Unlike Earth, Venus harbors little if any molecular oxygen in its lower atmosphere. The abundant oxygen in Earth's atmosphere is a by-product of photosynthesis by plants; if not for the activity of living things, Earth's atmosphere also would be
60 oxygen poor. The atmosphere of Venus is far richer than Earth's in sulfur-containing gases, primarily sulfur dioxide. On Earth, rain efficiently removes similar sulfur gases from the atmosphere.

Pioneer Venus revealed other ways in which Venus is more primordial than Earth. Venus's atmosphere contains higher concentrations of inert, or noble, gases—especially neon and isotopes
65 of argon—that have been present since the time the planets were born. This difference suggests that Venus has held on to a far greater fraction of its earliest atmosphere. Much of Earth's primitive atmosphere may have been stripped away and lost into space
70 when our world was struck by a Mars-size body. Many planetary scientists now think the moon formed out of the cloud of debris that resulted from such a gigantic impact.

[Click here](#) to view this content as text.

31. With regard to the possibility of returning to the planet Venus, information presented in the passage makes it clear that the authors are:

- A. cheerful and optimistic.
- B. sarcastic and contentious.
- C. doubtful and pragmatic.
- D. uncertain and withdrawn.

32. Which of the following statements most accurately summarizes how the passage characterizes the state of scientific knowledge about Venus before the *Pioneer* mission?

- F. The scientific community was hesitant to return to Venus after an earlier mission had ended in disaster.
- G. Scientists saw Earth and Venus as near polar opposites in atmospheric conditions.
- H. The common belief that Earth and Venus were “twins” had been eroding under the weight of scientific evidence.
- J. Scientists knew little about the planet Venus because they were more interested in other planets.

33. Based on the passage, Earth may have retained less of its early atmosphere than Venus did due to:

- A. the impact that occurred when Earth was struck by Mars.
- B. a cloud of debris that stripped the atmosphere away.
- C. rain that removes sulfur gases from the atmosphere.
- D. a collision between Earth and another massive object.

34. The main point of the second paragraph (lines 17–27) is to:

- F. account for the failure of the *Magellan* mission and to show the superiority of the *Pioneer* mission.

- G. suggest that information from both the *Magellan* and *Pioneer* missions can bring the scientific community to a deeper understanding of Venus.
- H. show that the *Magellan* had sent back information regarding physical characteristics while the *Pioneer* had not.
- J. hypothesize that the findings of the *Pioneer* mission will help scientists to approach problems more intelligently.

35. The passage indicates that if humans were to attempt to live on the planet Venus, survival would not be possible because:

- A. of the mistaken belief that Venus and Earth are “twin” planets.
- B. carbon dioxide is locked away in bicarbonate rocks, not in gaseous form.
- C. the atmospheric pressure, heat, and air are not suitable for human life.
- D. all of the water on Venus is condensed onto the surface.

36. According to the passage, some evidence gained before the *Pioneer Venus* mission suggesting that Earth and Venus are not near-twins stated that:

- F. Venus produces no lead on or underneath its surface.
- G. Earth was found to be much farther from the sun than was previously thought.
- H. the atmosphere of Venus contains 78 percent nitrogen and 21 percent oxygen.
- J. the surface temperature of Venus is 450 degrees Celsius and thus unlivable for humans.

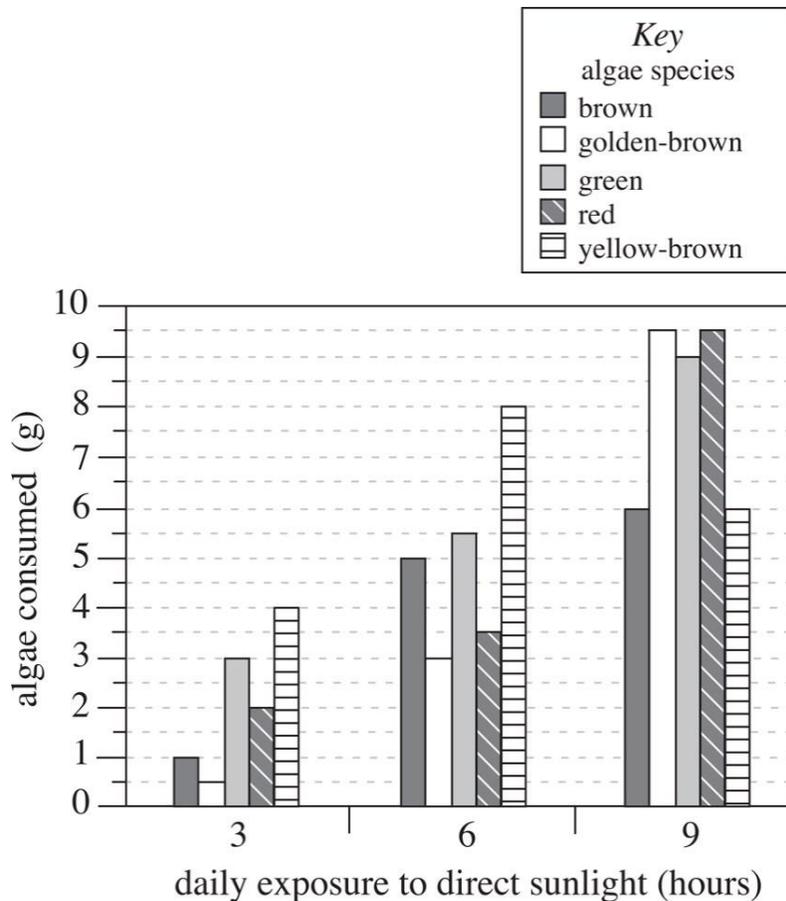
SCIENCE TEST*40 Minutes—40 Questions*

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

The sea snail *Littorina littorea* eats algae as one of its primary food sources. An experiment investigated whether the consumption of algae by *L. littorea* varies with the species of algae or the amount of sunlight exposure of the algae population. Isolated populations of 5 species of algae were introduced to glass tanks containing 1 liter of water and allowed to grow for 30 days. During this time, the populations were exposed to direct sunlight for either 3, 6, or 9 hours each day. The water was filtered out, and the resulting algae samples were allowed to dry completely. Then, 30 grams of each species of algae exposed to 3 hours of sunlight per day were placed in an empty fish tank, 30 grams of each species of algae exposed to 6 hours of sunlight per day were placed into a second tank, and 30 grams of each species of algae exposed to 9 hours of sunlight per day were placed into a third tank. Next, 3 *L. littorea* of similar size, age, and mass were added to each tank. After 2 weeks, the mass of algae consumed, in grams (g), was determined for each species of algae at each length of daily exposure to direct sunlight (see figure).



1. Of the following combinations of species of algae and length of daily direct sunlight exposure, which combination resulted in the greatest mass of algae consumed by *L. littorea* ?

- | <u>algae species</u> | <u>daily sunlight exposure</u> |
|----------------------|--------------------------------|
| A. green | 6 hours |
| B. green | 9 hours |
| C. yellow-brown | 6 hours |
| D. yellow-brown | 9 hours |

2. Which of the following statements about the effect of sunlight exposure of the algae population on the consumption of algae by *L. littorea* is consistent with the figure? As amount of sunlight exposure increased from 3 hours through 9 hours, the mass of algae consumed by *L. littorea*:

- F. increased for all 5 species of algae.
 - G. decreased for all 5 species of algae.
 - H. initially increased for all 5 species of algae, but then decreased for at least 1 of the 5 species of algae.
 - J. initially decreased for all 5 species of algae, but then increased for at least 1 of the 5 species of algae.
- 3.** Based on the passage, would *L. littorea* be classified as an autotroph or a heterotroph?
- A. Heterotroph, because *L. littorea* consumes another organism to obtain its energy.
 - B. Heterotroph, because *L. littorea* produces its own energy from sunlight.
 - C. Autotroph, because *L. littorea* consumes another organism to obtain its energy.
 - D. Autotroph, because *L. littorea* produces its own energy from sunlight.
- 4.** Based on the passage, does the primary food source of *L. littorea* likely contain chlorophyll or hemoglobin?
- F. Hemoglobin; *L. littorea* consumes algae, and algae species use hemoglobin to undergo cellular respiration.
 - G. Hemoglobin; *L. littorea* consumes algae, and algae species use hemoglobin to undergo photosynthesis.
 - H. Chlorophyll; *L. littorea* consumes algae, and algae species use chlorophyll to undergo cellular respiration.
 - J. Chlorophyll; *L. littorea* consumes algae, and algae species use chlorophyll to undergo photosynthesis.
- 5.** Which of the following statements comparing the consumption by *L. littorea* of yellow-brown algae exposed to 3 hours of sunlight per day, yellow-brown algae exposed to 6 hours of sunlight per day, and

yellow-brown algae exposed to 9 hours of sunlight per day is supported by the figure?

- A. Less algae exposed to 3 hours of sunlight per day was consumed than algae exposed to 6 hours of sunlight per day, and less algae exposed to 6 hours of sunlight per day was consumed than algae exposed to 9 hours of sunlight per day.
 - B. Less algae exposed to 3 hours of sunlight per day was consumed than algae exposed to 6 hours of sunlight per day, and more algae exposed to 6 hours of sunlight per day was consumed than algae exposed to 9 hours of sunlight per day.
 - C. More algae exposed to 3 hours of sunlight per day was consumed than algae exposed to 6 hours of sunlight per day, and less algae exposed to 6 hours of sunlight per day was consumed than algae exposed to 9 hours of sunlight per day.
 - D. More algae exposed to 3 hours of sunlight per day was consumed than algae exposed to 6 hours of sunlight per day, and more algae exposed to 6 hours of sunlight per day was consumed than algae exposed to 9 hours of sunlight per day.
- 6.** What mass, in *milligrams* (NOT grams), of the brown algae exposed to 6 hours of sunlight per day was consumed by *L. littorea* ?
- F. 5,000 mg
 - G. 6,500 mg
 - H. 50,000 mg
 - J. 65,000 mg

Passage II

The replication and infectivity of viruses is dependent on their environmental conditions. Viruses can be made harmless by varying these conditions, such as temperature and pH. Acidic solutions have been investigated as surface disinfectants and medications for viral diseases.

Researchers investigated the *acid-mediated inactivation* (the process of being made non-infective through exposure to low pH) of two types of HSV virus, HSV-1 and HSV-2.

Experiment 1

The researchers prepared eight petri dishes of a cell culture at a temperature of 25°C and added 10 µL of a solution containing active HSV-1 virions by pipette. The *virion* is the form of HSV-1 that can persist outside of the host body and infect cells. Then, 200 µL of four different buffer solutions, each at a specific pH, was added to each of the petri dishes. After the addition of the buffer solution, 2 of the petri dishes had a pH of 3.5, 2 had a pH of 4, 2 had a pH of 4.5, and 2 had a pH of 5.

For each pH, one of the petri dishes was left to stand for 1 day and one was left to stand for 1 hour. At the end of the assigned time period, each of the virus samples was added to a fresh cell culture and tested for its *relative infectivity* (the number of cells infected by the sampled virus divided by the number of cells infected by an HSV-1 virus that has not been exposed to acid). The results are shown in Table 1.

Virus type	pH	Relative infectivity	
		1 hour	1 day
HSV-1	3.5	0.00	0.00
	4.0	0.45	0.33

	4.5	0.82	0.81
	5.0	0.97	0.94

Experiment 2

The researchers repeated the procedure of Experiment 1 with a related type of virus, HSV-2, instead of HSV-1. The results are shown in Table 2.

Virus type	pH	Relative infectivity	
		1 hour	1 day
HSV-2	3.5	0.00	0.00
	4.0	0.18	0.07
	4.5	0.64	0.42
	5.0	0.88	0.88

7. Which of the following statements describes a difference between Experiments 1 and 2 ?

- A.** A different type of HSV virus was tested in Experiment 1 than in Experiment 2.
- B.** A different value of pH was used in Experiment 1 than in Experiment 2.
- C.** Viruses in Experiment 1 were inactivated with an acid, while viruses in Experiment 2 were inactivated with a base.
- D.** Viruses in Experiment 1 were left to stand for 1 hour before being added to a fresh culture, while viruses in Experiment 2 were left to stand for 1 day before being added to a fresh culture.

8. Suppose the researchers had determined the relative infectivity of a virus sample exposed to a pH of 4.3 for 1 hour in Experiment 2. The

relative infectivity of the HSV-2 virions in the sample would most likely have been:

- F. 0.00.
- G. between 0.00 and 0.18.
- H. between 0.18 and 0.64.
- J. between 0.64 and 0.88.

9. At which 2 pH values was the relative infectivity of HSV-2 virions less for the longer exposure time than for the shorter exposure time?

- A. 3.5 and 4.0
- B. 3.5 and 4.5
- C. 4.0 and 4.5
- D. 4.5 and 5.0

10. Which of the following questions was NOT addressed by either experiment?

- F. Does pH affect the relative infectivity of HSV-1 and HSV-2 virions after acid-mediated inactivation?
- G. Does time of exposure to acid affect the relative infectivity of HSV-1 and HSV-2 virions after acid-mediated inactivation?
- H. Do HSV-1 virions have a greater relative infectivity than HSV-2 virions after acid-mediated inactivation?
- J. Does the concentration of HSV-1 and HSV-2 virions in solution affect their relative infectivity after acid-mediated inactivation?

11. After one day of exposure to an acidic solution, which of the 4 samples of HSV-2 virions would have been the LEAST likely to infect chicken egg cells in a cell culture after being added to a petri dish containing the cell culture by pipette?

- A. The sample exposed to a pH of 3.5

- B. The sample exposed to a pH of 4.0
- C. The sample exposed to a pH of 4.5
- D. The sample exposed to a pH of 5.0

12. Suppose that a researcher wants to weaken a sample of HSV-1 virions without completely inactivating them. Based on the results of Experiment 1, which of the following combinations of pH and exposure time would most likely ensure the lowest relative infectivity of the virions?

- F. pH 4.0 and 1 hour
- G. pH 4.0 and 1 day
- H. pH 4.5 and 1 hour
- J. pH 4.5 and 1 day

13. Consider the rating system in the table below for the relative infectivity of virions after acid-mediated inactivation.

Rating	Relative infectivity
Fully active	> 0.8
Attenuated	≥ 0.2 and ≤ 0.8
Inactivated	< 0.2

Based on this table, what is the total number of petri dishes in Experiment 1 that contained inactivated virus samples?

- A. 2
- B. 3
- C. 4
- D. 5

Passage III

When an object is hung vertically from the end of a spring, the spring stretches to a point of equilibrium where the upward *spring force* is exactly equal to the downward gravitational force. When a spring is stretched beyond the point of equilibrium, the upward force is greater than the downward force, and the spring bounces back to the equilibrium point.

A group of scientists conducted 2 experiments on spring forces using 3 springs of equal length, diameter, and number of coils made of different combinations of metals—steel, Alloy X, and Alloy Y—having spring constants of 2.5 N/m, 3.0 N/m, and 3.5 N/m, respectively.

Experiment 1

The scientists attached a mass onto the end of the spring made of steel and determined the distance the spring stretched from its initial position to reach the point of equilibrium. They then repeated this procedure with identical masses for springs made of Alloy X and Alloy Y (see Figure 1).

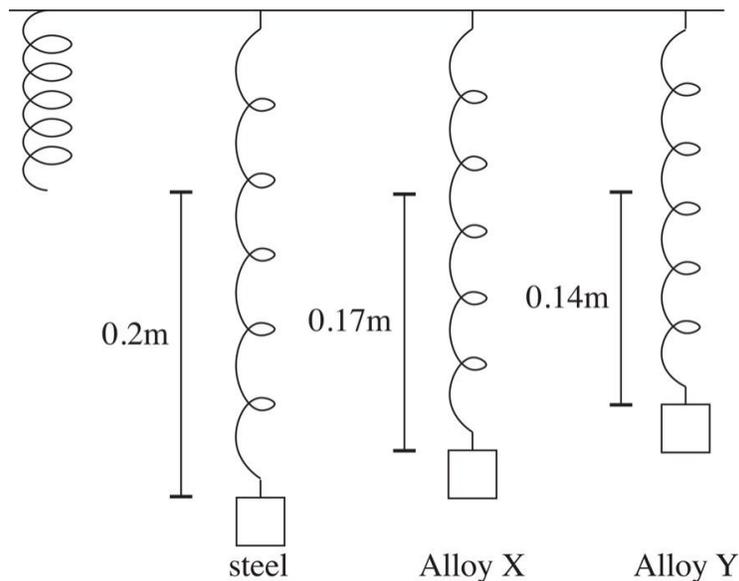


Figure 1

Experiment 2

The scientists positioned a cubic mass—either Mass 1, Mass 2, or Mass 3—on top of each spring and allowed the spring to compress to equilibrium. They measured the distance the spring compressed and recorded it as displacement, D . They then removed the mass and allowed the spring to return to its neutral position (see Figure 2).

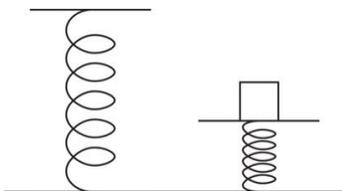


Figure 2

The scientists calculated the spring force exerted by each spring as D multiplied by the spring constant for that spring. They repeated this procedure to test all 3 masses on all 3 springs. Table 1 lists each mass's length, and D , in meters (m), as well as the spring force, in N, exerted by each spring.

Mass	Length (cm)	D (m)	Spring force (N)		
			steel	Alloy X	Alloy Y
1	5.0	0.15	0.38	0.45	0.53
2	10.0	0.15	0.38	0.45	0.53
3	10.0	0.25	0.63	0.75	0.88

- 14.** Based on the results of Experiment 2, as the spring constant of the spring on which Mass 2 was placed decreases, the spring force on Mass 2:

- F. decreases only.
- G. increases only.
- H. increases and then decreases.
- J. varied with no general trend.

15. In Experiment 1, did the spring made of Alloy X or the spring made of Alloy Y experience more strain on its coils?

- A. Alloy X, because the distance the spring stretched was greater for Alloy X than for Alloy Y.
- B. Alloy X, because the distance the spring stretched was greater for Alloy Y than for Alloy X.
- C. Alloy Y, because the distance the spring stretched was greater for Alloy X than for Alloy Y.
- D. Alloy Y, because the distance the spring stretched was greater for Alloy Y than for Alloy X.

16. Suppose the scientists decide to study whether a mass's shape determines the distance the spring of a certain composition stretches. Which of the following procedural changes should the scientists make to Experiment 1? The scientists should test:

- F. a single mass with multiple springs; the springs should each have the same spring constant.
- G. multiple masses with a single spring; the masses should have different shapes but the same mass.
- H. a single mass with multiple springs; the springs should have different spring constants.
- J. multiple masses with a single spring; the masses should have different masses but the same shape.

17. Based on the results of Experiment 2, for Mass 3, what was the difference between the spring force exerted by the spring made of Alloy X and the spring force exerted by the spring made of Alloy Y ?

- A. 0.08 N
- B. 0.13 N
- C. 0.25 N
- D. 0.35 N

18. Suppose that in Experiment 1 the scientists had attached the mass onto the end of a spring with a spring constant of 2.0 N/m. The distance of the stretch would most likely have been:

- F. less than 0.14 m.
- G. between 0.14 m and 0.17 m.
- H. between 0.17 m and 0.20 m.
- J. greater than 0.20 m.

19. Suppose that in Experiment 2 the scientists had tested a mass having the same length as Mass 1 but a smaller displacement than Mass 1. Which of the following statements about the spring force on this mass would be correct? The spring force on this mass from a spring made of:

- A. steel would have been less than 0.38 N.
- B. Alloy X would have been greater than 0.45 N.
- C. Alloy Y would have been greater than 0.53 N.
- D. steel would have been greater than the spring force on this mass from a spring made of Alloy X.

20. Assume that an exercise machine contains two spring hangers to hold counterweights. The first spring on the machine has a spring constant of 15.2 N/m, and the second spring on the machine has a spring constant of 13.1 N/m. Based on the results of Experiment 1, which spring hanger would most likely have the greater distance stretched when a 25 kg mass is hung from it?

- F.** The first spring, because the results of Experiment 1 indicate that distance stretched increases as spring constant increases.
- G.** The first spring, because the results of Experiment 1 indicate that distance stretched increases as spring constant decreases.
- H.** The second spring, because the results of Experiment 1 indicate that distance stretched increases as spring constant increases.
- J.** The second spring, because the results of Experiment 1 indicate that distance stretched increases as spring constant decreases.

Passage IV

Chemical compounds that are *hydrophilic* can dissolve in water. When a hydrophilic liquid is mixed with water, the freezing point of the mixture is different from that of each component.

Ethylene glycol is a hydrophilic liquid that is used in anti-freeze. To determine the effectiveness of different formulations of antifreeze, a product scientist mixed ethylene glycol and water in different proportions and studied the freezing points of the mixtures.

Experiment

For each of 7 batches numbered 1–7, the scientist followed the procedure in Steps 1–5:

1. Known volumes of distilled water, pure ethylene glycol, or both, were combined in a glass flask at 70°F until the total volume of the liquid in the flask equaled 200 mL.
2. The top of the flask was sealed with a cork through which a thermometer was inserted until the thermometer bulb came into contact with the liquid in the flask.
3. The flask was placed into a cold bath containing dry ice and acetone.
4. When solid appeared in the flask and the temperature stopped changing, the thermometer reading, in degrees Fahrenheit, was recorded as the freezing point (*fp*) of the liquid.
5. The *freezing point depression* (Δfp) was determined using the following formula:

$$\Delta fp = fp - 32$$

The results for each batch are shown in Table 1.

Batch number	Water added (% by volume)	Ethylene glycol added (% by volume)	fp (°F)	Δfp (°F)
1	100	0	32	0
2	80	20	19.4	-12.6
3	60	40	-14.8	-46.8
4	50	50	-36.4	-68.4
5	35	65	-61.6	-93.6
6	25	75	-56.2	-88.2
7	0	100	8.6	-23.4

The scientist made a graph of Δfp versus percent by volume of ethylene glycol for each batch and connected the data points with a trendline (see Figure 1).

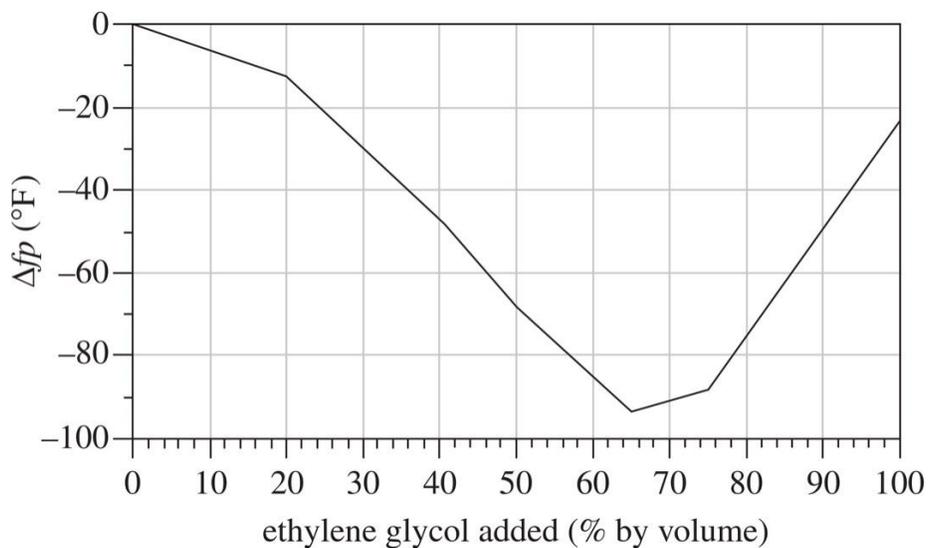


Figure 1

The scientist then identified which batch had the most negative value of Δfp . This batch was identified as the *eutectic mixture*.

- 21.** If a batch had been mixed with 55% water by volume and 45% ethylene glycol by volume, *fp* would most likely have been:
- A. less than -36.4°F .
 - B. between -36.4°F and -14.8°F .
 - C. between -14.8°F and 19.4°F .
 - D. greater than 19.4°F .
- 22.** Before the experiment, the scientist predicted that *fp* for Batch 7 would be greater than the *fp* for Batch 2. Do the results shown in Table 1 support this prediction?
- F. Yes; *fp* for Batch 7 was 8.6°F greater than *fp* for Batch 2.
 - G. Yes; *fp* for Batch 7 was 10.8°F greater than *fp* for Batch 2.
 - H. No; *fp* for Batch 7 was 8.6°F less than *fp* for Batch 2.
 - J. No; *fp* for Batch 7 was 10.8°F less than *fp* for Batch 2.
- 23.** For each batch, the *difference* between *fp* and Δfp was:
- A. 16.0°F .
 - B. 32.0°F .
 - C. 48.0°F .
 - D. 64.0°F .
- 24.** Consider the batch for which the volume of ethylene glycol was 3 times as great as the volume of water. For this batch, *fp* was:
- F. -61.6°F .
 - G. -56.2°F .
 - H. 8.6°F .
 - J. 19.4°F .
- 25.** Suppose a batch had been prepared with 65% water by volume and 35% ethylene glycol by volume. Based on Figure 1, Δfp for this new batch would most likely have been closest to which of the following?

- A. -80°F
- B. -60°F
- C. -40°F
- D. -20°F

26. Which of the following statements best explains why Δfp was 0°F for Batch 1 ? The volume added was 0 mL for one of the components of the:

- F. mixture in the flask, ethylene glycol, so the freezing point was not depressed.
- G. mixture in the flask, water, so the freezing point was not depressed.
- H. cold bath, ethylene glycol, so the freezing point was not depressed.
- J. cold bath, water, so the freezing point was not depressed.

27. Suppose the compound added to the water had been *hydrophobic*. As the hydrophobic compound was added to the water, would the freezing point of the water most likely have decreased or stayed the same?

- A. Decreased, because the compound would have dissolved in water.
- B. Decreased, because the compound would not have been able to mix with water.
- C. Stayed the same, because the compound would have dissolved in water.
- D. Stayed the same, because the compound would not have been able to mix with water.

Passage V

The Earth's oceans contain a mixture of dissolved salts. The *salinity* (concentration of total dissolved salts) of seawater varies by location and affects its physical properties. Figure 1 shows how salt concentration (in percent by mass) affects density, in g/cm^3 , at 20°C for seawater and 3 aqueous solutions of pure salts (NaCl , LiCl , and NH_4Cl).

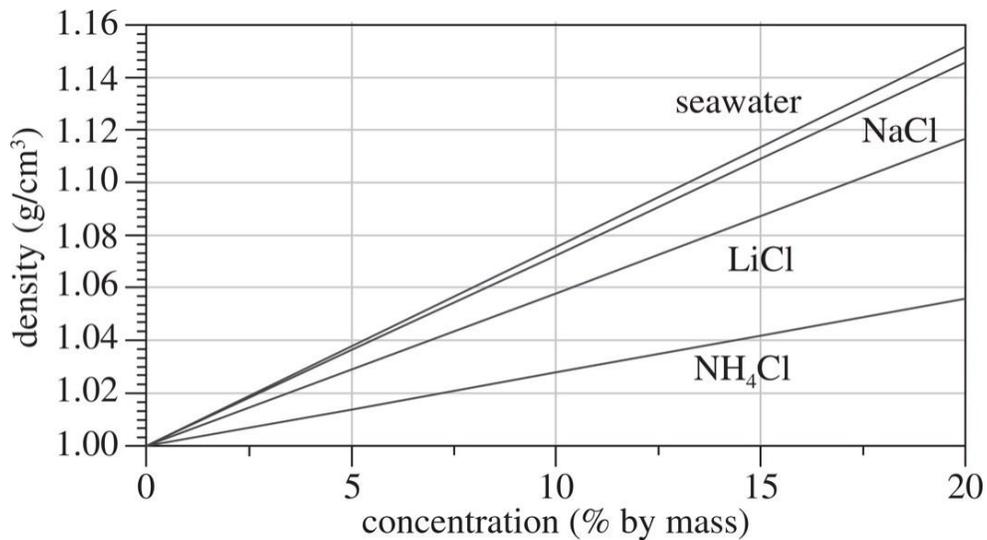


Figure 1

Figure 2 shows how the density of seawater at 0°C varies with ocean depth at 3 different concentrations of dissolved salt.

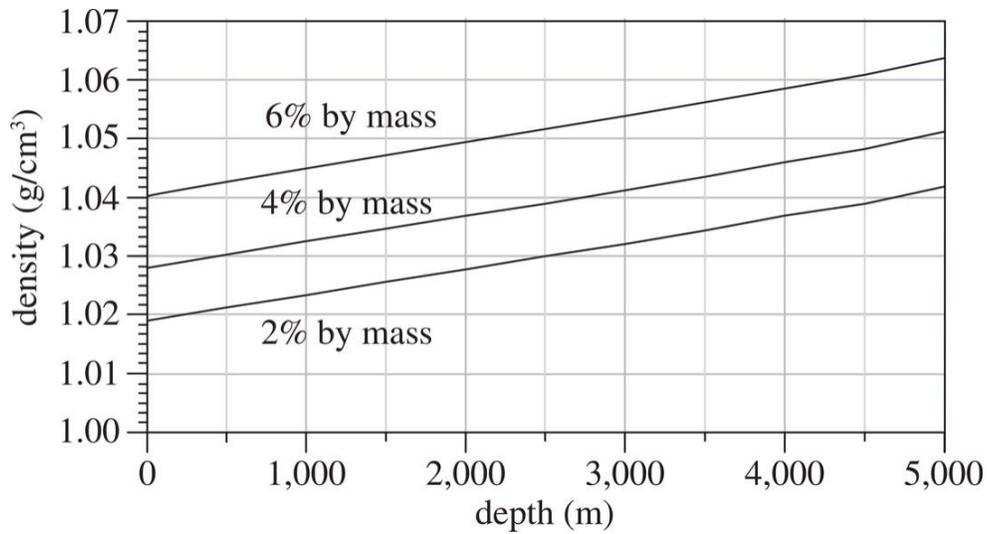


Figure 2

Figure 3 shows how the density of seawater at the surface varies with temperature at 4 different concentrations.

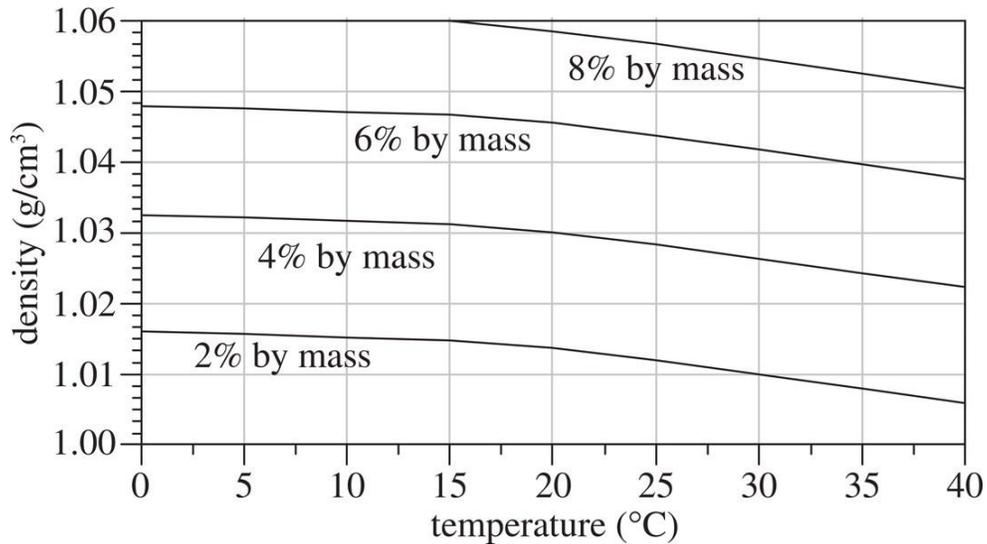


Figure 3

28. According to Figure 2, at 2% by mass of salt, the density of seawater is closest to 1.03 g/cm^3 at which of the following depths?

F. 2,000 m

- G. 2,500 m
- H. 3,000 m
- J. 3,500 m

29. Based on Figure 3, at the surface and at 7% by mass of salt, seawater having a density of 1.045 g/cm^3 would most likely have a temperature that is:

- A. less than 15°C .
- B. between 15°C and 20°C .
- C. between 20°C and 25°C .
- D. greater than 25°C .

30. According to Figure 1, at 20°C , the density of NaCl solution and the density of LiCl solution are closest in value at which of the following pairs of concentrations?

	<u>NaCl</u>	<u>LiCl</u>
F.	2.5% by mass	10% by mass
G.	2.5% by mass	15% by mass
H.	7.5% by mass	10% by mass
J.	7.5% by mass	15% by mass

31. Based on Figure 1, at 20°C and a concentration of 15% by mass, the density of seawater is approximately how much greater than or less than the density of NH_4Cl solution?

- A. 0.07 g/cm^3 greater
- B. 0.10 g/cm^3 greater
- C. 0.07 g/cm^3 less
- D. 0.10 g/cm^3 less

32. According to Figure 1, increasing concentration from 5% by mass to 20% by mass has a *lesser* effect on the density of which solution, LiCl

or NH_4Cl ?

F. LiCl ; the density increases by about 0.04 g/cm^3 .

G. LiCl ; the density increases by about 0.09 g/cm^3 .

H. NH_4Cl ; the density increases by about 0.04 g/cm^3 .

J. NH_4Cl ; the density increases by about 0.09 g/cm^3 .

33. Consider the density of seawater at a depth of 0 m and a salt concentration of 6% by mass, as shown in Figure 2. According to Figure 3, this seawater would have a temperature closest to which of the following?

A. 5°C

B. 15°C

C. 25°C

D. 35°C

Passage VI

A solar eclipse occurs when the Sun, Earth, and Moon are all aligned, and the Moon casts a shadow on the Earth. In a *total eclipse*, the Moon completely covers the Sun's disc, whereas in an *annular eclipse* the Moon obscures all but the outer ring of the Sun. For example, Figure 1 shows how all of the solar eclipses occurring between January 2001 and January 2004 appeared when observed from Earth.

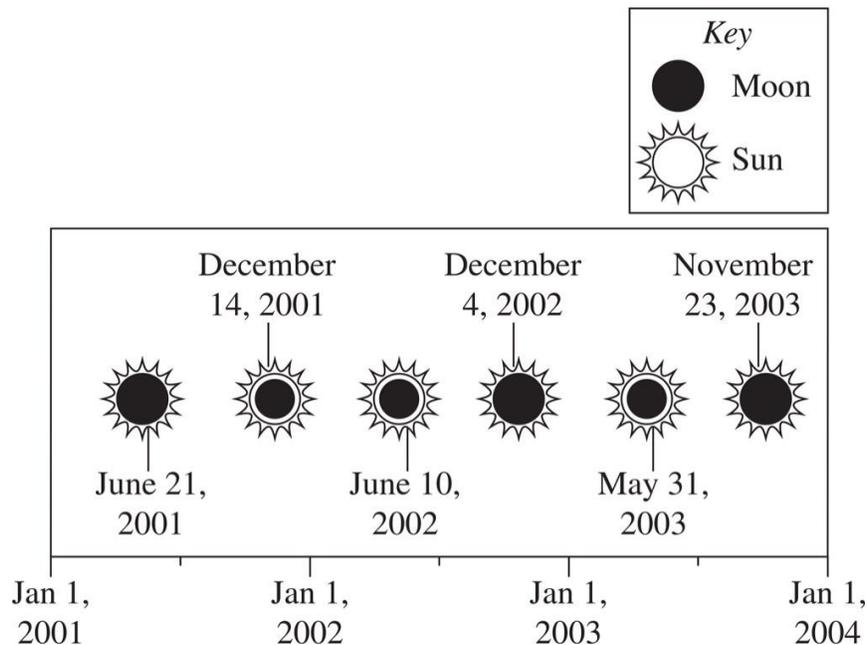


Figure 1

Two theories were presented to explain why solar eclipses sometimes appear as annular rather than total.

Theory 1

The Moon orbits the Earth in a circular path in which the Earth is the center. When the Moon passes between the Sun and Earth, it creates a shadow called an *umbra*, in which the entire Sun is obscured from view. Whether the umbra reaches the Earth or not depends on the size of the Sun, which varies over time due to expansion and contraction. In Figure 2, the

top image shows an eclipse when the Sun is in a period of contraction, and the bottom image shows an eclipse when the Sun is in a period of expansion.

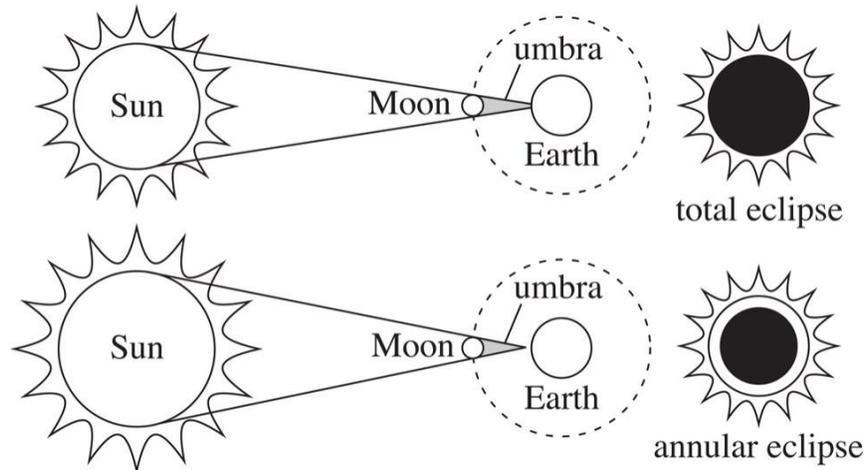


Figure 2

When the Sun is in a period of contraction, the umbra reaches the Earth and a total eclipse is observed. When the Sun is in a period of expansion, the umbra does not quite reach the Earth and an annular eclipse is observed.

Theory 2

The Moon orbits the Earth in an elliptical path in which the Earth is the center. In an elliptical path, the Moon is sometimes located closer to or further away from the Earth depending on where it is in its orbit. As a result, the amount of the Sun obscured by the Moon varies depending on how far the Moon is from the Earth. Figure 3 shows where the Moon was located in its orbit around the Earth during two of the solar eclipses labeled in Figure 1. For each eclipse, the reach of the umbra, the shadow in which the Sun is completely obscured, relative to Earth is shown.

There are 2 rules for when a solar eclipse will be annular:

- An eclipse will be total when the Moon is located in the region of its orbit that is a *smaller* distance from the Earth. The umbra will reach all the way to the Earth's surface, leading to a complete obstruction of light from the Sun.
- An eclipse will be annular when the Moon is located in the region of its orbit that is a *greater* distance from Earth. The umbra will not reach all the way to Earth's surface and the outer ring of the Sun will still be visible from the Earth.

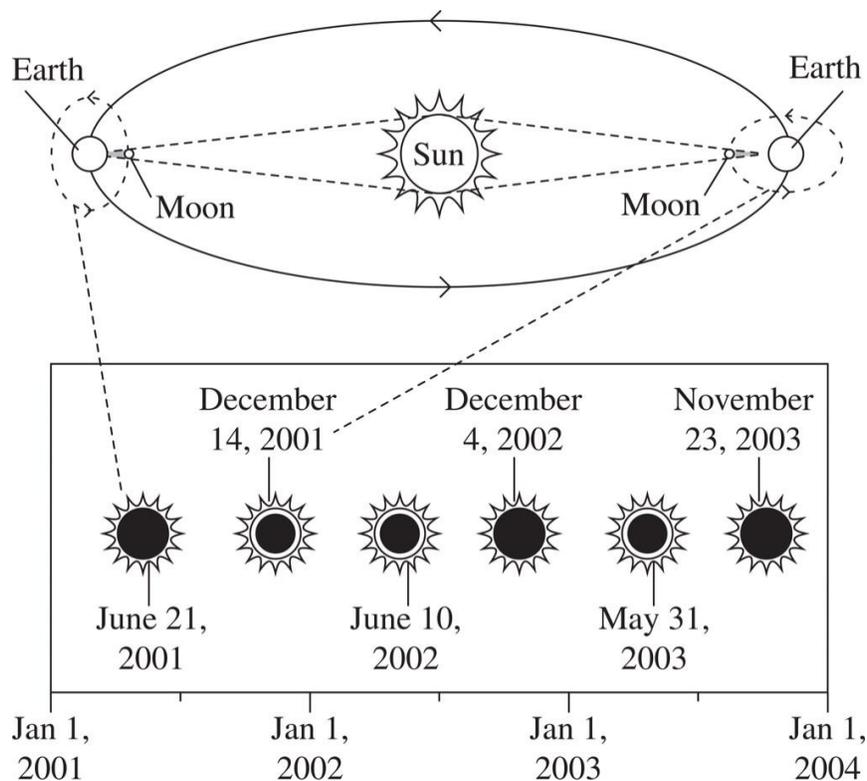


Figure 3

34. Which of the following statements best explains a primary difference between the two theories? Theory 1 states that the Moon follows:

- F.** an elliptical orbit around the Earth, whereas Theory 2 states that the Moon follows a circular orbit around the Earth.

- G.** an elliptical orbit around the Earth, whereas Theory 2 states that the Moon follows a circular orbit around the Sun.
- H.** a circular orbit around the Earth, whereas Theory 2 states that the Moon follows an elliptical orbit around the Earth.
- J.** a circular orbit around the Earth, whereas Theory 2 states that the Moon follows an elliptical orbit around the Sun.

35. Assuming that Figures 2 and 3 are drawn to scale, which of the figures, if either, implies that the distance between the Moon and Earth is constant over time?

- A.** Figure 2 only
- B.** Figure 3 only
- C.** Both Figure 2 and Figure 3
- D.** Neither Figure 2 nor Figure 3

36. Consider the eclipses in 2001 represented in Figures 1 and 3 and also the reason that, according to Theory 2, the amount of the Sun obscured by the Moon varies depending on how far the Moon is from Earth. Is the top portion of Figure 3 consistent with that reason?

- F.** No; the Moon is shown as having a circular orbit and as being located closer to the Earth during some points of its orbit and farther from the Earth during other points of its orbit.
- G.** No; the Moon is shown as having an elliptical orbit and as being located closer to the Earth during some points of its orbit and farther from the Earth during other points of its orbit.
- H.** Yes; the Moon is shown as having a circular orbit and as being located closer to the Earth during some points of its orbit and farther from the Earth during other points of its orbit.
- J.** Yes; the Moon is shown as having an elliptical orbit and as being located closer to the Earth during some points of its orbit and farther from the Earth during other points of its orbit.

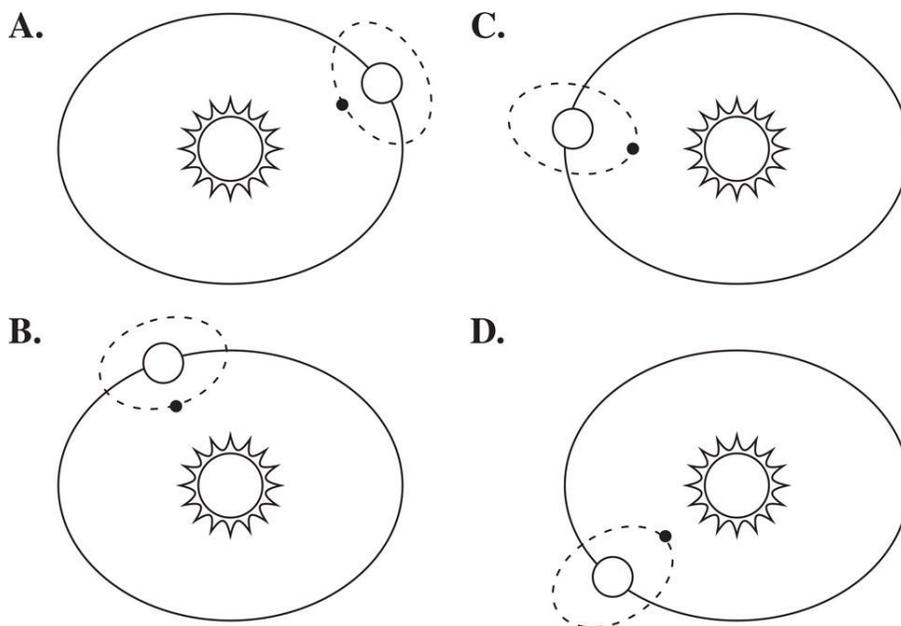
37. Based on Figure 1, after the eclipse in December of 2001, approximately how many days passed before the next annular eclipse?

- A. 60
- B. 90
- C. 180
- D. 360

38. A proponent of Theory 1 and a proponent of Theory 2 would both be likely to agree with which of the following statements? When an annular eclipse is observed from the Earth, the umbra:

- F. is as long as the distance between the Earth and Moon.
- G. is not as long as the distance between the Earth and Moon.
- H. is longer than the umbra during a total eclipse.
- J. is the same size as the umbra during a total eclipse.

39. Based on Figures 1 and 3, if Theory 2 is correct, which of the following figures could represent the positions of the Sun, Moon, and Earth on May 31, 2003 ?



40. Can Theory 2 be used to explain why some ocean tides are stronger than others?

- F.** Yes, Theory 2 accounts for the varying distance between the Earth and the Sun, whose gravitational field is the primary driver of tides.
- G.** Yes, Theory 2 accounts for the varying distance between the Earth and the Moon, whose gravitational field is the primary driver of tides.
- H.** No, Theory 2 does not account for the varying distance between the Earth and the Sun, whose gravitational field is the primary driver of tides.
- J.** No, Theory 2 does not account for the varying distance between the Earth and the Moon, whose gravitational field is the primary driver of tides.

DIRECTIONS

This is a test of your writing skills. You will have forty (40) minutes to write an essay. Before you begin planning and writing your essay, read the writing prompt carefully to understand exactly what you are being asked to do. Your essay will be evaluated on the evidence it provides of your ability to express judgments by taking a position on the issue in the writing prompt; to maintain a focus on the topic throughout your essay; to develop a position by using logical reasoning and by supporting your ideas; to organize ideas in a logical way; and to use language clearly and effectively according to the conventions of standard written English.

You may use the unlined pages in this test booklet to plan your essay. These pages will not be scored. *You must write your essay on the lined pages in the answer folder.* Your writing on those lined pages will be scored. You may not need all the lined pages, but to ensure you have enough room to finish, do NOT skip lines. You may write corrections or additions neatly between the lines of your essay, but do NOT write in the margins of the lined pages. *Illegible essays cannot be scored, so you must write (or print) clearly.*

If you finish before time is called, you may review your work. Lay your pencil down immediately when time is called.

DO NOT OPEN THIS BOOK UNTIL YOU ARE TOLD TO DO SO.

ACT Assessment Writing Test Prompt

Population Growth

Since the Industrial Revolution, the growth rate of Earth's human population has increased dramatically. It took mankind until the 1800s to reach one billion, but only 120 years after that to reach two billion, and less than 40 years after that to reach three billion. We continue to increase our numbers, measuring in at 7.8 billion in 2021. Some express a great deal of concern about this trend, arguing that the increasing population uses more resources than the planet can provide and encourages harmful practices such as deforestation and industrial pollution. Others say that while our population is at higher numbers than ever before and the subsequent problems are very real, the issues are caused less by the actual number of people and more by the unequal distribution of resources.

Read and carefully consider these perspectives. Each suggests a particular way of thinking about human population growth.

Perspective One

Overpopulation is one of the most serious environmental issues humans face. Our increasing numbers are causing myriad problems from loss of fresh water to extinction of species to lowered life expectancy in developing countries.

Perspective Two

The number of people on Earth is not a problem. We have less than 8 billion people, while scientists predict our planet can

support up to 10 billion. The real problem is the unequal distribution of resources. A more equitable use of water, land, food, and fuel would eliminate many of the problems we currently face.

Perspective Three

Though our population numbers are higher than they've ever been, this is not a cause for alarm. Our growth rate is already beginning to slow. As we approach critical mass, that decrease in rate will continue until we're at "replacement" levels of reproduction, allowing the human race to continue without drastically increasing the overall numbers.

Essay Task

Write a unified, coherent essay in which you evaluate multiple perspectives on the issues connected with population growth. In your essay, be sure to:

- analyze and evaluate the perspectives given
- state and develop your own perspective on the issue
- explain the relationship between your perspective and those given

Your perspective may be in full agreement with any of the others, in partial agreement, or wholly different. Whatever the case, support your ideas with logical reasoning and detailed, persuasive examples.

Answers and Explanations

ENGLISH TEST

1. D

Connecting words are changing in the answer choices, so the question is testing consistency. The part before the underlined portion contains the word *associate*. The correct idiom is *associate...with*. Eliminate (A), (B), and (C) because they do not contain the word *with*. The correct answer is (D).

2. F

The phrase surrounding *people of all ages* is changing in the answer choices, so the question could be testing concision. First determine whether the phrase is necessary. The sentence already states *people of all ages*, so there is no need to repeat that idea. Eliminate any choices that are redundant. The phrase *young and old* means the same as *all ages*, so eliminate (G), (H), and (J). The correct answer is (F).

3. C

Note the question! The question asks whether the sentence should be added, so it's testing consistency. If the content of the new sentence is consistent with the ideas surrounding it, then it should be added. The paragraph discusses the widespread appeal of *crocheting* to modern audiences. The new sentence discusses *Irish nuns* who crocheted during the *Great Irish Potato Famine*, so it is not consistent with the ideas in the text; the sentence should not be added. Eliminate (A) and (B). Keep (C) because it states that the new sentence is irrelevant. Eliminate (D) because it doesn't state that the new sentence is inconsistent with the text. The correct answer is (C).

4. F

Vocabulary is changing in the answers, so the question is testing word choice. Determine what meaning of the underlined portion would be consistent with the sentence. The underlined word is part of a phrase that describes *crocheting*, so look for a word that can work in context. Keep (F) because *crocheting* can be *easily taught*. Eliminate (G) because it is not correct to say that crocheting *easily teaches*; this changes the meaning of the sentence. Eliminate (H) and (J) because *taughted* and *teached* are incorrect forms of *taught*. The correct answer is (F).

5. C

Punctuation is changing in the answer choices, so the question is testing STOP and GO punctuation. Use the Vertical Line Test, and identify the ideas as complete or incomplete. Draw the vertical line between the words *stitches* and *picking*. The phrase *Instructional books are readily available, and once you've learned a few basic stitches* is an incomplete idea, and the phrase *picking up the more advanced ones is a snap* is a complete idea. To connect an incomplete idea to a complete idea, GO punctuation is needed. The period and the semicolon are STOP punctuation, so eliminate (A) and (B). The comma is GO punctuation, so keep (C). A lack of punctuation is GO punctuation, but (D) adds an extra word. Adding the word *since* without a punctuation mark makes the sentence incomplete; eliminate (D). The correct answer is (C).

6. H

The length of the phrase is changing in the answer choices, so the question could be testing concision. Determine what parts of the phrase are necessary. Choice (F) says *purchase* and describes the books as *store-bought*. Since both mean the same thing in context, (F) is redundant. Eliminate (F). Likewise, *acquire* and *bought* have the same meaning in context, so eliminate (J). Eliminate (G) because

certain and *specific* mean the same thing in context. Keep (H) because it is the most concise choice. The correct answer is (H).

7. **D**

Pronouns are changing in the answer choices, so the question is testing consistency of pronouns. A pronoun must be consistent in number with the noun it is replacing. The pronoun refers to the noun *projects*, which is plural. To be consistent, the pronoun in the answer choice must also be plural. Eliminate (A), (B), and (C) because none of these contains a plural pronoun. Keep (D) because *their* is plural on the ACT. The correct answer is (D).

8. **F**

Vocabulary is changing in the answers, so the question is testing word choice. Determine what meaning of the underlined portion would be consistent with the sentence. The underlined portion should mean that *fifteen dollars will buy* “at least” *three starter kits*. Keep (F) because *no fewer than* means the same as “at least.” Eliminate (G) and (J) because *then* refers to time, not a comparison of quantities. Eliminate (H) because the word *less* must be used for a quantity that is not countable, but *kits* are countable and therefore should go with the word *fewer*. The correct answer is (F).

9. **A**

Punctuation is changing in the answer choices, so the question is testing STOP and GO punctuation. Use the Vertical Line Test, and identify the ideas as complete or incomplete. Draw the vertical line between the words *types* and *to*. The phrase *As you grow more proficient, you can expand your supplies by purchasing hooks of different types* is a complete idea, and the phrase *to vary the size of your stitches* is an incomplete idea. To connect a complete idea to an

incomplete idea, HALF-STOP or GO punctuation is needed. Keep (A) because a lack of punctuation is GO punctuation. Eliminate (B) because the semicolon is STOP punctuation. A colon is HALF-STOP punctuation, but there is no reason to use a colon here, since the second part of the sentence does not contain a list or an explanation of a concept from the first part. Eliminate (C). A comma is GO punctuation, but there is no reason to use a comma here, so eliminate (D). The correct answer is (A).

10. G

Punctuation is changing in the answer choices, so the question is testing STOP and GO punctuation. Use the Vertical Line Test, and identify the ideas as complete or incomplete. Draw the vertical line between the words *sizes* and *ranging*. The phrase *Crochet hooks are available in all sizes* is a complete idea, and the phrase *ranging from very small to very large, with everything in between* is an incomplete idea. To connect a complete idea to an incomplete idea, HALF-STOP or GO punctuation is needed. A comma is GO punctuation, but there is no reason to use a comma after *ranging*, so eliminate (F). Likewise, eliminate (J) because it also contains an unnecessary comma after *ranging*. Keep (G) because a comma is GO punctuation. Eliminate (H) because a semicolon is STOP punctuation. The correct answer is (G).

11. C

Note the question! The question asks where Sentence 6 should be placed, so it's testing consistency. Look for a clue in the sentence to determine what idea it needs to come before or after. Sentence 6 says, *These hooks make big stitches*. Sentence 6 must come after some mention of a specific type of hook. Sentences 5 and 1 do not mention a specific type of hook, so eliminate (A) and (B). Sentence 3 mentions *big* hooks, so keep (C). Sentence 7 mentions *medium* hooks, so keep

(D). To choose between (C) and (D), consider which sentence is most consistent with Sentence 6. Sentence 6 mentions hooks that make *big stitches*, so Sentence 3, which mentions *big* hooks, is more consistent than Sentence 7, which mentions *medium* hooks. Therefore, Sentence 6 should follow Sentence 3. Eliminate (D). The correct answer is (C).

12. H

Note the question! The question asks which option *provides the most effective transition*. A transition must be consistent with the relationship between the ideas it connects, so look at the two paragraphs to determine how they are related. The preceding paragraph discusses the variety of materials available to people who crochet, and the paragraph beginning with the transition discusses the relatively inexpensive cost of crocheting in relation to its benefits. Eliminate (F) and (G) because neither mentions the relatively low cost of crocheting. Keep (H) because it relates the *materials* discussed in the previous paragraph to the idea that crocheting is an *inexpensive* hobby. Eliminate (J) because who dominates the *field* does not relate to the cost of crocheting. The correct answer is (H).

13. D

Vocabulary is changing in the answers, so the question is testing word choice. Determine what meaning of the underlined portion would be consistent with the sentence. *Also, you have finished a project and you have a cherished keepsake* are both complete ideas. A comma without a FANBOYS word is GO punctuation, so it cannot connect two complete ideas. Eliminate (A). Choice (B) also makes the first part of the sentence complete, so eliminate it. Eliminate (C) because the word *despite* introduces a conflict that isn't consistent with the ideas in the sentence. Keep (D) because *once* makes the first part of the sentence incomplete, allowing it to be followed by the comma, and provides a consistent meaning. The correct answer is (D).

14. **F**

Connecting words are changing in the answer choices, so the question is testing consistency. The part before the underlined portion contains the word *warm*, and the part after the underlined portion contains the words *coldwinter nights*. When describing something that happens on certain days or nights, the correct preposition is *on*. Keep (F) because it contains the word *on*. Eliminate (G), (H), and (J) because they do not contain the word *on*. The correct answer is (F).

15. **C**

Note the question! The question asks whether the essay demonstrates the *commercial potential of crocheting*. Consider the main idea of the passage and use Process of Elimination. The passage is about the personal benefits of adopting crocheting as a hobby. Eliminate (A) and (B) because, though the author did discuss *end products* and *supplies*, these concepts were discussed on a personal, not a commercial, level. Keep (C) because it is true that the author does not mention the *market value of crocheted products*. Eliminate (D) because the author does not compare crocheting to *other industries and hobbies that would be more commercially successful*. The correct answer is (C).

16. **G**

Verbs are changing in the answer choices, so the question is testing consistency of verbs. The answer choices are in different tenses, so look for a clue in the sentence or surrounding sentences to identify the appropriate tense. The beginning of the sentence uses *never thought* to indicate an action that the narrator didn't believe would occur in the future, so the action refers to a possible future action from a point of view in the past. Therefore, the underlined portion needs to be in past tense but also needs to indicate that it was a possible action in the

future. Eliminate (F) because *saw* is past tense, indicating that this action happened in the past. Keep (G) because *would see* is past tense describing an action that may happen in the future. Eliminate (H) because *had seen* indicates an action that has already happened. Eliminate (J) because *was seeing* indicates an action that has already happened. The correct answer is (G).

17. **D**

Vocabulary is changing in the answer choices, so this question is testing word choice. There is also the option to DELETE; consider this choice carefully as it's often the correct answer. The phrase *got my chance to* must be followed by an action. Since no action is provided, there is no need to use the word *to* or the phrase *just to*. Eliminate (A) and (C). The sentence already says *when*, so there is no need to use the phrase *at the moment*. Eliminate (B). The phrase should be deleted to make the sentence more concise. The correct answer is (D).

18. **H**

Pronouns are changing in the answer choices, so the question is testing consistency of pronouns. A pronoun must be consistent in number with the noun it is replacing. The pronoun refers to the noun *painting*, which is singular. To be consistent, the pronoun in the answer choice must also be singular. Eliminate (G) because *our* is plural and refers to people. The *grandeur* belongs to *the painting*, so the pronoun must also be possessive. Eliminate (F) because *it's* is a contraction, not a possessive pronoun. Keep (H) because *its* is singular and possessive. Eliminate (J) because *its'* is an incorrect pronoun. The correct answer is (H).

19. **A**

The phrase surrounding *jumped into the car* is changing, and the underlined portion is part of a list, so the question is testing consistency with lists. All items in a list must be consistent in structure, and all items must be separated by a comma. The unchanging items in the list—*packed our bags* and *jumped into the car*—begin with a simple past tense verb. To be consistent, the third item must also begin with a simple past tense verb. Keep (A) because *headed* is a simple past tense verb. Eliminate (B) because *had headed* is not in the correct tense to be consistent with *packed* and *jumped*. Eliminate (C) because *head* is present tense. Eliminate (D) because *had jumped* is not in the correct tense to be consistent with *packed* and *jumped*. The correct answer is (A).

20. **G**

Note the question! The question asks where a new sentence should be placed, so it's testing consistency. Look for a clue in the sentence to determine what idea it needs to come before or after. The new sentence says *Her name was Lisa*. Therefore, this sentence must come after some introduction of a person. Sentence 3 introduces *someone else who loved the painting*. Therefore, the new sentence should follow Sentence 3. The correct answer is (G).

21. **D**

Punctuation is changing in the answer choices, so the question is testing STOP and GO punctuation. Use the Vertical Line Test, and identify the ideas as complete or incomplete. Draw the vertical line between the words *displayed* and *was*. The phrase *The first thing that struck me as we entered the room where the painting was displayed* is an incomplete idea, and the phrase *was the size of the painting* is an incomplete idea. To connect an incomplete idea to an incomplete idea, GO punctuation is needed. The semicolon is STOP punctuation, so eliminate (A). The colon is HALF-STOP punctuation, so eliminate

(B). The comma is GO punctuation, but there is no reason to use a comma here since the second idea is a continuation of the first, so eliminate (C). A lack of punctuation is GO punctuation, so keep (D). The correct answer is (D).

22. F

The phrase after *task* is changing in the answer choices, so the question could be testing concision. First determine whether the phrase is necessary. The sentence already states, *To create a painting...seemed an almost impossible task*, meaning the task is difficult. There is no need to repeat that idea. Eliminate any choices that are redundant. Choices (G), (H), and (J) each repeat the idea that the task is *difficult*, so eliminate them. The correct answer is (F).

23. A

Note the question! The question asks for the sentence that is *LEAST relevant to the development of this paragraph*, so it's testing consistency. Cross off the word *LEAST*, and mark each answer as Yes/No. The paragraph describes the narrator's reaction when he or she saw *the painting* in person. Sentence 2 discusses *a common size for canvases*. This is not consistent with the paragraph, so mark (A) as No. Sentences 4, 5, and 6 each describe a reaction that the narrator had when seeing the painting, so mark (B), (C), and (D) as Yes. Choice (A) is the odd one out. The correct answer is (A).

24. F

Note the question! The question asks which option *provides the most effective and logical transition from the preceding paragraph to this one*. A transition should be consistent with the relationship between the ideas it connects. The previous paragraph says that the narrator is struck by the *size* of the painting. The paragraph beginning with the

transition phrase discusses the *beauty* of the painting, which the narrator seems even more fascinated by. Keep (F) because *Even more impressive* indicates that the narrator will draw a comparison between the information in the previous paragraph and the information in this paragraph. Eliminate (G) because it does not draw a comparison between the information in the preceding paragraph and the information in this paragraph. Eliminate (H) because the writing of *art critics* is not consistent with either paragraph. Eliminate (J) because neither paragraph indicates that the beauty of the painting is subject to harsh *debate*. The correct answer is (F).

25. C

Note the question! The question asks which alternative *would NOT be acceptable*, so it's testing consistency. Cross off the word *NOT*, and mark each answer as Yes/No. The underlined portion uses an opposite-direction transition word to imply that something changed when the narrator *approached the painting*. Mark (A), (B), and (D) as Yes because each is consistent with the underlined portion. Mark (C) as No because it is not consistent in meaning with the underlined portion: this phrase makes the sentence incomplete. The odd one out is (C). The correct answer is (C).

26. G

Note the question! The question asks what the paragraph would lose if the phrase *from a distance* were deleted. Consider the purpose of the phrase. The sentence containing the phrase compares the appearance of the painting *from a distance* to its appearance *up close*. Therefore, the phrase is part of a contrast. Check the answers and eliminate any choice that is not consistent with this purpose. Eliminate (F) because the phrase does not convey *the author's love of the painting*. Keep (G) because the *contrast* is consistent with the purpose of the phrase. Eliminate (H) because the phrase does not refer to a *road trip*.

Eliminate (J) because the phrase is necessary to the meaning of the statement, and the information it provides is not *stated more clearly elsewhere in the paragraph*. The correct answer is (G).

27. **D**

Pronouns are changing in the answer choices, so the question is testing consistency of pronouns. A pronoun must be consistent in number and case with the noun it is replacing. The pronoun refers to the subject of the sentence—both the narrator and Lisa—which is plural. Additionally, the pronoun must be a first-person pronoun, since the narrator uses it to refer to a memory. To be consistent, the pronoun in the answer choice must also be first-person and plural. Eliminate (A) and (B) because neither *he* nor *one* is first-person or plural. Eliminate (C) because *they* is not first-person. Keep (D) because *we* is first-person and plural. The correct answer is (D).

28. **H**

Note the question! The question asks whether the sentence should be added, so it's testing consistency. If the content of the new sentence is consistent with the ideas surrounding it, then it should be added. The paragraph discusses the narrator's reaction to the *beauty of the painting* with regard to its coloration. The new sentence discusses *other famous paintings* in the *Art Institute of Chicago*, so it is not consistent with the ideas in the text; the sentence should not be added. Eliminate (F) and (G). Keep (H) because it states that the new sentence is irrelevant. Eliminate (J) because it doesn't state that the new sentence is inconsistent with the text. The correct answer is (H).

29. **D**

Punctuation is changing in the answer choices, so the question is testing STOP and GO punctuation. Use the Vertical Line Test, and

identify the ideas as complete or incomplete. Draw the vertical line between the words *sights* and *on*. The phrase *My friend and I saw many other sights* is a complete idea, and the phrase *on our trip to Chicago, but the best part by far was being able to see our favorite work of art* is an incomplete idea. To connect a complete idea to an incomplete idea, HALF-STOP or GO punctuation is needed. The comma is GO punctuation, but no comma is needed here, so eliminate (A). Eliminate (B) because the addition of the word *which* makes the sentence incomplete. Eliminate (C) because a semicolon is STOP punctuation. Keep (D) because a lack of punctuation is GO punctuation. The correct answer is (D).

30. J

Note the question! The question asks where the underlined portion should be placed, so it's testing consistency. Look for a clue in the sentence to determine what idea the underlined portion needs to come before or after. The underlined portion says, *at the museum gift shop*. Therefore, this phrase refers to an event that happened at the gift shop, so it must come after a mention of some event. The narrator's *mind* was not an event at the gift shop, so eliminate (F). The *image* imprinted in the narrator's mind is not an event at the gift shop, so eliminate (G). Eliminate (H) because it makes the sentence incomplete. Keep (J) because it states an event: the narrator *bought* the *souvenir print* at the gift shop. The correct answer is (J).

31. A

Punctuation is changing in the answer choices, so the question is testing STOP and GO punctuation. Use the Vertical Line Test, and identify the ideas as complete or incomplete. Draw the vertical line between the words *developed* and *an*. The phrase *However, cats have developed* is a complete idea, and the phrase *an intricate language not for each other, but for the human beings who have adopted them as*

pets is an incomplete idea. To connect a complete idea to an incomplete idea, HALF-STOP or GO punctuation is needed. A lack of punctuation is GO punctuation, so keep (A). A comma is GO punctuation, but there is no reason to use a comma here, so eliminate (B). A lack of punctuation is GO punctuation, but there is no reason to use a comma after *language*; eliminate (C). A semicolon is STOP punctuation, so eliminate (D). The correct answer is (A).

32. F

Note the question! The question asks which option would *most clearly and effectively express the ownership relationship between humans and cats*. Check each answer choice to see whether it has to do with the *ownership relationship between humans and cats*. Keep (F) because *adopted them as pets* means that humans have ownership of cats. Eliminate (G) because the idea that humans *like* to have cats around doesn't reflect an *ownership relationship*. Eliminate (H) because the idea that humans *often have dogs* does not relate to their ownership relationship with cats. Eliminate (J) because a statement about the natural inclination of humans toward cats does not express an *ownership relationship*. The correct answer is (F).

33. C

The order of the words is changing in the answer choices, so the question is testing consistency with a modifier. The non-underlined portion contains the modifier *When communicating with each other*. The communication is being done by the cats, so the word that directly follows the modifying phrase should be "cats." Eliminate (B) and (D) because neither begins with the word *cats*. Eliminate (A) because, though *cats'* follows the modifying phrase, the phrase incorrectly modifies *cats'* "talk" rather than cats themselves. Keep (C) because the word *cats* directly follows the modifying phrase. The correct answer is (C).

34. F

Verbs are changing in the answer choices, so the question is testing consistency of verbs. The answer choices are in different tenses, so look for a clue in the sentence or surrounding sentences to identify the appropriate tense. The underlined verb refers to the word *tails*, which is plural, so the verb in the underlined portion also needs to be plural to be consistent. Furthermore, the sentence continues a thought expressed in the preceding sentence, which has verbs in the simple present tense, so the underlined verb should be in simple present tense to be consistent. Keep (F) because *provide* is both plural and in simple present tense. Eliminate (G) because *having provided* is not simple present tense. Eliminate (H) because *has provided* is not plural or simple present tense. Eliminate (J) because *were providedby* is not simple present tense. The correct answer is (F).

35. C

Note the question! The question asks what the paragraph would lose if the sentence were deleted. Consider the purpose of the sentence. The paragraph describes nonverbal communication used when cats communicate with each other. The sentence explains the only time when *cats will use their voices* while communicating with *other cats*. This is an exception to the earlier idea that cats communicate with each other through nonverbal signals. Check the answers and eliminate any choice that is not consistent with this purpose. Eliminate (A) because the idea that cats use their voices with other cats is not mentioned elsewhere. Eliminate (B) because the sentence mentions verbal, not nonverbal, communication. Keep (C) because the *exception to the general trend* is consistent with the purpose of the sentence. Eliminate (D) because the sentence doesn't provide a *summary of the information*. The correct answer is (C).

36. J

Transitions are changing in the answer choices, so the question is testing consistency with transitions. Note that each choice also contains the option to either begin a new paragraph or continue the previous paragraph. A new paragraph should be started when a new idea is discussed. Look at the previous sentence to determine how the two ideas are related; then determine whether the information that follows is consistent with the preceding paragraph. The sentences prior to the underlined portion discuss how cats communicate with one another, and the sentences after the underlined portion discuss how cats communicate with humans. Since these ideas are different, they should not be part of the same paragraph. Eliminate (G). *Next* implies a series. Since there is no series in the paragraph, there is no need to use *Next*. Eliminate (F) and (H). The correct answer is (J).

37. C

Apostrophes are changing in the answer choices, so the question is testing apostrophe usage. When used with a noun on the ACT, the apostrophe indicates possession. In this sentence, the *cats* are possessing the *verbal expressions*. Therefore, the apostrophe is needed, and because *cats* is plural, the apostrophe should be placed after the *s*. Eliminate (A) and (D) because neither contains the apostrophe. Eliminate (B) because the apostrophe is before the *s*, which indicates a singular noun. Keep (C) because the apostrophe is after the *s*. The correct answer is (C).

38. J

The phrase after *logical* is changing in the answer choices, so the question could be testing concision. First determine whether the phrase is necessary. The sentence already uses the word *logical*, so there is no need to repeat that idea. Eliminate any choices that are redundant. Eliminate (F) and (G) because *reasonable* and *well-reasoned* both have the same meaning as *logical*. Eliminate (H)

because adding *to a startling degree* is not necessary to the main idea and does not change the meaning of the sentence; (J) is more concise. The correct answer is (J).

39. **D**

Vocabulary is changing in the answer choices, so this question is testing word choice. The underlined phrase is explaining how the fact was *demonstrated*; therefore, the underlined portion needs an adverb to describe how the fact is *demonstrated*. Eliminate (A) and (B) because *clear* is an adjective (a word describing a noun) rather than an adverb (a word describing a verb). To choose between (C) and (D), consider the meaning of the sentence with each choice. The word *since* implies that the *fact is demonstrated* more clearly now that *households with only one cat* have been observed. The word *when* implies that the fact is demonstrated more clearly whenever *households with only one cat* are observed. Since the paragraph suggests that the *fact* may still be demonstrated, eliminate (C). The correct answer is (D).

40. **J**

Note the question! The question asks whether the sentence should be added, so it's testing consistency. If the content of the new sentence is consistent with the ideas surrounding it, then it should be added. The paragraph discusses the differences in communication between cats *in households that have only one cat* and *cats with other feline companions*. The new sentence discusses communication in *birds*, so it is not consistent with the ideas in the text; the sentence should not be added. Eliminate (F) and (G). Eliminate (H) because it doesn't repeat information given earlier in the essay. Keep (J) because it states that the new sentence *does not contribute to the development of the paragraph and the essay as a whole*. The correct answer is (J).

41. A

Commas are changing in the answer choices, so the question is testing comma rules. The phrase *to name just a few examples* is unnecessary information, so it needs a comma before and after. There is already a comma after the phrase, so eliminate choices that do not have a comma before the phrase. Keep (A) because it has a comma before the phrase. Eliminate (B) because, though it has a comma before the phrase, there is no reason to have a comma after *to*. Eliminate (C) and (D) because each lacks a comma before the phrase. The correct answer is (A).

42. G

Note the question! The question asks which option would emphasize that *cats communicate vocally with their owners to express a large number of different emotions*. Check each answer choice to see whether it has to do with *cats* communicating *different emotions* with their *owners*. Eliminate (F) because this choice compares *cats* to other *animals*. Keep (G) because it states that *cats will tell their owners* when they feel a variety of emotions. Eliminate (H) because it expresses how cats communicate with *other cats*, not with their owners. Eliminate (J) because it discusses *humans*, not cats. The correct answer is (G).

43. C

Connecting words and verbs are changing in the answer choices, so the question is testing consistency. The part before the underlined portion contains the phrase *every bit as important*, which implies a comparison between two items. The two items being compared must have the same structure. The non-underlined item is *forging good relationships*, so the underlined item must be consistent with this structure. Eliminate (A) because *communicate* isn't in the correct form

to be consistent with *forging*. Eliminate (B) because it adds the word *being*, which is not consistent with *forging*. Since the sentence is making a comparison, the correct phrasing is *every bit as important... as* because of the *as...as* idiom. Eliminate (D) because it does not include the word *as*. The correct answer is (C).

44. **G**

The phrase after *making senseless noises* is changing in the answer choices, so the question could be testing concision. First determine whether the phrase is necessary. The sentence already states *senseless*, so there is no need to repeat that idea. Eliminate any choices that are redundant. Choices (F), (H), and (J) each repeat the idea that the noises are *senseless*, or made without thought and reason, so eliminate them. The correct answer is (G).

45. **B**

Note the question! The question asks which option would *summarize the main point the essay makes about cats' communication with their human owners*. The essay suggests that cats make noises for specific reasons, and that each time they communicate with their human owners, it's to convey something. Check each answer choice to see whether it is consistent with this idea. Eliminate (A) because this choice compares *cats* to *other animals*. Keep (B) because it states that cats will communicate with their owners when they want to express *something*. Eliminate (C) because it expresses how cats communicate with *other cats*, not with their owners. Eliminate (D) because it discusses a benefit of having *more than one cat*. The correct answer is (B).

46. **J**

Phrase length is changing in the answer choices, so this question is testing concision. The sentence already uses the phrase *in time*, so there's no need to include another reference to time. Eliminate (F), (G), and (H) because each of these mentions the *past*, which is redundant with the idea of stepping or moving back in time. Keep (J) because it is the most concise. The correct answer is (J).

47. C

Apostrophes are changing in the answer choices, so the question is testing apostrophe usage. When used with a noun on the ACT, the apostrophe indicates possession. In this sentence, nothing belongs to the *houses*. Therefore, no apostrophe is needed, so eliminate (A) and (B). To choose between (C) and (D), consider the function of the comma. The word *houses* is part of a list with two items—*Victorian houses* and *a fort*. A comma should be used only in a list with three or more items, so no comma is needed. Eliminate (D). The correct answer is (C).

48. F

The phrase before *to* is changing in the answer choices, so the question could be testing concision. First determine whether the phrase is necessary. The sentence already states *get to*, and it is implied that *you* are the person traveling, so there is no need to repeat that idea. Eliminate any choices that are redundant. Choices (G) and (H) repeat the idea that *you* will *get* to the island, so eliminate them. Choice (J) adds the unnecessary word *over*. Keep (F) because it is the most concise. The correct answer is (F).

49. C

Commas are changing in the answer choices, so the question is testing comma rules. The word *Michigan* is necessary information, so it does

not need a comma before and after. Eliminate (A) and (D) because each contains a comma before and after the word. To choose between the remaining choices, consider the difference between them: (C) contains a comma and (B) does not. Since a comma with a FANBOYS word is STOP punctuation and a lack of punctuation is GO punctuation, use the Vertical Line Test. Draw vertical lines after the word *island* and before the word *visitors*, and identify the ideas as complete or incomplete. The phrase *Automobiles are outlawed on the little, isolated Michigan island* is a complete idea, and the phrase *visitors can see the sights only by horse, carriage, bicycle, or on foot* is a complete idea. To connect a complete idea to a complete idea, STOP or HALF-STOP punctuation is needed. Eliminate (B) because a lack of punctuation is GO punctuation. Keep (C) because a comma with a FANBOYS word is STOP punctuation. The correct answer is (C).

50. J

The phrase before *bicycle* is changing in the answer choices, so the question could be testing concision. However, the underlined portion is also part of a list, so the question is also testing consistency. All items in a list must be consistent, so the underlined item must be consistent with the non-underlined items in the list—*horse, carriage,* and *foot*. Eliminate (F) and (H) because each of these includes a verb, *riding*; none of the other items in the list uses a verb. Eliminate (G) because none of the other items in the list repeats the word *by*. Keep (J) because it is consistent with the other items in the list. The correct answer is (J).

MATHEMATICS TEST

1. **A.** The midpoint formula is: $(x_1 + x_2)/2$ for the coordinate. Calculate: $(-15 + (-11))/2 = -26/2 = -13$.
2. **H.** This is a right triangle with hypotenuse $CD = 10$ and one leg $CE = 8$. Using the Pythagorean theorem: $a^2 + b^2 = c^2$. So $8^2 + DE^2 = 10^2$. Calculate: $64 + DE^2 = 100$. Subtract 64: $DE^2 = 36$. Take the square root: $DE = 6$.
3. **C.** "50 more than double the volume" translates to: Start with volume V , double it ($2V$), then add 50. This gives: $N \approx 2V + 50$.
4. **J.** Total books = 5 fiction + 7 nonfiction = 12 books. Probability = (number of favorable outcomes)/(total outcomes) = $5/12$. Answer: **5/12**.
5. **C.** Average = sum of all scores \div number of scores. Sum = $108 + 81 + 79 + 99 + 85 + 82 = 534$. Average = $534 \div 6 = 89$.
6. **J.** When parallel lines are cut by a transversal, corresponding angles are congruent (located in the same relative position at each intersection). Looking at the diagram, $\angle 2$ and $\angle 5$ are corresponding angles—both are in the same position relative to their intersection point. They must be **congruent**.
7. **A.** If Gregor deposits 80% of his paycheck (since he spends 20%), and \$3,200 represents 80%, then: $0.80 \times (\text{total pay}) = \$3,200$. Divide both sides by 0.80: Total pay = $\$3,200 \div 0.80 = \$4,000$.
8. **J.** Similar figures have the same shape but not necessarily the same size. The key property is that their **corresponding angles are congruent**, while sides are proportional (not necessarily equal). Areas and perimeters differ unless the figures are also congruent.
9. **D.** First discount: 30% off \$60 means she pays 70% of \$60 = $0.70 \times \$60 = \42 . Second discount: 10% off \$42 means she pays 90% of \$42 = $0.90 \times \$42 = \37.80 .
10. **J.** Initially, Erin has 3 more chips than Amy. When Erin wins 4 chips from Amy: Erin gains 4 chips (+4) and Amy loses 4 chips (-4). The difference changes by $4 + 4 = 8$. New difference: $3 + 8 = 11$ more chips.
11. **C.** Substitute $y = 4$: $|1 - 4| = |-3| = 3$. The absolute value of a negative number is its positive counterpart.
12. **J.** Use the distributive property (FOIL): $(3a + 2b)(a - b^2) = 3a(a) + 3a(-b^2) + 2b(a) + 2b(-b^2) = 3a^2 - 3ab^2 + 2ab - 2b^3$. Answer: **$3a^2 - 3ab^2 + 2ab - 2b^3$** .
13. **D.** Distribute the -2: $3 - 2(4 - y) = 3 - 8 + 2y = -5 + 2y = 2y - 5$.
14. **G.** When raising a power to a power, multiply the exponents: $(y^3)^8 = y^{(3 \times 8)} = y^{24}$.

15. B. To find what day the 260th day is, divide 260 by 7 (days in a week): $260 \div 7 = 37$ remainder 1. This means 37 complete weeks plus 1 extra day. Starting from Monday, one day later is **Tuesday**.

16. H. If the square has area 64, then its side length = $\sqrt{64} = 8$. The largest circle that fits inside has a diameter equal to the side of the square = 8, so radius = 4. Area of circle = $\pi r^2 = \pi(4)^2 = 16\pi$.

17. A. For a quadratic equation $ax^2 + bx + c = 0$, the product of the roots equals c/a . For $x^2 - 5x - 14 = 0$, $a = 1$ and $c = -14$. Product of roots = $-14/1 = -14$. (You can verify: the equation factors as $(x - 7)(x + 2) = 0$, giving roots 7 and -2 , whose product is -14 .)

18. F. Factor $x^{12} - 9$ as a difference of squares: $x^{12} - 9 = (x^6)^2 - 3^2 = (x^6 + 3)(x^6 - 3)$. Continue factoring $x^6 - 3$: $x^6 - 3 = (x^3)^2 - (\sqrt{3})^2 = (x^3 + \sqrt{3})(x^3 - \sqrt{3})$. Further factoring gives $(x - \sqrt{3})$ and other factors. However, $x^6 + 3$ cannot be factored using real numbers since it's a sum (not a difference) and has no real roots.

19. C. Substitute $x = 1/6$: $(2x + 4)/(3x) = (2(1/6) + 4)/(3(1/6)) = (1/3 + 4)/(1/2) = (1/3 + 12/3)/(1/2) = (13/3)/(1/2) = (13/3) \times (2/1) = 26/3$.

20. H. Time = Distance \div Speed = 60 miles \div 90 mph = $2/3$ hour. Convert to minutes: $(2/3) \times 60 = 40$ minutes.

21. C. To find the area, we need the height of the trapezoid. Draw perpendiculars from the ends of the top base to the bottom base. Each creates a right triangle with hypotenuse $3\sqrt{2}$ inches and base $(11 - 5)/2 = 3$ inches. Using the Pythagorean theorem: $3^2 + h^2 = (3\sqrt{2})^2$, so $9 + h^2 = 18$, $h^2 = 9$, $h = 3$. Area = $(1/2)h(b_1 + b_2) = (1/2)(3)(5 + 11) = (1/2)(3)(16) = 24$ square inches.

22. F. If $x = -2/3$ is a root, then $3x + 2 = 0$ is a factor. If $x = 1/4$ is a root, then $4x - 1 = 0$ is a factor. Therefore, the factors are **$(3x + 2)$ and $(4x - 1)$** .

23. C. In a rhombus, the diagonals bisect each other at right angles. This creates four right triangles, each with legs of length $AC/2 = 3$ and $BD/2 = 4$. The hypotenuse of each triangle is a side of the rhombus. Using the Pythagorean theorem: $side^2 = 3^2 + 4^2 = 9 + 16 = 25$. Therefore, side = **5**.

24. G. Let length = l and width = $l - 2$. Area: $l(l - 2) = 80$. Expand: $l^2 - 2l = 80$. Rearrange: $l^2 - 2l - 80 = 0$. Factor: $(l - 10)(l + 8) = 0$. Solutions: $l = 10$ or $l = -8$. Since length must be positive, $l = 10$ feet.

25. D. Slope = $(y_2 - y_1)/(x_2 - x_1) = (10 - (-5))/(5 - 1) = 15/4 = 15/4$.

26. G. The standard form of a circle is $(x - h)^2 + (y - k)^2 = r^2$, where (h, k) is the center. For $(x + 5)^2 + (y - 5)^2 = 5$, rewrite as $(x - (-5))^2 + (y - 5)^2 = 5$. The center is **$(-5, 5)$** .

27. D. Looking at the graph, the function is defined from $x = 0$ to $x = 4$ (not including the endpoints, based on the open circles). The domain is **$\{x: 0 < x < 4\}$** .

28. F. Midpoint formula: $((x_1 + x_2)/2, (y_1 + y_2)/2) = ((-1 + 3)/2, (-5 + 3)/2) = (2/2, -2/2) = (1, -1)$.

29. A. Temperature increases during two periods: (1) From time 5 to 10, temperature goes from 40°C to $60^\circ\text{C} = 20^\circ\text{C}$ increase in 5 minutes = $4^\circ\text{C}/\text{min}$. (2) From time 10 to 17.5, temperature goes from 60°C to $80^\circ\text{C} = 20^\circ\text{C}$ increase in 7.5 minutes $\approx 2.67^\circ\text{C}/\text{min}$. The average rate during the first increasing period is the greatest at **$4^\circ\text{C per minute}$** .

30. H. Using exponent rules: $a^x/a^y = a^{(x-y)}$. If $a^{(x-y)} = a^5$, then the exponents must be equal: $x - y = 5$.

31. D. Rearrange to slope-intercept form: $8 = 3y - 5x$. Add $5x$: $3y = 5x + 8$. Divide by 3: $y = (5/3)x + 8/3$. The slope is **5/3**.

32. J. Find the LCD by taking the highest power of each prime factor that appears: 3^2 (from 3^2 and 3), 5^2 (from 5 and 5^2), 7 (from 7), and 11^3 (from 11 and 11^3). LCD = $3^2 \times 5^2 \times 7 \times 11^3$.

33. C. Notice the pattern: $(1 \times 2 \times 3 \times 4 \times 5 \times 6 \times 7) / (4 \times 5 \times 6 \times 7 \times 8 \times 9 \times 10)$. Many terms cancel: = $(1 \times 2 \times 3) / (8 \times 9 \times 10) = 6/720 = 1/120 = \mathbf{1/120}$.

34. J. This forms a right triangle with legs 110 miles (south) and 200 miles (east). Using the Pythagorean theorem: $\text{distance}^2 = 110^2 + 200^2 = 12,100 + 40,000 = 52,100$. Distance = $\sqrt{52,100}$ miles.

35. D. Each side of the first pentagon can intersect with each side of the second pentagon at most twice (once entering, once leaving, but typically once). With 5 sides on each pentagon, the maximum number of intersection points is 2 per side \times 5 sides = **10 points**.

36. J. This is a permutation problem. First person: 10 choices. Second person: 9 choices (one person already assigned). Third person: 8 choices. Total: $10 \times 9 \times 8 = \mathbf{720 \text{ ways}}$.

37. D. For $\angle PQR$ to be a right angle, we need $QR \perp QP$. The slope of $QP = (2 - 4)/(6 - 1) = -2/5$. A perpendicular line has slope that is the negative reciprocal = $5/2$. From $Q(1, 4)$, using slope $5/2$: $y - 4 = (5/2)(x - 1)$. Test $(3, 9)$: $9 - 4 = 5$ and $(5/2)(3 - 1) = 5$. \checkmark Answer: **(3, 9)**.

38. J. Expand: $y = 25 - 0.25y$. Add $0.25y$ to both sides: $1.25y = 25$. Divide by 1.25: $y = \mathbf{20}$.

39. B. Solve: $4\cos^2x = 1$, so $\cos^2x = 1/4$, $\cos x = \pm 1/2$. For $0^\circ \leq x \leq 180^\circ$, $\cos x = 1/2$ gives $x = \mathbf{60^\circ}$ ($\cos x = -1/2$ gives $x = 120^\circ$, but that's not an option; the question must be asking for the acute angle).

40. H. Room area = $16 \times 18 = 288$ sq ft. Rug area = $\pi r^2 = \pi(6)^2 = 36\pi \approx 113$ sq ft. Bare floor area = $288 - 113 = \mathbf{175 \text{ sq ft}}$.

41. A. Calculate the average rate of change (slope) for each interval:

- A: $(28 - 52)/(2 - 0) = -24/2 = -12$
- B: $(7 - 28)/(5 - 2) = -21/3 = -7$
- C: $(12 - 7)/(10 - 5) = 5/5 = 1$
- D: $(39 - 12)/(13 - 10) = 27/3 = 9$

The greatest rate of change (in absolute value) is **interval A** with $|-12| = 12$.

42. F. The distance from the origin to $(2\sqrt{3}, 2)$ is: $r = \sqrt{[(2\sqrt{3})^2 + 2^2]} = \sqrt{(12 + 4)} = \sqrt{16} = 4$. $\sin \theta = \text{opposite/hypotenuse} = 2/4 = \mathbf{1/2}$.

43. C. $R = \log(A/A_0) = \log(3000)$. Using a calculator or estimation: $\log(3000) \approx \log(10^3) = 3$ to $\log(10^4) = 4$. More precisely, $\log(3000) \approx \mathbf{3.5}$ (since $10^{3.5} \approx 3162$).

44. F. For mn to be even, at least one of m or n must be even. It's easier to find $P(\text{both odd})$. In Set P , odd numbers are $\{3, 5\} = 2$ out of 4. In Set Q , odd numbers are $\{1, 3\} = 2$ out of 4. $P(\text{both odd}) = (2/4)(2/4) = 1/4$. $P(\text{at least one even}) = 1 - 1/4 = \mathbf{3/4}$.

45. B. Solve $|2z - 3| \geq 7$ by considering both cases: Case 1: $2z - 3 \geq 7$, so $2z \geq 10$, $z \geq 5$ Case 2: $2z - 3 \leq -7$, so $2z \leq -4$, $z \leq -2$ Solution: $\mathbf{z \leq -2 \text{ or } z \geq 5}$.

READING TEST

1. C

This reasoning question asks about the *shift in the passage* found in the last paragraph of Passage A. Because this is a general question, it should be done after all the specific questions. Look for the Golden Thread. Once you identify the Golden Thread, read the last paragraph. While the majority of the passage describes watching Jackie Robinson *making his major league debut* as the first African American to play in Major League Baseball, the last paragraph finds the narrator apologizing for his actions and starting to understand that his expectations had been unrealistic. Eliminate answers that don't match this answer from the passage. Eliminate (A), as the passage begins with the end of segregation in baseball. Eliminate (B), as while the narrator does blame his outburst on his fever, he admits it's only *partly true*. Choice (C) matches the answer from the passage, so keep it. While the narrator's grandfather's *anticipation* is mentioned early in the passage, *anger* doesn't fit the grandfather's tone in the last paragraph, so eliminate (D). The correct answer is (C).

2. F

This reasoning question asks what the narrator's ultimate opinion was of *Jackie Robinson*. Look for the lead words *Jackie Robinson* to find the window for the question in Passage A. In the second paragraph, the narrator describes Robinson as a *gentleman, never losing his cool*. Additionally, he mentions that he is *proud that Robinson is playing*.

Eliminate answers that don't match this answer from the passage. Choice (F) matches the answer from the passage, so keep it. Choice (G) is mentioned in the passage, but it answers the wrong question: while the narrator initially thinks Robinson is *capable of doing the impossible*, the question asks how he *ultimately* sees Robinson; eliminate (G). While the narrator is at one point disappointed in a play by Robinson, he learns that *what matters is how he plays the whole game*, so eliminate (H). Eliminate (J) because the passage describes the narrator and his grandfather as *excited and tense*, but the question asks about *Robinson*. The correct answer is (F).

3. A

This reasoning question asks what the passage suggests about why the narrator's grandfather is *annoyed* when the narrator groans. Look for the lead word *groan* to find the window for the question in Passage A. In lines 27–28, the narrator lets out a *loud groan* when another player gets Robinson out. In lines 31–36, the narrator apologizes to his grandfather, who tells him that Robinson *needs our support*. Eliminate answers that don't match this answer from the passage. Choice (A) states that the narrator's grandfather believes the narrator *shouldn't have criticized Robinson*, which is consistent with the text. The text contradicts (B), so eliminate it. There is no indication that the grandfather is concerned with his ability to concentrate on the game, so eliminate (C). Choice (D) doesn't reflect the grandfather's response to the narrator's apology, so eliminate it. The correct answer is (A).

4. G

This reasoning question asks for the purpose of the *narrator's statement* in lines 46–48. Although this question includes a line reference, it asks about the purpose of the statement in relationship to the passage as a whole; it is a general question and should be done after all of the specific questions about Passage B. Look for the

Golden Thread. In Passage B, the narrator notes a change in how he felt about progress toward racial equality: he felt excited and hopeful at the game, but disappointed by the slow pace of change outside the stadium. This question asks about the narrator's description of how he felt *inside the stadium*. He says, *I felt I was in some utopian society that existed without segregation and racism*. Eliminate answers that don't match this answer from the passage. Eliminate (F) because the narrator is describing the feelings he has about the significance of the event; it is not a literal description of how people were interacting in the stadium. Choice (G) matches the answer from the passage, so keep it. Choice (H) uses words from the passage but doesn't match what the passage says; while the narrator believed that Jackie Robinson playing in the major leagues would change the world, the rest of the passage shows that society was not free from *segregation and racism*. Eliminate (H). Eliminate (J) as the statement in the window is largely positive and does not reflect the negative feelings of the narrator 21 years later. The correct answer is (G).

5. **B**

This referral question asks how the *narrator's expectations about how Jackie Robinson's appearance in Major League Baseball would affect segregation* compared to its *actual effect*, based on Passage B.

Because this is a general question, it should be done after all the specific questions. Look for the Golden Thread. In lines 52–58, the narrator recounts, *My friends and I were flying high as we left the stadium. If a black man was now playing for the Brooklyn Dodgers, we felt there was nothing we couldn't do... Change, we thought, was rapidly coming. To some extent that was true, but racism and injustice also persisted*. In lines 67–70, as he recounts the death of Martin Luther King, Jr., the narrator describes his earlier sentiments as *hopelessly naïve*. This indicates that the effect of Robinson's playing in the Major Leagues was different than anticipated, so eliminate (C)

and (D). Eliminate (A) as the size of the *crowd* is not related to the effect on segregation. Choice (B) aligns closely with the narrator's statement: *Change, we thought, was rapidly coming*. The correct answer is (B).

6. H

This reasoning question asks why *the information about Dr. Martin Luther King, Jr.* in lines 67–69 was included. Read a window around the given line reference. As the narrator contrasts the death of Martin Luther King, Jr. with Jackie Robinson's first major league game, he says *at times it felt like nothing had been accomplished* regarding the struggle for racial equality in the 21 years since the baseball game. Eliminate answers that don't match this answer from the passage. Nothing is said about *role models*, so eliminate (F). Eliminate (G) as the mention of King does not point to Robinson's importance *in baseball*. Choice (H) matches the answer from the passage about the narrator's feeling that *nothing had been accomplished* with regard to racial equality; keep (H). Eliminate (J) because the lines referenced in the question do not touch on *Robinson's influence*. Eliminate (J). The correct answer is (H).

7. A

This reasoning question asks what the *narrator of Passage B makes a comparison between*. There is not a good lead word in this question, so work the question later. Choice (A) mentions comparing *the struggle for racial equality* and *the baseball season*. In the final paragraph, the narrator states that *the season is 162 games long, and we are only part of the way through it*, and compares that to the slow pace of change in equality issues. Keep (A). Choice (B) uses words from the passage but does not match what the passage says: the passage brings up both *baseball* and *golf*, but there is no direct comparison between the two. Eliminate (B). The references to *tense*

excitement and *bed covers* are made only in Passage A, so eliminate (C). Eliminate (D) as Passage B never mentions *striking out*. The correct answer is (A).

8. **J**

This reasoning question asks for a *comparison of the tone of each passage*. Because this question asks about both passages, it should be done after the questions that ask about each passage individually. Consider the Golden Thread of both passages. Passage A starts with a tone of excitement but finishes with a more somber tone, which is similar to the positivity in the first half of Passage B followed by disappointment in the latter half. Eliminate answers that don't match this answer from the passage. Eliminate (F), as *hopeful and cheery* doesn't describe the full progression of Passage A; nor does *dreary and pessimistic* reflect the tone of Passage B. Eliminate (G) because Passage A is not objectively factual; it is a story which includes subjective descriptions such as, *I realize then that I had been nervous, too. I had expected the impossible—I had wanted him to bat a thousand*. Eliminate (H) as it disregards the positive aspects of both passages. Choice (J) matches the answer from the passage, so keep (J). The correct answer is (J).

9. **B**

This referral question asks what *the narrator of Passage B provides more information about than the narrator of Passage A* does. Because this question asks about both passages, it should be done after the questions that ask about each passage individually. Eliminate any answer choices that misrepresent either passage. While Passage A describes the events of only one day, Passage B relays the events of that day along with future events. Eliminate (A), as a *play-by-play* is not included in either passage. Keep (B) as the narrator of Passage B relates Jackie Robinson's actions to the long-term *struggle for racial*

equality. Eliminate (C) since Passage B does not discuss Robinson's career prior to that day's events. Eliminate (D) as only Passage A mentions the *Negro League*. The correct answer is (B).

10. **H**

This reasoning question asks how the narrator of Passage A felt *after seeing Jackie Robinson play*, compared to the way the narrator of Passage B felt. Because this question asks about both passages, it should be done after the questions that ask about each passage individually. The narrator of Passage A says that he *let out a loud groan* when another player got Robinson out, and realizes that he had wanted Robinson *to bat a thousand*. The narrator of Passage B describes himself as *flying high* after seeing Robinson play. In other words, the narrator of Passage B was excited, and the narrator of Passage A was disappointed. Eliminate any answer choices that misrepresent either passage. Eliminate (F), as the narrator for Passage B focuses more on race relations than the narrator for passage A does. Eliminate (G) as there is no indication that the narrator of Passage A is likely to stop following the Dodgers. Keep (H) because it matches the answer from the passage. Eliminate (J) as the narrator of Passage A does not mention excitement about *the future for African American baseball players*. The correct answer is (H).

11. **D**

This reasoning question asks about the *main idea of the passage*. Because this is a general question, it should be done after all the specific questions. Look for the Golden Thread. The passage focuses on the CCC, a program that arose from the New Deal that put many young men to work in forests, parks, and other public lands in return for pay, housing, education, food, and clothing. Eliminate answers that don't match this answer from the passage. Eliminate (A) because the CCC never *forced unemployed young men to work*. Eliminate (B)

because the passage does not suggest that there was no *suitable employment* for veterans before the CCC. Eliminate (C) because the passage states that the *idea for the CCC* came from *President Roosevelt*, not from *Congress*. Keep (D) because it is consistent with the main idea of the text. The correct answer is (D).

12. G

This reasoning question asks about the main idea of the third paragraph. Read the third paragraph. The paragraph states that the *earliest enrollees were some veterans who returned to Washington... demanding pay.... When it became clear that no bonus would be forthcoming, about twenty-five hundred of the men took Roosevelt up on his offer and joined the CCC*. Eliminate answers that don't match this answer from the passage. Choice (F) includes a statement that is mentioned in the passage, but it answers the wrong question: while the paragraph mentions that *Eleanor Roosevelt* met with the Bonus Army, this is not the main idea of the paragraph. (Also, *Hoover* was not President, but ACT doesn't expect you to know information that is not included in the passage.) Keep (G) because it matches the answer from the passage. Eliminate (H) because the fact that *Roosevelt* provided *food* and *shelter* is not the main idea of the paragraph. Additionally, the passage doesn't indicate that Roosevelt paid the veterans a *bonus*. Eliminate (J) because the paragraph does not mention the *age requirement*. The correct answer is (G).

13. D

This reasoning question asks why President Roosevelt described himself as a *tree farmer* in line 7. Read a window around the line reference. The passage states that the president *cared about the fate of the trees* and *was fond of listing his occupation as "tree farmer."* The phrase "*tree farmer*" means he enjoyed caring for the trees on his estate. Eliminate answers that don't match this answer from the

passage. Eliminate (A) because the passage never mentions Roosevelt growing trees to support his *family*. Eliminate (B) because the passage never states that he *believed in agrarian economy over urban industrialization*. Eliminate (C) because the passage does not mention a *successful business selling trees*. Note that (A) and (C) take the description *tree farmer* literally, which is not supported by the text. Keep (D), which is consistent with the passage. The correct answer is (D).

14. G

This referral question asks for a project *the CCC performed for the National Park Service*. Look for the lead words *National Park Service* to find the window for the question. In lines 61–63 the passage states, *For the National Park Service, they built roads, campgrounds, bridges, and recreation and administration facilities*. Choices (F), (H), and (J) all include details that are mentioned in the passage but that answer the wrong question: they describe projects that were done in the *national forests* or for the *Biological Survey*, instead of for the *National Park Service*. Keep (G), which is consistent with the passage. The correct answer is (G).

15. A

This referral question asks for a true statement *about the CCC*. There is not a good lead word in this question, so work the question later. Eliminate answers that are not consistent with the passage. Keep (A) since lines 72–74 state that the program *taught more than a hundred thousand to read and write* and passed out eighth grade and high school diplomas. Eliminate (B) because the CCC did not focus on *urban job training*. Eliminate (C), which uses words from the passage but doesn't match what the passage says: lines 32–34 indicate that the CCC required enrollees to have at least six teeth; it does not say that the CCC accepted *only men with six teeth*. Eliminate (D) because the

passage never mentions *courses in nutrition and self-esteem*. The correct answer is (A).

16. G

This referral question asks what the fourth paragraph *makes clear* about the CCC. Read the fourth paragraph. Lines 51–54 state that *Congress continued to reauthorize [the CCC program] faithfully over the next seven years* and that *the CCC had put more than three million young “soil soldiers” to work*. Eliminate answers that don’t match this answer from the passage. Eliminate (F), which is only partially true; the organization was *voluntary*, but workers were compensated. Keep (G) because Congress kept reinstating the program year after year, and line 18 states that the CCC was originally *to last two years*. Eliminate (H) because the number *4.1 million* refers to the *man-hours fighting fires*, not the number of men *employed*; this answer uses words from the passage but doesn’t match what the passage says. Eliminate (J), which also uses words from the passage but doesn’t match what the passage says: the passage mentions *flood controls* in West Virginia, Vermont, and New York, rather than *fighting fires* in these states. The correct answer is (G).

17. C

This reasoning question asks what the passage suggests about *national forests before the 1930s*. Look for the lead words *national forests* to find the window for the question. Lines 54–61 describe the work the CCC did in the *national forests*. According to the passage, the CCC existed from *1933 to 1942*, but this question asks about the period *before the 1930s*. Lines 59–61 say that the CCC *planted more than 1.3 billion young trees in the first major reforestation campaign in the country’s history*. This implies that before the 1930s, there had not been a major reforestation campaign. Eliminate answers that don’t match this answer from the passage. Choices (A) and (B) use words

from the passage, but neither matches what the passage says: the passage doesn't give any information about *diseased trees* or *wildlife refuges* in the national parks before the 1930s. Eliminate (A) and (B). Keep (C) because it matches the answer from the passage. Eliminate (D), which uses words from the passage but doesn't match what the passage says: the passage does not indicate that there were *floods* in the national forests before the 1930s. The correct answer is (C).

18. F

This referral question asks *when the CCC changed its name*. Work backwards and use lead words from the answers to find the window for this question. The lead words *CCRYRM* and *Congress* appear in the first paragraph. Lines 11–15 state that when President Roosevelt *went to Congress for authorization of the program, he called the new agency the Civilian Corps Reforestation Youth Rehabilitation Movement, but before sinking under the weight of an acronym like CCRYRM, it was soon changed to the Civilian Conservation Corps*. Eliminate any answers that do not match this answer from the passage. Keep (F), as the name was *soon changed* after the program was approved by Congress. Eliminate (G) because Congress never *protested that CCRYRM was too difficult to say*. This answer uses words from the passage but doesn't match what the passage says. Eliminate (H) because lines 7–16 imply that *the CCC changed its name* in 1933, soon after Roosevelt *went to Congress for authorization of the program*, and lines 50–51 state that Roosevelt *expanded the size of the CCC...to 500,000 in 1935*. Eliminate (J), which uses words from the passage but doesn't match what the passage says: the passage never states that the *Bonus Army disbanded*, and lines 47–49 state that men from the Bonus Army *joined the CCC*, suggesting that the name had already been changed when they joined. The correct answer is (F).

19. C

This referral question asks what requirements enrollees had to meet *the same year the CCC was authorized*. Work backwards and use lead words from the answers to find the window for the question. Lines 29–34 state, *The men had to be US citizens between the ages of seventeen and twenty-seven...out of school, out of work, capable of physical labor, over 60 inches but under 78 inches in height, more than 107 pounds in weight, and had to possess no fewer than “three serviceable natural masticating teeth above and below.”* Eliminate answers that don’t match this answer from the passage. Eliminate (A) because the passage states that the men should be *over 60 inches but under 78 inches*, not *over 78 inches*. Eliminate (B) because the passage states that the men needed to be *out of school*, not *in school*. Keep (C) because it matches the answer from the passage. Eliminate (D) because, according to line 30, the age limit changed *later*, not in *the same year the CCC was authorized*. Choices (A), (B), and (D) each use words from the passage but don’t match what the passage says. The correct answer is (C).

20. G

This referral question asks about *CCC programs in national parks and forests*. Look for the lead words *national parks and forests*. Lines 21–24 state that the *Departments of Agriculture and Interior...would design and supervise projects in regional and national forests, national parks, and other public lands*. Eliminate answers that don’t match this answer from the passage. Eliminate (F) because the passage does not indicate that the CCC programs were *conducted far from where the members were fed and housed*. Keep (G), which matches the answer from the passage. Eliminate (H), since it contradicts lines 21–24. Eliminate (J), as the passage does not indicate that these were *minimum-wage jobs*. The correct answer is (G).

21. C

This reasoning question asks for the *main idea of the passage*. Because this is a general question, it should be done after all the specific questions. Look for the Golden Thread. This passage deals with the importance of the totem pole and the role the totem pole plays in Native American culture. Eliminate answers that don't match this answer from the passage. Choice (A) stresses the importance of *canoes over totem poles*. Eliminate (A). Choice (B) focuses too narrowly on the history of a single totem pole, so eliminate (B). Choice (C) matches the answer from the passage, so keep it. Like (B), (D) focuses too narrowly on one detail (specifically on the potlatch ban) and can be eliminated. The correct answer is (C).

22. G

This referral question asks for a question that is *NOT answered in the passage*. When a question asks what is **not** mentioned in the text, eliminate answers that are mentioned. Work backwards and use lead words from the answers to find the window for this question. Lines 1–3 state that *it was the natives of the far north, in what is now British Columbia and Alaska, who first carved totem poles*, so eliminate (F). Lines 64–66 state, *Today, Haida, Tlingit, Tsimshian, Kwakiutl and other native craftsmen carve, predominantly for the tourist trade, small “souvenir” totem poles*, so eliminate (H). Lines 3–9 indicate that totem poles were not carved before *the mid-18th century* because the Native Americans *lacked the iron tools necessary to fell a massive tree in one piece and carve its entire length*. Eliminate (J). Only the question posed in (G) goes unanswered in the passage. The correct answer is (G).

23. C

This referral question asks for *one of the main purposes of totem poles*. Look for the lead words *poles* and *purpose* to find the window for this question. Lines 39–40 state that *poles serve the important purpose of recording the lore of a clan, much as a book would*. Eliminate answers that don't match this answer from the passage. Choice (A) is stated in the passage but answers the wrong question; the idea that the totem poles display the carvers' *artistic skill* is stated in the passage, but the passage doesn't indicate that this is a main purpose of totem poles. Eliminate (A). While (B) is mentioned in the passage, it similarly answers the wrong question: the passage does not state that serving as a landmark is a main purpose of totem poles. Eliminate (B). Choice (C) matches the answer from the passage, so keep it. Choice (D) is stated in the passage but answers the wrong question: totem poles are associated with potlatches, but only lines 39–40 identify an *important purpose* of totem poles. Eliminate (D). The correct answer is (C).

24. G

This reasoning question asks how the sixth paragraph functions in the context of the passage. Read the sixth paragraph. Lines 49–59 describe the meanings of some of the symbols used on totem poles. Eliminate answers that don't match this answer from the passage. Choice (F) uses words from the passage but doesn't match what the passage says: the passage indicates that there is a story behind *almost every*, not *every*, image. Eliminate (F). Choice (G) matches the answer from the passage, so keep it. There are no comparisons of regional totem poles in the paragraph, so eliminate (H). Eliminate (J), as the paragraph describes how Raven is depicted, but not Raven's *role in mythology*; this answer comes from the wrong window, since Raven's role in mythology is mentioned in the fifth paragraph. The correct answer is (G).

25. D

This referral question asks which example of *the role totem poles play in Native American culture* is NOT used in the passage. When a question asks what is **not** mentioned in the text, eliminate answers that are mentioned. Work backwards and use lead words from the answers to find the window for this question. Choice (A) is addressed in lines 40–41, which state that *the top figure on the pole identifies the owner’s clan*. Eliminate (A). Choice (B) is addressed in lines 42–44, which state that *Raven, the trickster, might tell [a] story...while Frog might tell how he wooed a human woman*. Eliminate (B). Choice (C) is addressed in lines 64–66, which state that *native craftsmen carve, predominantly for the tourist trade, small “souvenir” totem poles*. Eliminate (C). Choice (D) is mentioned in the passage, but it answers the wrong question. According to line 33, the pole was placed by *Seattle businessmen*, but this fact isn’t an example of *the role totem poles play in Native American culture*.

26. J

This referral question asks which fact about the *totem poles carved by coastal tribes of the far north* is NOT included in the second paragraph. Read the second paragraph. When a question asks what is **not** mentioned in the text, eliminate answers that are mentioned. Choice (F) is addressed in lines 13–15, which state that *initially, the poles were made to stand against the front of a house...so all would enter the house through the pole*. Eliminate (F). Choice (G) is addressed in lines 11–12, which state that *the coastal tribes of the far north used trees that grew so tall and straight in their wet climate*. Eliminate (G). Choice (H) is addressed in lines 15–17, which state that *the totem poles in some way identified the owner*. Eliminate (H). Choice (J) uses words from the passage but doesn’t match what the passage says; the *family crest* is mentioned in line 16, but there is no

evidence in the passage that the poles were constructed *only* by clans who had family crests. The correct answer is (J).

27. **B**

This referral question asks what *the various characters on a totem pole* represent according to the fifth paragraph. Read the fifth paragraph. Lines 40–42 indicate that the *top figure on the pole identifies the owner’s clan, and succeeding characters...tell their stories*. Eliminate answers that don’t match this answer from the passage. Choice (A) uses words from the passage but doesn’t match what the passage says, as the *owner’s clan* is identified only by the top figure on the totem pole, not by the *various characters* underneath it. Eliminate (A). Choice (B) matches the answer from the passage, so keep it. Eliminate (C) and (D), which are stated in the passage but answer the wrong question. *Raven* and *Frog* are specific examples (lines 42–44) of the *various characters*; neither answers the question about what the *various characters* represent. The correct answer is (B).

28. **J**

This referral question asks for the *home* of the *Tlingit*. Look for the lead word *Tlingit* to find the window for the question. Line 31 indicates that the Tlingit are from *the southeastern coast of Alaska*. Eliminate (F), (G), and (H) because they do not match the answer from the passage. The correct answer is (J).

29. **A**

This reasoning question asks why the author includes the information in lines 60–63. Read a window around the given line reference. This paragraph suggests that the broad importance of totem poles is related to the poles’ *history, mythology, social structure, and spirituality*.

Eliminate answers that don't match this answer from the passage. Choice (A) matches the answer from the passage, so keep it. Choice (B) uses words from the passage but doesn't match what the passage says: while totem poles can function *as* books do, there is no evidence in the passage that the poles have *replaced* books. Eliminate (B). Choices (C) and (D) also use words from the passage but don't match what the passage says. Lines 60–61 say, *Learning to read totem poles is like learning to read a language*. The passage does not say that *Native American tribes have no spoken or written language*. Eliminate (C). Lines 62–63 state that *totem poles continue to be carved by the descendants of the original carvers*, but there is no indication in the passage that these *descendants* carve *copies*. Eliminate (D). The correct answer is (A).

30. H

This reasoning question asks for a word to describe the employers' attitude toward *potlatches* in the third paragraph. Read the third paragraph. Lines 26–28 state, *Employers, too, complained that their Indian workers were unreliable when a pole was being carved or a potlatch planned*. Eliminate answers that don't match this answer from the passage. Eliminate (F) and (G), as there is no evidence that the employers were *patient* or *accepting* regarding the potlatches. Choice (H) matches the answer from the passage, so keep it. Eliminate (J) because the mention of the employers' complaints offers no evidence of civility. The correct answer is (H).

31. C

This reasoning question asks for the authors' attitude about the *possibility of returning to the planet Venus*. There is not a good lead word in this question (the word *Venus* appears throughout the passage), so work the question later. Lines 14–16 say, *in the present climate of fiscal austerity, there is no telling when humans will next*

get a good look at Earth's nearest planetary neighbor. Based on those lines, the authors are unsure about the possibility of returning to Venus for financial reasons. Eliminate answers that don't match this answer from the passage. Eliminate (A) because there is no indication that the authors are *cheerful and optimistic* about the possibility of returning to Venus. Eliminate (B) because *sarcastic and contentious* are not supported by the passage. Choice (C) matches the answer from the passage; *doubtful* is supported by the phrase *there is no telling when* and *pragmatic* (which means "practical") is supported by the mention of *fiscal austerity*. Although *uncertain* matches the answer from the passage, *withdrawn* is not supported, so eliminate (D). The correct answer is (C).

32. **H**

This reasoning question asks how the passage describes the *state of scientific knowledge about Venus before the Pioneer mission*. Look for the lead words *before the Pioneer mission* to find the window for the question. Lines 28–30 say, *Well before the arrival of Pioneer Venus, astronomers had learned that Venus does not live up to its image as Earth's near-twin*. Eliminate answers that don't match this answer from the passage. Eliminate (F) because it doesn't mention any *scientific knowledge*. Additionally, the passage does not mention an *earlier mission that ended in disaster*, nor does it support the idea that the scientific community was *hesitant to return to Venus* before the Pioneer mission. Eliminate (G) because it goes beyond what is stated in the passage: although the answer from the passage does support the idea that Earth and Venus are not twins, it doesn't indicate that the planets are *polar opposites in atmospheric conditions*. Keep (H) because it matches the answer from the passage; in addition, lines 30–33 give *scientific evidence* of how Earth and Venus are different. Eliminate (J) because there is no mention of scientists' interest in

other planets in the window for the question. The correct answer is (H).

33. D

This referral question asks why *Earth may have retained less of its early atmosphere than Venus did*. Look for the lead words *early atmosphere* to find the window for this question. Lines 67–70 state that *Venus has held on to a far greater fraction of its earliest atmosphere. Much of Earth’s primitive atmosphere may have been stripped away and lost into space when our world was struck by a Mars-size body*. Eliminate answers that do not match this answer from the passage. Eliminate (A), which uses words from the passage but doesn’t match what the passage says: the passage states that Earth was *struck by a Mars-size body*, not by Mars itself. Eliminate (B), which also uses words from the passage but doesn’t match what the passage says: the passage mentions a *cloud of debris* that resulted from the impact but does not say that the cloud of debris stripped the atmosphere away. Eliminate (C) because *rain* that removes *sulfur gases* is not mentioned in the window for the question, nor does the passage indicate that rain removed Earth’s early atmosphere. Keep (D), which matches the answer from the passage. The correct answer is (D).

34. G

This reasoning question asks about the *main point* of the second paragraph. Read the second paragraph. The paragraph discusses what *Magellan* and *Pioneer Venus* studied on Venus. Lines 22–25 state, *These findings illustrate how seemingly small differences in physical conditions have sent Venus and the Earth hurtling down very different evolutionary paths*. Eliminate answers that don’t match this answer from the passage. Choice (F) uses words from the passage but doesn’t match what the passage says; although the paragraph discusses both

Magellan and *Pioneer Venus*, there is no indication that one mission was better than the other. Eliminate (F). Keep (G) because it matches the answer from the passage; it says that information from both *Magellan* and *Pioneer Venus* contributed to a *deeper understanding of Venus*. Eliminate (H) because both missions, not just the *Magellan*, studied *physical characteristics*. Choice (J) uses words from the passage but doesn't match what the passage says; the paragraph says that the *knowledge will help scientists intelligently evaluate how human activity may be changing the environment on the Earth*; it does not say that the knowledge will help them *approach problems*, in general, more intelligently. Additionally, this sentence is a detail, rather than the main point of the paragraph. Eliminate (J). The correct answer is (G).

35. C

This referral question asks what makes it impossible for *humans to live on the planet Venus*. Work backwards and use lead words from the answers to find the window for this question. For (A), look for the lead words “*twin*” planets in the passage. Lines 1–2 say, *Venus is sometimes referred to as the Earth’s “twin” because it resembles the Earth in size and in distance from the sun*, and lines 28–30 say, *astronomers had learned that Venus does not live up to its image as Earth’s near-twin*. Although these lines support (A), (A) answers the wrong question; the fact that Venus and Earth are not twin planets does not answer the question about why humans cannot live on Venus. Eliminate (A). For (B), look for the lead words *carbon dioxide* and *bicarbonate rocks*. Lines 43–45 say, *On Earth, however, the carbon dioxide is locked away in carbonate rocks, not in gaseous form in the air*. Choice (B) uses words from the passage but doesn't match what the passage says; the lines are about Earth, but the question is about Venus. The passage also says *carbonate rocks*, rather than *bicarbonate rocks*. Eliminate (B). For (C), look for the lead words *heat, pressure,*

and *atmosphere*. Lines 34–35 say, *Even aside from the heat and the pressure, the air on Venus would be utterly unbreathable to humans*. These lines support (C) and answer the question, so keep (C). For (D), look for the lead words *water* and *condensed*. Lines 53–55 say, *If all of Venus’s water could somehow be condensed onto the surface, it would make a global puddle only a couple of centimeters deep*. Choice (D) uses words from the passage but doesn’t match what the passage says; the passage discusses the water on Venus being condensed on the surface as a hypothetical situation, not the actual condition on Venus. Eliminate (D). The correct answer is (C).

36. J

This referral question asks for evidence gathered before *Pioneer Venus* that supports the idea that *Earth* and *Venus* are *not near-twins*. Look for the lead words *near-twins* to find the window for the question. Lines 28–30 say, *Well before the arrival of Pioneer Venus, astronomers had learned that Venus does not live up to its image as Earth’s near-twin*. Lines 30–33 contrast conditions on Earth, which *maintains conditions ideal for liquid water and life*, with the high *surface temperature* and *atmospheric pressure* of Venus. Eliminate answers that don’t match this answer from the passage. Choice (F) uses words from the passage but doesn’t match what the passage says; although the paragraph mentions *lead*, it says that Venus’s surface temperature is *hotter than the melting point of lead*, not that Venus does not produce *lead*. Eliminate (F). Eliminate (G) because it doesn’t mention evidence gathered about Venus and Earth that shows they are different. Furthermore, the passage never mentions a new discovery about Earth’s distance from the *sun*. Choice (H) uses words from the passage but doesn’t match what the passage says; *78 percent nitrogen and 21 percent oxygen* describe Earth’s atmosphere, not Venus’s. Eliminate (H). Keep (J) because it matches the answer from the

passage; the paragraph says, *Venus's surface temperature is 450 degrees Celsius*. The correct answer is (J).

SCIENCE TEST

1. B

The question asks for the combination of *species of algae and length of daily direct sunlight exposure* that resulted in the greatest mass of algae consumed. Look at the figure to determine the *mass of algae consumed* for each combination. Look at green first. The amount of green algae consumed increases from 6 to 9 hours, so eliminate (A) because it says the mass consumed is greatest at 6 hours of sunlight exposure. At 9 hours, the amount of green algae consumed is 9 grams. Now, look at yellow-brown algae. Yellow-brown algae has 8 grams consumed at 6 hours of exposure to sunlight and 6 grams consumed at 9 hours of exposure to sunlight. Eliminate (C) and (D) as both of these values are less than the mass of green algae consumed at 9 hours of sunlight exposure. The correct answer is (B).

2. H

The question asks how the *mass of algae consumed* varies as *sunlight exposure* is increased, based on the figure. Look at the figure to find the relationship between the values of *sunlight exposure* and the *mass of algae consumed*. For all 5 species of algae, the *mass of algae consumed* increases as the *sunlight exposure* increases from 3 to 6 hours. Eliminate (G) and (J) because they indicate that the *mass of*

algae consumed decreases as the *sunlight exposure* increases from 3 to 6 hours. For most of the 5 species of algae, the *mass of algae consumed* also increases as the daily *sunlight exposure* increases from 6 to 9 hours. The masses of *brown* and *yellow-brown* algae consumed, shown by the dark gray bar and the white bar with black stripes, decrease as the daily *sunlight exposure* increases from 6 to 9 hours. Eliminate (F) as it indicates that the *mass of algae consumed* increases only as *sunlight exposure* is increased. The correct answer is (H).

3. A

The question asks whether *L. littorea* would be *classified as an autotroph or a heterotroph*. Use the information in the passage and POE. The first paragraph states that *Littorina littorea eats algae and barnacle larvae*. Eliminate (B) and (D) because they indicate that the sea snail produces its own energy without consuming another organism. To choose between the remaining choices, outside knowledge is necessary. Heterotrophs consume other organisms to obtain their energy, while autotrophs produce their own energy from sunlight. Eliminate (C) as it states that an *autotroph...consumes another organism to obtain its energy*. The correct answer is (A).

4. J

The question asks whether the *primary food source* of the sea snail contains *chlorophyll or hemoglobin*. The passage states that one of the primary food sources of *L. Littorea* is *algae* but does not mention *chlorophyll or hemoglobin*. Therefore, this question requires outside knowledge. Algae are *autotrophic*, meaning they are a species that produces its own energy from sunlight utilizing the process of *photosynthesis*. Eliminate (F) and (H) because these answer choices state that algae undergo cellular respiration. *Photosynthesis* relies on the color pigment *chlorophyll*. Eliminate (G) because it states that algae use hemoglobin. The correct answer is (J).

5. **B**

The question asks how the mass of *yellow-brown algae* consumed varies as *sunlight exposure* is increased, based on the figure. Look at the figure to find the relationship between the values of *sunlight exposure* and the *mass of algae consumed for yellow-brown algae*. The bar for *mass of algae consumed for yellow-brown algae* is represented by the white bar with black stripes, which increases from 3 to 6 hours of *sunlight per day*. Eliminate (C) and (D) because they indicate that more *yellow-brown algae* is consumed at 3 hours of *sunlight per day* than at 6 hours of *sunlight per day*. The bar for mass of algae consumed for yellow-brown algae decreases from 6 to 9 hours of *sunlight per day*. Eliminate (A) as it indicates that the *mass of algae consumed* increases as *daily sunlight exposure* increases from 6 to 9 hours for *yellow-brown algae*. The correct answer is (B).

6. **F**

The question asks for the mass consumed, *in milligrams...of the brown algae exposed to 6 hours of sunlight per day*. Look at the figure to determine the *mass of algae consumed for brown algae*, represented by the dark gray bar. At 6 hours of *daily sunlight exposure*, the *mass of algae consumed* is 5 grams for *brown algae*. Eliminate (G) and (J) because both start with numbers other than 5. To decide between the remaining choices, outside knowledge is necessary. There are 1,000 *milligrams* in 1 gram. Therefore, to convert grams into milligrams, multiply the value in grams by 1,000, or $5 \times 1,000 = 5,000$ mg. Eliminate (H) as it multiplies the value by a factor larger than 1,000. The correct answer is (F).

7. **A**

The question asks for *a difference between Experiments 1 and 2*. The results of the experiments are shown in Table 1 and Table 2, so look at

Tables 1 and 2 to find a difference. According to Table 1, the virus type used in Experiment 1 was HSV-1, while in Table 2, the virus type used in Experiment 2 was HSV-2. Since the virus types are different, keep (A). The pH values listed in the two tables are the same for both experiments, 3.5, 4.0, 4.5, and 5.0. Eliminate (B) since it states that the pH values differed between the two experiments. Neither Table 2 nor the description of Experiment 2 mentions use of a *base*, so eliminate (C), which states a base was used in Experiment 2. Both Table 1 and Table 2 show results for 1 hour and 1 day of exposure. Eliminate (D) since it claims that only the viruses in Experiment 1 were left to stand for 1 hour. The correct answer is (A).

8. **H**

The question asks for the *relative infectivity of a virus sample* at a pH of 4.3 after 1 hour of exposure in Experiment 2. The results of Experiment 2 are shown in Table 2. A pH of 4.3 is not shown in Table 2, so look for nearby values. After 1 hour of exposure, the relative infectivity at a pH of 4.0 is 0.18, and the relative infectivity at a pH of 4.5 is 0.64. Since relative infectivity increases as pH increases, the relative infectivity at a pH of 4.3 is likely between 0.18 and 0.64. The correct answer is (H).

9. **C**

The question asks for the *pH values* at which *the relative infectivity of HSV-2 virions* was lower after a *longer exposure time*. The results for HSV-2 are shown in Table 2. In Table 2, at a pH of 3.5, the relative infectivity was 0.00 after both 1 hour and 1 day of exposure. Eliminate (A) and (B) since both state that the relative infectivity would be different at different exposure times at a pH of 3.5. The relative infectivity is also the same, 0.88, at both exposure times at a pH of 5.0. Eliminate (D), which includes 5.0. Only (C) does not include 3.5 or 5.0. The correct answer is (C).

10. J

The question asks which question was *NOT addressed by either experiment*. The results of the experiments are shown in Table 1 and Table 2. Look for changes corresponding to each answer choice in Table 1 and Table 2. In both Table 1 and Table 2, pH was varied, and this resulted in different *relative infectivity* for the viruses. Eliminate (F) since it states that the relationship between pH and *relative infectivity* was not explored. The tables also show different exposure times, 1 day and 1 hour, with different *relative infectivity* at each time. Eliminate (G) since exposure time was varied. Table 1 shows results for HSV-1, and Table 2 shows results for HSV-2. Eliminate (H) since it claims that the experiment did not compare the two types of viruses. Neither table contains data about different concentrations of virions. The correct answer is (J).

11. A

The question asks which sample of HSV-2 would be *LEAST likely to infect chicken egg cells* after *one day of exposure* to acid. Table 2 contains the results for HSV-2, so look at Table 2. The virus sample *LEAST* likely to infect cells is the one with the lowest relative infectivity. According to Table 2, at 1 day of exposure, relative infectivity increases as pH increases. The lowest relative infectivity, 0.00, corresponds to the lowest pH, 3.5. The correct answer is (A).

12. G

The question asks which of the given conditions would give the *lowest relative infectivity* in Experiment 1. The results of Experiment 1 are shown in Table 1, so look at Table 1. In Table 1, relative infectivity increases as pH increases. Eliminate (H) and (J) since the two virus samples at a pH of 4.5 have a higher relative infectivity than those at a pH of 4.0. At this pH, samples left for 1 hour have a higher

relative infectivity than those left for 1 day. Eliminate (F) since it corresponds to a relative infectivity of 0.45, which is higher than the corresponding value for the virus left for 1 day, or 0.33. The correct answer is (G).

13. A

The question asks how many of the petri dishes used in Experiment 1 *contained inactivated virus samples*. According to the table given in the question, an inactivated sample has a relative infectivity less than 0.2. The results of Experiment 1 are shown in Table 1, so look at Table 1. In Table 1, only the 2 samples at a pH of 3.5 have a relative infectivity less than 0.2, and all other samples have a relative infectivity greater than 0.2 and would not be classified as inactivated. The correct answer is (A).

14. F

The question asks how the *spring force on Mass 2* varies as the *spring constant of the spring* is decreased, *based on the results of Experiment 2*. The results of Experiment 2 are shown in Table 1. Use Table 1 and look for the values of *spring force* for each type of spring. For *Mass 2*, the spring force is 0.38 N for the spring made of steel, 0.45 for the spring made of Alloy X, and 0.53 for the spring made from Alloy Y. Look for information in the passage about the *spring constant* of each spring. The second paragraph states that the spring constant of the spring made of steel is 2.5 N/m, the spring constant of the spring made of Alloy X is 3.0 N/m, and the spring constant of the spring made of Alloy Y is 3.5 N/m. For the three types of spring, as the *spring constant* decreases from Alloy Y to Alloy X to steel, the *spring force* also decreases. The correct answer is (F).

15. A

The question asks whether *the spring made of Alloy X or the spring made of Alloy Y experiences more strain on its coils* in Experiment 1. Since the reasons in the answer choices discuss the distances the springs stretched, refer first to Figure 1, which shows how the three springs stretched when a mass was attached to them in Experiment 1. Based on Figure 1, the spring made of Alloy X stretched a greater distance than the spring made of Alloy Y. Eliminate (B) and (D) because they incorrectly state that the spring made of Alloy Y stretched a greater distance. To choose between the remaining choices, outside knowledge is necessary. When a spring stretches, it experiences *strain on its coils*. A spring stretched to a greater distance will experience more strain on its coils than one stretched a shorter distance. Eliminate (C) as it incorrectly states that the spring with a smaller distance of stretch will experience more *strain on its coils*. The correct answer is (A).

16. **G**

The question asks for a procedural change that will allow the scientists to *study whether a mass's shape determines the distance the spring of a certain composition stretched*. When testing one variable, a scientist must change only that variable and keep all other variables constant across trials. To test how the *mass's shape* affects the *distance the spring...stretched*, the scientists must use multiple masses and vary the shape of the masses while keeping all other factors the same. Eliminate (F) and (H) because they incorrectly state that only one mass should be used. Eliminate (J) as it indicates that the masses should have the *same shape*. The correct answer is (G).

17. **B**

The question asks for the *difference between the spring force exerted by the spring made of Alloy X and the spring force exerted by the spring made of Alloy Y...for Mass 3*, according to *Experiment 2*. The

results of Experiment 2 are shown in Table 1. Use Table 1 and look for the spring force for Mass 3 for springs made of Alloy X and Alloy Y. The spring force of the spring made of Alloy X on Mass 3 is 0.75 N, and the spring force of the spring made of Alloy Y on Mass 3 is 0.88 N. Subtract the two values to find the difference: $0.88 \text{ N} - 0.75 \text{ N} = 0.13 \text{ N}$. The correct answer is (B).

18. J

The question asks what the *distance of the stretch* would be for a mass attached to a spring with a *spring constant of 2.0 N/m*, according to *Experiment 1*. The results of Experiment 1 are shown in Figure 1. Look at Figure 1 to determine how different springs stretched when a mass was attached to them. The spring made of steel stretched 0.2 m, while the spring made of Alloy X stretched 0.17 m, and the spring made of Alloy Y stretched 0.14 m. Look for information in the passage about the *spring constant* of each spring. The second paragraph states that the spring constant of the spring made of steel is 2.5 N/m, the spring constant of the spring made of Alloy X is 3.0 N/m, and the spring constant of the spring made of Alloy Y is 3.5 N/m. As the spring constant decreases, the distance of the stretch increases. Thus, the distance of the stretch for a spring with a spring constant of 2.0 N/m will be greater than the distance of the stretch of the steel spring, or greater than 0.2 m. The correct answer is (J).

19. A

The question asks what the *spring force* would be on a mass with the *same length as Mass 1 but a smaller displacement than Mass 1*, according to *Experiment 2*. Scan the description of Experiment 2 for information about *displacement*; according to the passage, *displacement* is represented by the variable *D*. The results of Experiment 2 are shown in Table 1. In Table 1, look for the relationships between the values of *length*, *spring force*, and *D*. Both

Mass 1 and Mass 2 have the same displacement, but Mass 1 has a length of 5.0 cm, and Mass 2 has a length of 10.0 cm. The spring force is the same for both Mass 1 and Mass 2 for all three springs, so varying length does not affect spring force. Both Mass 2 and Mass 3 have the same length, but Mass 2 has a displacement of 0.15 m, and Mass 3 has a displacement of 0.25 m. The spring force for Mass 3 is always higher than the spring force for Mass 2. Thus, spring force increases as displacement increases. A mass with a *smaller displacement than Mass 1* should therefore have a smaller *spring force*. Eliminate (B) and (C) because they state that a mass with a *smaller displacement* will have a larger spring force than Mass 1 in Experiment 2. The spring force from the spring made of steel is always less than the spring force from the spring made of Alloy X. Eliminate (D) because it incorrectly states that the spring force from the spring made of steel will be greater than the spring force from the spring made of Alloy X. If the displacement of the mass is smaller than that of Mass 1, the steel spring will have a smaller spring force than with Mass 1 in Experiment 2. The correct answer is (A).

20. J

The question asks for the spring hanger that would have the *greater distance stretched when a 25 kg mass is hung from it*. Since the reasons in the answer choices discuss the distances the springs stretched, refer first to Figure 1, which shows how three springs stretched when a mass was attached to them. Based on Figure 1, the spring made of steel stretched a greater distance than the spring made of Alloy X. Look for information in the passage about the *spring constant* of each spring. The second paragraph states that the spring constant of the spring made of steel is 2.5 N/m and the spring constant of the spring made of Alloy X is 3.0 N/m. As the spring constant decreases, the distance of the stretch increases. Eliminate (F) and (H) because they incorrectly state that *distance stretched increases as*

spring constant increases. The question states that *the first spring on the machine has a spring constant of 15.2 N/m, and the second spring on the machine has a spring constant of 13.1 N/m.* Thus, the second spring will have the *greater distance stretched* because it has the smaller spring constant. The correct answer is (J).

21. **B**

The question asks for the *fp* of a batch with 55% water and 45% ethylene glycol. Look at Table 1 to find the *fp* for the different batches. According to Table 1, a batch with 40% ethylene glycol has an *fp* of -14.8°F and a batch with 50% ethylene glycol has an *fp* of -36.4°F . Therefore, the *fp* for a batch with 45% ethylene glycol is likely between -36.4°F and -14.8°F . The correct answer is (B).

22. **J**

The question asks whether the experimental results support the scientist's prediction that the *fp for Batch 7 would be greater than the fp for Batch 2.* Table 1 shows the *fp* for the different batches. According to Table 1, for Batch 2 the *fp* is equal to 19.4°F , while for Batch 7 the *fp* is equal to 8.6°F . Eliminate (F) and (G) because the value of *fp* was greater for Batch 2, and the scientist's prediction was incorrect. Next, eliminate (H) since 8.6°F is the value of *fp* for Batch 7 rather than the difference between the 2 values of *fp*, which is $19.4^{\circ}\text{F} - 8.6^{\circ}\text{F} = 10.8^{\circ}\text{F}$. The correct answer is (J).

23. **B**

The question asks for the *difference between fp and Δfp* for each batch. Look at Table 1 to find *fp* and Δfp for the batches. In Batch 1, the *fp* is equal to 32°F , while the Δfp is equal to 0° . Subtract these values from each other to obtain a difference of 32°F . The question indicates that the difference will be the same for the other batches.

Alternatively, scan the passage for the relationship between fp and Δfp . According to the equation given in the passage, $\Delta fp = fp - 32$, indicating a difference of 32°F between the two variables. The correct answer is (B).

24. G

The question asks for the fp of *the batch for which the volume of ethylene glycol was 3 times as great as the volume of water*. The compositions of the batches are shown in Table 1. In Table 1, the batch with three times as much ethylene glycol as water is Batch 6, which contains 25% water and 75% ethylene glycol. For Batch 6, the fp is equal to -56.2°F . The correct answer is (G).

25. C

The question asks for the Δfp of a batch with 65% water and 35% ethylene glycol based on Figure 1. Figure 1 contains marks for 30% and 40% ethylene glycol, so look between those to estimate the Δfp for 35%. At 35% ethylene glycol, Δfp is approximately -40°F . The correct answer is (C).

26. F

The question asks why Δfp was 0°F for *Batch 1*. Batch 1 is listed in Table 1, so look at Table 1. According to Table 1, Batch 1 contained 100% water and 0% ethylene glycol. Eliminate (G) and (J) since both state that Batch 1 contained 0 mL of water. Since information about the flask and the cold bath is not found in the table, scan the passage for these words as well as ethylene glycol. According to the passage, *water, ethylene glycol, or both were combined in a glass flask*, which is consistent with (F). The passage also mentions *a cold bath containing dry ice and acetone*. Eliminate (H) since ethylene glycol is not 1 of the 2 components of the cold bath. The correct answer is (F).

27. **D**

The question asks how the *freezing point of the water* would change if a *hydrophobic compound was added*. Outside knowledge is helpful but not required to answer this question. The passage states that *compounds that are hydrophilic dissolve in water*. Hydrophobic is the opposite of hydrophilic. Thus, a hydrophobic compound would not dissolve in water, so eliminate (A) and (C). According to the passage, *when a hydrophilic compound dissolves in water, the freezing point of the mixture is different from that of each component*. However, a hydrophobic compound would not dissolve or form a mixture with water, so the freezing point of the water would be unchanged, which is consistent with (D). Eliminate (B), which claims that the hydrophobic compound would lower the freezing point of water. The correct answer is (D).

28. **G**

The question asks for the depth at which the *density of seawater with 2% by mass of salt...is closest to 1.03 g/cm³* based on Figure 2. In Figure 2, the bottom-most line represents *2% by mass of salt*. For this line, at a density of 1.03 g/cm³, the depth is halfway between 2,000 m and 3,000 m, corresponding to a depth of 2,500 m. The correct answer is (G).

29. **D**

The question asks for the temperature at which the density of seawater with *7% by mass of salt* is equal to 1.045 g/cm³ based on Figure 3. Figure 3 does not show seawater with *7% by mass of salt*. However, as percent by mass of salt increases, the density at a given temperature increases as well. Therefore, the density for 7% by mass of salt should be between those for 6% and 8% by mass of salt. The line corresponding to a concentration of 6% by mass shows a density of

1.045 g/cm³ at a temperature of about 20°C. The density of 7% by mass of salt seawater should be higher than 1.045 g/cm³ at this temperature, as well as all lower temperatures since there is an inverse relationship between temperature and density. Eliminate (A) and (B) because they state that the density will be equal to 1.045 g/cm³ at a temperature equal to or less than 20°C. Both (C) and (D) contain a temperature of 25°C. At 25°C, the density of 6% by mass seawater is about 1.043 g/cm³, and the density of 8% by mass seawater is about 1.057 g/cm³. The 7% by mass of salt density would be between the two, or approximately 1.05 g/cm³. Eliminate (C) since at temperatures below 25°C the density would be even higher than this value and above 1.045 g/cm³. The correct answer is (D).

30. H

The question asks for the concentrations at which *the density of NaCl solution and the density of LiCl solution are closest in value* based on Figure 1. Begin by looking at Figure 1 to find density values for the listed concentrations. For NaCl, when the concentration is equal to 2.5% by mass, the density is approximately 1.02 g/cm³. For LiCl, when the concentration is equal to 10% by mass, the density is approximately 1.06 g/cm³. Eliminate (F) since the LiCl density is significantly larger. Choice (G) can be eliminated since there is a direct relationship between concentration and density, so at a LiCl concentration of 15% by mass, the density would be even larger than 1.06 g/cm³. At a NaCl concentration of 7.5% by mass the density is approximately 1.06 g/cm³. This matches the density obtained for 10% by mass LiCl, so keep (H). Eliminate (J) since at an LiCl concentration of 15% by mass, the density would be larger than 1.06 g/cm³. The correct answer is (H).

31. A

The question asks for the difference between *the density of seawater* and *the density of NH₄Cl solution* at a concentration of 15% by mass based on Figure 1. According to Figure 1, the density of seawater is greater than the density of NH₄Cl solution at all concentrations, so eliminate (C) and (D) as they state that the seawater has a smaller density. At a concentration of 15% by mass, the seawater density is approximately 1.11 g/cm³ and the NH₄Cl density is approximately 1.04 g/cm³. Subtract these values to obtain a difference of 0.07 g/cm³. The correct answer is (A).

32. H

The question asks whether the LiCl or the NH₄Cl solution would be less affected by *increasing concentration from 5% by mass to 20% by mass*. Figure 1 shows that the line corresponding to NH₄Cl has a smaller slope than the line corresponding to LiCl. Since slope represents rate of change, this means that the density of the NH₄Cl solution would change less in response to increasing concentration. Eliminate (F) and (G) since both claim that the density of the LiCl solution would be less affected by increasing concentration. In Figure 1, at a concentration of 5% by mass, the NH₄Cl solution density is about 1.01 g/cm³, and at 20% by mass, its density is about 1.05 g/cm³. Subtract these values to obtain a difference of 0.04 g/cm³. The correct answer is (H).

33. D

The question asks for the temperature of seawater at *a depth of 0 m and a salt concentration of 6% by mass*. Depth and concentration are shown in Figure 2. According to Figure 2, at a depth of 0 m, seawater with a concentration of 6% by mass has a density of about 1.04 g/cm³. To find the temperature of this water, look at Figure 3, which shows the relationship between temperature and density at different

concentrations. According to the passage, Figure 3 shows *seawater at the surface*, or at a depth of 0 m, which matches the water with a density of 1.04 g/cm^3 from Figure 2. In Figure 3, seawater with a concentration of *6% by mass* and a density of 1.04 g/cm^3 has a temperature of 35°C . The correct answer is (D).

34. H

The question asks for *a primary difference between the two theories*. Look at each theory to find what they say about the Moon's *orbit around the Earth*. Theory 1 states that *the Moon orbits the Earth in a circular path*. Eliminate (F) and (G) because both incorrectly say that Theory 1 states that the Moon follows *an elliptical orbit*. Theory 2 states that *the Moon orbits the Earth in an elliptical path*. Eliminate (J) because it says that Theory 2 states that the Moon orbits *around the Sun*. The correct answer is (H).

35. A

The question asks *which of the figures...implies that the distance between the Moon and Earth is constant over time*. Look at Figures 2 and 3, and check to see which one shows a constant distance between the Moon and Earth. Figure 2 shows a circular orbit for the Moon, which implies that *the distance between the Moon and Earth is constant*. Eliminate (B) and (D) because they don't include Figure 2. Figure 3 shows an elliptical orbit for the Moon. The Moon looks closer to the Earth on the left side of the figure and farther from the Earth on the right side of the figure. This implies that *the distance between the Moon and Earth* is not constant. Eliminate (C) because it includes Figure 3. The correct answer is (A).

36. J

The question asks whether the *top portion of Figure 3* is consistent with the reason provided by Theory 2 that *the amount of the Sun obscured by the Moon varies depending on how far the Moon is from Earth*. Begin by examining Theory 2 to find the reason why *the amount of the Sun obscured by the Moon varies*. Theory 2 states that *the Moon is sometimes located closer to or further away from the Earth depending on where it is in its orbit*. Now look at Figure 3 to see if it is consistent with this reason. Figure 3 shows an elliptical orbit for the Moon. The Moon looks closer to the Earth on the left side of the figure and farther from the Earth on the right side of the figure. This implies that the distance between the Moon and Earth is not constant, which is consistent with the reason. Eliminate (F) and (G), which both state that the figure is not consistent. Eliminate (H) since it says *the Moon is shown as having a circular orbit*. The correct answer is (J).

37. C

The question asks for the approximate number of *days passed* after the *eclipse in December of 2001 ...before the next annular eclipse*, according to Figure 1. Look at Figure 1 to determine when the next annular eclipse occurred. An annular eclipse should show a ring of light surrounding the ring, so the next one after December of 2001 occurred in June of 2002. There are approximately six months between December and June, and there are approximately 30 days in a month, so $6(30) = 180$, so there are approximately 180 days. The correct answer is (C).

38. G

The question asks for a statement that *a proponent of Theory 1 and a proponent of Theory 2 would both be likely to agree with*. Begin by examining Theory 1 to find what it says about the umbra during an annular eclipse. Theory 1 states that the umbra doesn't reach Earth

during an annular eclipse, but it does during a total eclipse. Eliminate (F), (H), and (J) because all of these statements indicate that the umbra is either longer or the same size as the *distance between the Earth and Moon* and the *umbra during a total eclipse*. The correct answer is (G).

39. C

The question asks for the figure that could *represent the positions of the Sun, Moon, and Earth on May 31, 2003*, according to Figures 1 and 3. Look at Figure 1 to determine what kind of eclipse occurred on *May 31, 2003*. Figure 1 shows that the Moon is blocking only some of the light from the Sun, so the eclipse was an annular eclipse. Look at Theory 2 to determine where the Moon will be located in its orbit during an annular eclipse. Theory 2 states that *an eclipse will be annular when the Moon is located in the region of its orbit that is a greater distance from Earth*. Eliminate (A) and (B) because they incorrectly place the Moon at a closer location in its orbit to the Earth. Look at Figure 3 to determine where this date falls in terms of the locations pictured. The date May 31 will occur between December 14 and June 21. Based on Figure 3, the Moon and Earth are on the right side of the orbit in December and on the left side of the orbit in June. The arrows indicate that the Earth will travel counterclockwise around the Sun. Therefore, the Earth should fall somewhere in between the locations for December and June in the top half of the orbit. Eliminate (D) because it shows the Earth in the bottom half of the orbit. The correct answer is (C).

40. G

The question asks whether Theory 2 can *be used to explain why some ocean tides are stronger than others*. The information in Theory 2 is summarized in Figure 3, so look at Figure 3. Figure 3 shows that the distances between the Earth and the Moon and the Sun and the Moon

vary throughout the Moon's orbit. Eliminate (H) and (J) because both state that the theory *does not account for the varying* distances between these bodies. To choose between the remaining choices, outside knowledge is necessary. The *gravitational field* of the Moon is the *primary driver of tides*. Eliminate (F) because it incorrectly states that the *gravitational field* of the Sun drives tides. The correct answer is (G).