

# **FULL-LENGTH PRACTICE TESTS 20**

# English Test

35 Minutes — 50 Questions

**Directions:** Each passage has certain words and phrases that are underlined and numbered. The questions in the right column will provide alternatives for the underlined segments. Most questions require you to choose the answer that makes the sentence grammatically correct, concise, and relevant. If the word or phrase in the passage is already the correct, concise, and relevant choice, select Choice A, NO CHANGE. Some questions will ask a question about the underlined segment. When a question is presented, choose the best answer.

Some questions will ask about part or all of the passage. These questions do not refer to a specific underlined segment. Instead, these questions will accompany a number in a box.

For each question, choose your answer and fill in the corresponding bubble on your answer sheet. Read the passage once before you answer the questions. You will often need to read several sentences beyond the underlined portion to be able to choose the correct answer. Be sure to read enough to answer each question.

## Passage I

### A Screenwriting Career

[1]

Wanting to have success as a Hollywood screenwriter, if you do, you should be aware of the difficulties that come along with this career and its development. Very few budding screenwriters attain success by selling, let alone producing, their screenplays. On the other hand, even successful screenwriters report living stressful and dissatisfied, though wealthy, lives.

[2]

The first difficulty encountered by budding screenwriters is the lack of a formal career path. A recent college graduate cannot approach the career center at his or her school or find time for extracurricular activities. While several successful screenwriters have written guides that outline possibilities for success, their proposed suggestions only highlight the fruitlessness of their experiences.

[3]

Unlike its value in other professional pursuits, a college education was not necessarily a career boost for a budding screenwriter. In fact, a college

education can have the reverse effect on a screenwriter. The academic study of literature or film may help a budding screenwriter to produce higher quality work, but such an education delays its recipient from competing in the film industry. This also tends to hold true for actors. While a college graduate spends his or her late teens and early twenties studying, the budding screenwriters who do not attend college begins honing their craft and competing for work several years earlier. In a career path that usually requires years to develop, late entry can create a substantial disadvantage.<sup>8</sup>

[4]

Moreover, the debt of a college education acquired at a prestigious school may lead many young screenwriters to surrender early to the allure of steady, if not glamorous, work and pay. Those without college educations often cannot escape to “fallback” careers; this lack of options bolsters their drive to succeed. Furthermore, those without college educations are less averse to the low-wage jobs, aspiring screenwriters are forced to take in order to pay living expenses while saving blocks of time to hone their craft.

[5]

The very few screenwriters who succeed often find that’s the realities of their day-to-day lives are far different from their

glamorous preconceptions and the media's idealistic portrayals. While they can earn very high salaries, successful Hollywood screenwriters often feel more stressed and powerless than they did when they struggled. A Hollywood screenwriter's reputation always hinges on the success of his or her last screenplay. <sup>1</sup>It produces a high level of stress and pressure to continually produce more and better work. Furthermore, the Hollywood <sup>14</sup>hierarchy places studio executives, producers, directors, and star actors above screenwriters in both pay and importance. Thus, even the most successful screenwriters must yield creative power to individuals who often have very little knowledge of the craft of screenwriting.

[6]

Regardless of the hardships of initially succeeding and then thriving in the screenwriting profession, young people move to Los Angeles every year to pursue this career. If one is among these people, please research and learn as <sup>15</sup>much as possible about the vicissitudes as well as the potential triumphs of this profession.

1. A. NO CHANGE  
B. If you want to succeed as a Hollywood screenwriter,  
C. Whether or not wanting to succeed as a Hollywood screenwriter,  
D. Having decided if you want to or not succeed as a Hollywood screenwriter,
  
2. F. NO CHANGE  
G. For this reason  
H. Nowadays  
J. Furthermore
  
3. Assuming that all are true, which choice is the most logical and appropriate in context?  
  
A. NO CHANGE  
B. read the classified ads in order to find screenwriting opportunities.  
C. understand the difficulties of his or her chosen career.  
D. stumble into an opportunity to work in the field.
  
4. Which choice best conveys that there is no one path to becoming a screenwriter?

- F. NO CHANGE
- G. difficulty
- H. rewards
- J. disparity

5. A. NO CHANGE
- B. a college education has been
  - C. a college education is
  - D. it is, a college education

6. F. NO CHANGE
- G. Actors also find this to be true for themselves.
  - H. This has similar repercussions for actors.
  - J. DELETE the underlined portion.

7. A. NO CHANGE
- B. begins to hone
  - C. begin honing
  - D. has begun honing

8. Suppose the writer had intended to write a paragraph discouraging those interested in writing screenplays from pursuing a college education. Does the paragraph fulfill this purpose?

- F. Yes, because it mentions the value of education.
  - G. Yes, because it provides reasons why pursuing an education can be harmful.
  - H. No, because the author does not express an opinion about the value of education.
  - J. No, because the focus is on screenwriting rather than education.
9. A. NO CHANGE
- B. though universities offer work-study programs to help students pay for school, many graduate with debt; this burden
  - C. the burden of student loans
  - D. student loans which
10. F. NO CHANGE
- G. careers; this,
  - H. careers so, this
  - J. careers this
11. A. NO CHANGE
- B. jobs, these aspiring screenwriters
  - C. jobs aspiring, screenwriters,
  - D. jobs that aspiring screenwriters

12. F. NO CHANGE  
G. that the realities of there  
H. there the realities of their  
J. that the realities of their
13. A. NO CHANGE  
B. This volatile situation  
C. The screenplay  
D. They
14. F. NO CHANGE  
G. churn out improving and increasing  
H. be more productive and improved  
J. raising the stakes of
15. A. NO CHANGE  
B. one is among them  
C. finding yourself among these people  
D. you are among these people

## *Passage II*

### The Swallows of San Juan Capistrano

[1]

The oldest building still in use in California is the Mission at San Juan Capistrano, the seventh in the chain of California missions built by Spanish priests in the late eighteenth and early nineteenth centuries. The mission has gained fame as the well-known summer residence of the swallows of San Juan Capistrano.<sup>17</sup>

16

[2]

[1] For centuries, these cliff swallows have migrated to and from California every year in a cloud-like formation. [2] The swallows leave the town of San Juan Capistrano, halfway between San Diego and Los Angeles, around October 23. [3] They then journey 7,000 miles to spend the winter in Argentina. [4] Every spring, the birds faithfully return from Argentina to nest and for bearing their young in the valley near the mission. [5] On March 19,<sup>18</sup> mission bells ring, a fiesta is held, and a parade snaking through the streets as<sup>19</sup> throngs of locals and tourists celebrate the birds' return.

[3]

According to legend, the swallows were seeking refuge from an innkeeper who had destroyed their muddy nests when they discovered the mission.<sup>20</sup> Biologists have a different explanation for how the birds might of developed<sup>21</sup> their fondness for the mission. Although observing the swallows' behavior and<sup>22</sup>

22

noting that the birds build their nests out of mud, biologists have postulated that the swallows really chose the mission due to its proximity to two rivers. These rivers provide the swallows with ample mud for building their funnel-like nests of which they return year after year. [24]

23

[4]

[1] One aspect of the legend, however, rings true. [2] The swallows, sensing that they will be protected within the mission walls, return to the compound every spring. [3] Despite this, beyond the church walls, the entire city has sought to protect the swallows. San Juan Capistrano municipal ordinances declare the city a bird sanctuary and outlaw the destruction or damaging of swallow nests.

25

[5]

[1] Although the community clearly sees the importance of providing a home for the swallows, some problems have arisen in recent years. [2] Due to the city's growth and development, the number of insects has declined, causing many of the swallows to locate farther from the mission in the town center and closer to the open areas where their food source thrives. [3] Large groups of swallows have found other nesting sites in the area, usually in the hills due to disruptions from recent restorations of the

26

27

old, historic buildings at the mission. [4] Fortunately, city and mission officials  
28

have started to respond to these problems. [5] For example,

to attempt at enticing the birds back home, mission workers have strewn  
29

insects about the mission's grounds.

16. F. NO CHANGE

G. seasonal residence for the summer

H. summer residence

J. residential summer home

17. The primary purpose of this paragraph is to:

A. introduce the story of the founding of the mission.

B. transition into a discussion of the architecture of the mission.

C. set the scene for a discussion of the swallows.

D. persuade the reader that the mission is important.

18. F. NO CHANGE

G. with bearing

H. bearing

J. bear

19. A. NO CHANGE  
B. snaked  
C. snakes  
D. is snaking
20. F. NO CHANGE  
G. nests when discovering  
H. nests, when  
J. nests, when finding
21. A. NO CHANGE  
B. might have  
C. may of  
D. may
22. F. NO CHANGE  
G. Indeed  
H. After  
J. Before
23. A. NO CHANGE  
B. to which  
C. by which  
D. which

24. Of the following true statements, which is the best choice to insert here in order to further support the biologists' explanation that the swallows chose the mission because of its proximity to two rivers?

F. The swallows will repair a damaged nest instead of building an entirely new nest.

G. The rivers also supply insects upon which the swallows feed.

H. Both rivers are also home to a wide variety of fish.

J. The location of the mission near the rivers also provides other advantages for the swallows.

25. A. NO CHANGE

B. Finally

C. In fact

D. Next

26. F. NO CHANGE

G. community, clearly

H. community clearly,

J. community clear

27. A. NO CHANGE

B. area; usually in the hills,

C. area—usually in the hills—

D. area, having been usual in the hills,

28. F. NO CHANGE  
G. old and historic  
H. historic  
J. olden times
29. A. NO CHANGE  
B. in an attempt to entice  
C. in an attempt's enticement  
D. in an attempt of enticing

Question 30 asks about the preceding passage as a whole.

30. The writer is considering adding the following sentence to further explain how residents of San Juan Capistrano feel about the swallows:

Many residents and visitors miss the huge clouds of swallows descending upon the mission as in the past decades.

The most logical place to insert this sentence would be directly after:

- F. Sentence 5 in Paragraph 2.  
G. Sentence 3 in Paragraph 4.  
H. Sentence 1 in Paragraph 5.  
J. Sentence 3 in Paragraph 5.

## Passage III

### Root for the Home Team?

If you are young and love football, it is advantageous to live near a large sporting-goods store that carries a wide variety of paraphernalia from different teams. My daughter and I visit our local store at least once a year to buy another new football jersey for yet another team. Although my daughter is a fan of our city professional team, she frequently changes her jersey to match that of her favorite player.

A free agent is a professional football player who is no longer under contract with a team, which means he can choose the team which he wants to play. In the NFL today, players can become free agents easily. [33] Things were much different when I was growing up. My favorite player was on the same team for his entire career I had one jersey. My daughter has bought over eight team jerseys in the past six years! At seventy-five dollars a shirt, this is not a sustainable trend.

There are many disadvantages to free agency. When my daughter and I went to pre-season training practice to get a preview of this year's home team, we constantly consulted the team roster to figure out the new line-up, because

there were so many new players. At one point, a number of fans even started to cheer for a player who, was no longer with the team, because they did not realize someone new was wearing his number.

A second disadvantage of free agency is having some camaraderie and cohesion. Football is the ultimate team sport, in which players must depend upon each other to win. A team trains strategizes and plays together for months. The players learn each other's strengths and weaknesses. Eleven players are on the field at one time, and their goal is to stop the other team from progressing down the field. If any one of those eleven players leaves the team, it disrupt the dynamics and cohesion that the entire team has worked together to build.

A third disadvantage is the loss of team dynasties. When I was a teenager, my home team made the playoffs for three years in a row. Since free agency was introduced, our team has not made it back to the playoffs for ten years. When the team did return 10 years later, my daughter fell in love with both the team and our star quarterback. That player moved to another team; because our home team has not had a winning season since he left, his new team has won the Superbowl for the last two years. [45]

31. A. NO CHANGE  
B. city's  
C. cities  
D. cities'

32. F. NO CHANGE  
G. at which  
H. for which  
J. DELETE the underlined portion.

33. The writer is considering adding a comma and the following to the end of the preceding sentence:

so they often switch teams many times in their careers.

Should the writer make this addition?

- A. Yes, because it adds an interesting detail about why players become free agents.  
B. Yes, because it provides a necessary link between being a free agent and switching teams.  
C. No, because it distracts from the focus on the parent-daughter relationship.  
D. No, because it is irrelevant to the point being made about free agents.

34. F. NO CHANGE  
G. career, so I had  
H. career, because I had  
J. career, and then I had
35. A. NO CHANGE  
B. free agency: for when my  
C. free agency, when my  
D. free agency when my
36. F. NO CHANGE  
G. player who was no longer with the team  
H. player, who was no longer, with the team  
J. player who was no longer, with the team
37. A. NO CHANGE  
B. lack of  
C. total  
D. wholehearted
38. F. NO CHANGE  
G. to win on each other  
H. upon winning with each other  
J. DELETE the underlined portion.

39. A. NO CHANGE  
B. trains, strategizes, and plays,  
C. trains strategizes, and plays  
D. trains, strategizes, and plays
40. F. NO CHANGE  
G. because their goal  
H. yet their goal  
J. or their goal
41. A. NO CHANGE  
B. disrupted  
C. disrupts  
D. disrupting
42. F. NO CHANGE  
G. A loss is the third disadvantage  
H. A disadvantage is the third loss  
J. The third loss is a disadvantage
43. A. NO CHANGE  
B. to the Super Bowl  
C. 10 years' later  
D. DELETE the underlined portion.

44. F. NO CHANGE

G. however

H. therefore

J. while

45. Which of the following sentences, if added, would best conclude the essay?

A. Football is a great sport that will never decrease in popularity.

B. Free agency has a variety of benefits, but the negatives outweigh the positives.

C. Free agency allows players to change teams frequently, which has made it increasingly difficult to root for a home team that never stays the same.

D. One thing will never change, and that is the home team.

### *Passage IV*

The paragraphs below may or may not be in the most logical order. A number in brackets appears above each paragraph. Question 49 will ask you to determine the most logical place for Paragraph 3.

#### **The Right to Write**

[1]

Going to see a play is a cultural tradition that has been passed on for thousands of years. Although theater is a form of art and entertainment, it is

also a highly competitive business, especially for playwrights. Many plays are written, but it is only<sup>46</sup> a select few are produced and seen by the public, and often with strings attached. Playwright José Rivera is an example of a contemporary playwright that<sup>47</sup> has fought for the right to have his work produced and seen in the way he intended it.

[2]

Rivera was born in San Juan, Puerto Rico, in 1955, but his family moved to New York when he was four years old. Yet<sup>48</sup> many of Rivera's relatives had already moved to the Bronx, a bustling neighborhood in New York, Rivera's father wanted to live in a place that felt more like a small town. So they moved to a quarter acre of land in Long Island, New York, which at the time had dirt roads and woods.

[3]

[49] From an early age, Rivera knew that he wanted to be a writer. As a kid, he wrote comic strips, a novel about baseball, and essays in response to photographs, from<sup>50</sup> *Life* magazine. When he was in middle school, he saw a play that inspired him when he saw the play that he wanted<sup>51</sup> to become a playwright. He writes<sup>52</sup> several plays during high school and in college.

[4]

Rivera, after graduating, returned to New York, from college determined to  
53  
continue writing. He worked at a bookstore and became then a copy editor at a  
54  
publishing company. Eventually, Rivera found an artistic home in a  
playwriting group called the Theater Matrix; the group met on Monday nights  
to share their work. One of them he wrote and produced, *The House of Roman*  
55  
*Iglesia*, received a good review by *The New York Times*. This was an important  
step in Rivera's career receiving a good review from a major publication led to  
56  
more work. The famous television producer Norman Lear read the review and  
immediately offered Rivera a job writing for Embassy Television in California.

[5]

In order to make a living, Rivera accepted the job. He learned a lot from  
the process of writing for television shows, but there were sacrifices he had to  
make. He missed writing plays and living in New York. [57] Rivera also  
discovered that in the entertainment business, he was often labeled and  
identified by his ethnicity. Rivera was proud of his cultural heritage but wanted  
to be acknowledged for his talent.

[6]

After many years of hard work and perseverance, Rivera has received the  
recognition he deserves through countless productions of his plays and the

numerous awards he has won for playwriting. Despite the challenges of show business, José Rivera has become an important playwright whose work has an impact on audiences worldwide.

58

46. F. NO CHANGE

G. there are only

H. only

J. there only is

47. A. NO CHANGE

B. who

C. which

D. whom

48. F. NO CHANGE

G. Meanwhile,

H. However,

J. Although

49. The most logical placement of Paragraph 3 is

A. where it is now. B.  
after Paragraph 1. C.  
after Paragraph 4. D.  
after Paragraph 5.

50. F. NO CHANGE  
G. photographs from H.  
photographs from:  
J. photographs; from

# Mathematics Test

50 Minutes — 45 Questions

**Directions:** Choose the correct solution to each question and fill in the corresponding bubble on your answer sheet.

Do not continue to spend time on questions if you get stuck. Solve as many questions as you can before returning to any if time permits.

You may use a calculator on this test for any question you choose. However, some questions may be better solved without a calculator.

Note: Unless otherwise stated, you can assume:

1. Figures are NOT necessarily drawn to scale.
2. Geometric figures are two dimensional.
3. The term *line* indicates a straight line.
4. The term *average* indicates arithmetic mean.

1. If  $7(2x - 5) = 3(x + 4) + 11$ , what is the value of  $x$ ?

- A. 2
- B.  $\frac{3}{13}$
- C. 5
- D.  $\frac{58}{11}$

2. A rectangular box has dimensions in the ratio 2:3:4. If the smallest dimension is 6 inches, what is the volume of the box in cubic inches?

- F. 432
- G. 216
- H. 648
- J. 324

3. If  $f(x) = x^3 - 2x^2 + 5x - 7$ , what is  $f(-2)$ ?

- A. -25
- B. -33
- C. -35
- D. -15

4. The population of a city decreased from 125,000 to 95,000. What was the percent decrease?

- F. 20%
- G. 24%
- H. 30%
- J. 24%

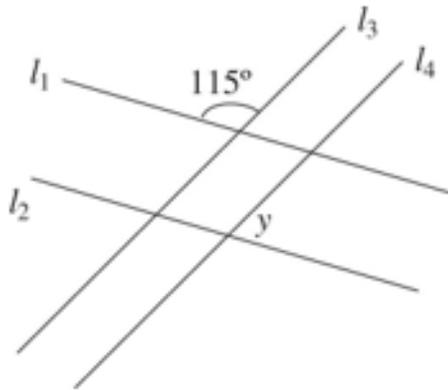
5. For all  $x \neq 0$  and  $y \neq 0$ ,  $(3x^2y^3)(4xy^4) = ?$

- A.  $12x^2y^7$
- B.  $7x^3y^7$
- C.  $12x^3y^7$
- D.  $12x^3y^{12}$

6. If  $\log_3(x - 2) = 4$ , then  $x = ?$

- F. 6
- G. 83
- H. 81
- J. 79

7. In the figure below,  $l_1$  is parallel to  $l_2$ ,  $l_3$  is parallel to  $l_4$ , and the lines intersect as shown. What is the measure of angle  $v$ ?



- A.  $60^\circ$
- B.  $65^\circ$
- C.  $70^\circ$
- D.  $75^\circ$

8. A sequence is defined by  $a_n = 3n^2 - 5n + 2$ . What is the value of  $a_5$ ?

- F. 52
- G. 62
- H. 52
- J. 48

9. If  $|3x - 8| = 19$ , what is the sum of all possible values of  $x$ ?

- A.  $16/3$
- B. 6
- C. 9
- D. 27

10. The sum of two numbers is 73 and their difference is 27. What is the product of these two numbers?

F. 1,150

G. 1,200

H. 1,050

J. 1,150

11. In a geometric sequence, the second term is 12 and the fifth term is 96. What is the first term?

A. 3

B. 4

C. 8

D. 6

12. If  $\tan(\theta) = 7/24$  where  $\theta$  is an acute angle, what is  $\sec(\theta)$ ?

F. 25/24

G. 7/25

H. 24/25

J. 24/7

13. What is the value of  $(2^3)(2^4)/(2^2)$ ?

A.  $2^5$

B.  $2^9$

C. 32

D. 64

14. A circle has a radius of  $r$  inches. If the radius is increased by 50%, by what percent does the area increase?

F. 50%

G. 125%

H. 150%

J. 225%

15. If  $x^2 - 10x + k$  is a perfect square trinomial, what is the value of  $k$ ?

- A. 5
- B. 25
- C. 100
- D. 10

16. The average of seven consecutive integers is 23. What is the largest of these integers?

- F. 25
- G. 24
- H. 26
- J. 27

17. For all  $x \neq -3$  and  $x \neq 5$ ,  $(x^2 - 2x - 15)/(x + 3) = ?$

- A.  $x - 5$
- B.  $x + 5$
- C.  $x^2 - 5$
- D.  $x - 3$

18. If  $4^{(x+3)} = 64^{(x-1)}$ , what is the value of  $x$ ?

- F. 9
- G. 4
- H. 5
- J. 3

19. A function is defined as  $f(x) = 2x - 7$ . If  $f(a) = f^{-1}(a)$ , what is the value of  $a$ ?

- A. 0
- B.  $7/2$
- C.  $14/3$
- D. 7

20. What is the coefficient of  $x^4$  in the expansion of  $(x - 2)^5$ ?

F.  $10x^4$

G. -80

H. 4

J. -40

21. If matrix  $M = \begin{bmatrix} 2 & -1 \\ 4 & 3 \end{bmatrix}$  and  $\det(M)$  represents the determinant of  $M$ , what is  $\det(M)$ ?

A. 2

B. 11

C. 10

D. 6

22. In triangle ABC, angle A =  $45^\circ$  and angle B =  $60^\circ$ . If side AB = 10, what is the approximate length of side BC?

F. 7.3

G. 7.3

H. 8.2

J. 9.1

23. The sum of the first  $n$  terms of an arithmetic sequence is given by  $S_n = 3n^2 + 2n$ . What is the 10th term?

A. 58

B. 59

C. 57

D. 60

24. If  $x$  varies directly with  $y^2$  and inversely with  $z$ , and  $x = 12$  when  $y = 6$  and  $z = 3$ , what is  $x$  when  $y = 4$  and  $z = 2$ ?

F. 16

G. 12

H. 8

J. 6

25. What is the solution set for  $x^2 - 7x + 10 > 0$ ?

- A.  $x < 2$  or  $x > 5$
- B.  $2 < x < 5$
- C.  $x \leq 2$  or  $x \geq 5$
- D. All real numbers

26. A sphere has a surface area of  $144\pi$  square centimeters. What is its volume in cubic centimeters?

- F.  $216\pi$
- G.  $288\pi$
- H.  $432\pi$
- J.  $288\pi$

27. If  $f(x) = \sqrt{x + 5}$  and  $g(x) = x^2 - 5$ , what is the domain of  $f(g(x))$ ?

- A.  $x \geq 0$
- B.  $x \geq 5$
- C.  $x \geq -5$
- D. All real numbers

28. Three consecutive terms of an arithmetic sequence have a sum of 81 and a product of 17,550. What is the middle term?

- F. 27
- G. 30
- H. 25
- J. 24

29. In a right triangle, the hypotenuse is 5 units longer than one leg and 3 units longer than the other leg. What is the length of the hypotenuse?

- A. 10
- B. 12
- C. 13
- D. 15

30. If  $\log(x) + \log(x + 21) = 2$ , what is the value of  $x$ ? (Assume  $\log$  represents  $\log_{10}$ )

F. 4

G. 4

H. 5

J. 7

31. The price of a stock increased by 40% in Year 1, decreased by 25% in Year 2, and increased by 20% in Year 3. If the original price was \$100, what is the price after 3 years?

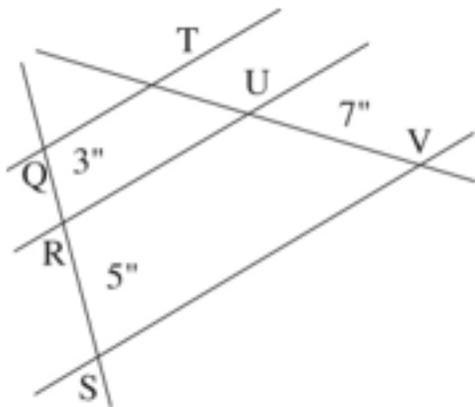
A. \$135

B. \$126

C. \$140

D. \$120

32. Three parallel lines are intersected by transversals, as shown below. The points of intersection are labeled. QR measures 3 inches, SZ measures 5 inches, and UV measures 7 inches. What is the length of AF, in inches?



F. 3/16

G. 3

H. 4

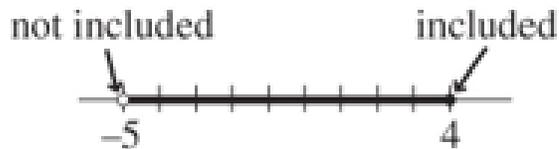
J. 3/16

K. 3/16

33. For what value of  $b$  will the system of equations  $3x + 2y = 12$  and  $6x + by = 24$  have infinitely many solutions?

- A. 4
- B. 6
- C. 8
- D. 12

34. Which of the following represents the same set as the figure shown below?



- F.  $x \leq -5$  or  $x > 4$
- G.  $x > -5$  or  $x \leq 4$
- H.  $x \geq -5$  or  $x < 4$
- J.  $x > -5$  and  $x \leq 4$
- K.  $x \geq -5$  and  $x < 4$

35. If  $\sin(A) + \sin(B) = 1$  and  $\cos(A) + \cos(B) = 0$ , where both  $A$  and  $B$  are acute angles, what is  $\sin(A + B)$ ?

- A. 0
- B.  $1/2$
- C. 1
- D.  $\sqrt{2}/2$

36. A committee of 5 people is to be chosen from a group of 8 people. How many different committees can be formed?

- F. 40
- G. 56
- H. 336
- J. 6,720

37. If the roots of the equation  $x^2 + px + q = 0$  are 3 and -7, what is the value of  $p - q$ ?

- A. 17
- B. -25
- C. 29
- D. 25

38. What is the distance from the point (4, -3) to the line  $3x + 4y = 12$ ?

- F. 2.4
- G. 3
- H. 2.4
- J. 4

39. If  $x^{2/3} = 16$ , what is the value of  $x$ ?

- A. 32
- B. 64
- C. 128
- D. 256

40. A cylinder and a cone have the same radius and height. If the volume of the cylinder is  $90\pi$  cubic inches, what is the volume of the cone?

- F.  $30\pi \text{ in}^3$
- G.  $45\pi \text{ in}^3$
- H.  $60\pi \text{ in}^3$
- J.  $270\pi \text{ in}^3$

41. The sum of an infinite geometric series is 48 and the first term is 16. What is the common ratio?

- A.  $2/3$
- B.  $1/2$
- C.  $2/2$
- D.  $3/4$

42. If  $i = \sqrt{-1}$ , what is the value of  $(2 + 3i)(4 - i)$ ?

F.  $5 + 10i$

G.  $8 - 3i$

H.  $8 + 12i$

J.  $11 + 10i$

43. The graph of  $y = f(x)$  is transformed to  $y = -2f(x - 3) + 5$ . Which of the following transformations has NOT been applied?

A. Horizontal shift

B. Vertical shift

C. Horizontal stretch/compression

D. Reflection over the x-axis

44. If the polynomial  $P(x) = x^3 + ax^2 + bx + 6$  has  $(x - 1)$  and  $(x + 2)$  as factors, what is the value of  $a$ ?

F.  $-4$

G.  $-2$

H.  $1$

J.  $4$

45. What is the remainder when  $5x^4 - 3x^3 + 2x - 7$  is divided by  $(x - 2)$ ?

A.  $51$

B.  $53$

C.  $49$

D.  $55$

# Reading Test

40 Minutes — 36 Questions

**Directions:** The Reading Test includes multiple passages. Each passage includes multiple questions. After reading each passage, choose the best answer and fill in the corresponding bubble on your answer sheet. You may review the passages as often as necessary.

## *Passage I*

Prose Fiction

*This passage is adapted from Howard’s End, by E.M. Forster (1910). Two sisters, Helen and Margaret, are attending an orchestra performance with friends and family.*

It will be generally admitted that Beethoven’s *Fifth Symphony* is the most sublime noise that has ever penetrated into the ear of man. All sorts and conditions are satisfied by it. Whether you are like  
(5) Mrs. Munt, and tap surreptitiously when the tunes come—of course, not so as to disturb the others—

or like Helen, who can see heroes and shipwrecks  
in the music's flood; or like Margaret, who can only  
see the music; or like Tibby, who is profoundly  
(10) versed in counterpoint, and holds the full score of  
the symphony open on his knee; or like Fraulein  
Mosebach's young man, who can remember  
nothing but Fraulein Mosebach: in any case, the  
passion of your life becomes more vivid, and you  
(15) are bound to admit that such a noise is cheap at  
two shillings. It is cheap, even if you hear it in the  
Queen's Hall, dreariest music-room in London,  
though not as dreary as the Free Trade Hall,  
Manchester; and even if you sit on the extreme left  
(20) of that hall, so that the brass bumps at you before  
the rest of the orchestra arrives, it is still cheap.

"Whom is Margaret talking to?" said Mrs. Munt,  
at the conclusion of the first movement. She was  
again in London on a visit to Wickham Place.

(25) Helen looked down the long line of their party,  
and said that she did not know.

"Would it be some young man or other whom  
she takes an interest in?"

"I expect so," Helen replied. Music enwrapped  
(30) her, and she could not be bothered by the  
distinction that divides young men whom one  
takes an interest in from young men whom one  
knows.

"You girls are so wonderful in always having—  
(35) Oh dear! One mustn't talk."

For the Andante had begun—very beautiful,

but bearing a family likeness to all the other  
beautiful andantes that Beethoven had written, and,  
to Helen's mind, rather disconnecting the heroes  
(40) and shipwrecks of the first movement from the  
heroes and goblins of the third. She heard the tune  
through once, and then her attention wandered,  
and she gazed at the audience, or the organ, or the  
architecture. Then Beethoven started decorating  
(45) his tune, so she heard him through once more, and  
then she smiled at her Cousin Frieda. But Frieda,  
listening to classical music, could not respond. Herr  
Liesecke, too, looked as if wild horses could not  
make him inattentive; there were lines across his  
(50) forehead, his lips were parted, his glasses at right  
angles to his nose, and he had laid a thick, white  
hand on either knee. And next to her was Aunt  
Juley, so British, and wanting to tap. How interesting  
that row of people was! What diverse influences  
(55) had gone into the making of them! Here Beethoven,  
after humming and hawing with great sweetness,  
said "Heigho," and the Andante came to an end.  
Applause ensued, and a round of praise volleying  
from the audience. Margaret started talking to her  
(60) new young man; Helen said to her aunt: "Now  
comes the wonderful movement: first of all the  
goblins, and then a trio of elephants dancing"; and  
Tibby implored the company generally to look out  
for the transitional passage on the drum.  
(65) "On the what, dear?"  
"On the drum, Aunt Juley."

“No—look out for the part where you think  
you are done with the goblins and they come back,”  
breathed Helen, as the music started with a goblin  
(70) walking quietly over the universe, from end to end.  
Others followed him. They were not aggressive  
creatures; that was what made them so terrible to  
Helen. They merely observed in passing that there  
was no such thing as splendor or heroism in the  
(75) world. Helen could not contradict them, for once,  
she had felt the same, and had seen the reliable  
walls of youth collapse. Panic and emptiness! Panic  
and emptiness! The goblins were right. Her brother  
raised his finger; it was the transitional passage on  
(80) the drum.

Helen pushed her way out during the applause.  
She desired to be alone. The music had summed  
up to her all that had happened or could happen in  
her life.  
(85) She read it as a tangible statement, which could  
never be superseded. The notes meant this and that  
to her, and they could have no other meaning, and  
life could have no other meaning. She pushed right  
out of the building and walked slowly down the  
(90) outside staircase, breathing the autumnal air, and  
then she strolled home.

1. Helen would most likely agree with which of the following  
statements about her relationship with Margaret?

- A. Helen disapproves of Margaret's actions.
- B. Helen's feelings toward Margaret are affected by Helen's jealousy of the attention Margaret receives from suitors.
- C. Helen is not interested in Margaret's actions, at least as long as the music is playing.
- D. They are drawn together principally by their mutual love of music.

2. Helen can most accurately be characterized as:

- F. creative and effervescent.
- G. analytical yet optimistic.
- H. imaginative and introspective.
- J. curt and insensitive.

3. Which of the following statements does NOT describe one of Helen's reactions to the goblins?

- A. She feels that their presence is a denial of the good in the world.
- B. She is frightened by the goblins' aggressive nature.
- C. She cannot deny the viewpoint that the goblins seem to represent.
- D. She believes that the goblins will return after they appear to have left.

4. As it is used in line 44, the word *decorating* most nearly means:

- F. dressing up.
- G. glamorizing.
- H. awarding.
- J. embellishing.

5. Which of the following does the author mention as images the music brings to the listeners' minds?

- A. Wild horses
- B. Shipwrecks
- C. Queen's Hall
- D. Drums

6. According to the passage, when Tibby listens to the symphony he is:

- F. most interested in the technical aspects of the music.
- G. caught up in imagery that the music conveys to him.
- H. distracted from the performance as a whole because of his focus on the drum.
- J. depressed by his dreary surroundings.

7. Which of the following statements most accurately expresses Helen's feelings as she leaves after the symphony?

- A. Helen feels alienated by the indifference of her companions.
  - B. Helen is meditative, pondering the music's immutable meaning.
  - C. Helen is upset with Tibby's constant focus on the technical aspects of the music.
  - D. Helen is relieved to have escaped the crowding and discomfort of the performance hall.
8. It can most reasonably be inferred from the passage that the reason Aunt Juley refrains from tapping along with the music is because:
- F. Aunt Juley is concentrating instead on the drum.
  - G. Aunt Juley does not want to distract Helen.
  - H. British custom only permits snapping one's fingers along with the music.
  - J. Aunt Juley feels it would not be appropriate.
9. All of the following characters are deeply interested in the music EXCEPT:
- A. Herr Liesecke.
  - B. Margaret.
  - C. Fraulein Mosebach's young man.
  - D. Tibby.
10. According to the passage, the reason why Helen's attention returns to the Andante after it had wandered is because she:

- F. hears changes in the tune.
- G. is directed to do so by Tibby.
- H. no longer wishes to speak with Mrs. Munt.
- J. believes the Andante is nearing its end.

## *Passage II*

### Social Science

*The following passage is adapted from the article “What Causes Overweight and Obesity” released by the National Heart, Lung and Blood Institute.*

The past 10 years have seen a dramatic rise in “diseases of affluence” in the United States.

Americans suffer from type II diabetes, obesity, and cardiovascular disease in epidemic proportions.

- (5) Indeed, American culture is often perceived to be entrenched in fast-food, excessive consumption, and minimal physical exertion. Supermarkets and restaurants in the United States serve a panoply of processed foods loaded with sugar, preservatives,
- (10) trans-fats and cholesterol. Children develop poor eating habits—from sugar-laden cereals to school lunches drenched in saturated fat—that, unfortunately, last into adulthood. While changes in diet are partly responsible for American obesity, the
- (15) primary cause of obesity is the sedentary lifestyle that 40 percent of Americans currently lead.

For most of human history, people worked as

farmers, hunters, laborers, and tradesmen—all physically demanding occupations. Blacksmiths  
(20) hammered metal, servants washed dirty linen, and farmers lifted hay bales by hand. At the time, the only sources of work energy were animals or man power. However, these lifestyles afforded people vast stretches of idle time—winter  
(25) months, religious holidays, and festivals—to rest and recover. Furthermore, routine and leisure activities also required more physical exertion. For all but the wealthy, everyday life was similar to a balanced gym routine. Despite high mortality  
(30) from infectious diseases and malnutrition (and debilitating physical injuries suffered in far more hazardous working environments than today’s workplace), physical fitness was standard.

Urbanization and industrialization during the  
(35) 19th and 20th centuries drastically changed people’s life-styles. Agricultural advances have led to increasingly larger farms manned by fewer workers. Machines are used for most aspects of farming, from sowing seeds to harvesting. Manufacturing,  
(40) meanwhile, transformed into a system of mass production facilitated by machines—a process that does not require the range or degree of physical exertion from workers as was necessitated by preindustrial fabrication. People began to move less  
(45) and sit more. During the 20th century, increasingly elaborate systems of government and finance brought about the most sedentary workplace of all:

the office building. Suddenly massive complexes  
peopled by legions of clerks, salespeople, analysts,  
(50) and secretaries manning telephones, computers,  
and typewriters began to fill the American city.  
Urbanization condensed all aspects of living into a  
few square blocks. The conveniences of the modern  
urban environment are also conducive to inactivity.  
(55) Transportation has also exacerbated the problem by  
offering city dwellers numerous options for travel,  
none of which require any real physical exertion.  
Therefore, the average 9-to-5 worker can go to  
work, run errands, and seek entertainment with  
(60) little more effort than what is required to walk to  
and from a car or a mass transit station.

Leisure has likewise contributed to the obesity  
epidemic. Watching television and playing video  
games have supplanted sports, leisurely strolls,  
(65) and horse-riding as popular pastimes. Pre-studies  
have revealed a positive correlation between hours  
of television viewing and levels of obesity. In  
fact, video games are found to play an especially  
significant role in childhood obesity.

(70) Despite the proliferation of gimmick diets  
and fancy gadgets, losing weight is actually a  
simple matter of burning more calories than one  
consumes. Active living initiatives are working  
hard to bring more movement into the average  
(75) American's life. Urban planners are designing cities  
that include more sidewalks, crosswalks, parks, and  
bicycle trails. Education programs and advertising

campaigns seek to reform the deleterious habits of adults and create more active lifestyles in children.

(80) Parents and nutritionists are working together to banish some of the more egregious offenders—fries, pizza, and soda—from public school cafeterias.

In the 21st century, the stakes for combating (85) obesity in the United States are increasingly high.

As an overweight baby boom generation enters its twilight, insurance providers and health care professionals are encountering alarming rates of diabetes and heart disease. American life

(90) expectancy has begun to drop from all-time highs during the late 1990s. Even more concerning is the earlier onset of obesity in younger generations.

Given that the World Health Organization has estimated 60 percent of the global population get

(95) insufficient exercise, finding a way to get people back in shape is perhaps the greatest health care issue that the world currently faces.

11. According to the author, pre-industrial revolution farmers faced challenges of:

- A. winter weather.
- B. obesity.
- C. disease.
- D. poor eating habits.

12. According to the passage, all of the following are aspects of pre-industrial culture responsible for promoting physical fitness

EXCEPT:

- F. the hazardous conditions of the 19th century workplace.
- G. the variation of physical activity required by most occupations.
- H. the absence of alternative energy source for performing tasks.
- J. the vigor of pastime activities.

13. The function of lines 17–33 is to:

- A. provide examples of typical pre-industrial occupations that have been rendered obsolete.
- B. cite occupations that necessitated human energy for successful completion.
- C. recommend jobs that modern Americans should pursue to counter obesity.
- D. explain why consuming foods rich in calories was more acceptable in past eras.

14. The third paragraph details the effects of industrialization on the workplace by:

- F. citing the hazards of the modern workplace.
- G. lamenting the working conditions in office buildings.
- H. praising the efficiency of modern farming and manufacturing.
- J. indicating specific ways in which modern workers do less physical work.

15. The author mentions 9-5 workers (lines 58–61) in order to:

- A. give an example of people who do not get a lot of exercise.
- B. prove that pre-industrial revolution farm workers are superior to modern office workers.
- C. criticize urbanization.
- D. support nutritional initiatives to combat obesity.

16. All of the following are cited as those working to make people more active and improve diets EXCEPT:

- F. urban planners.
- G. advertisers.
- H. nutritionists.
- J. physicians.

17. According to the passage, losing weight:

- A. is essential to avoiding health problems in later life.
- B. can be achieved only through excessive levels of physical exertion.
- C. is possible when caloric intake exceeds energy burned through activity.
- D. requires a deficit between consumption and metabolism.

18. The author most likely mentions diets and exercise machines to:

- F. contrast public opinion with the simplicity of losing weight.
- G. give examples of effective weight loss techniques.
- H. critique nontraditional methods of combating obesity.
- J. emphasize the ease of using modern exercise machines.

19. Based on the passage, health-conscious families and experts' attitudes toward public school lunches can best be described as:

- A. ambivalent.
- B. inimical.
- C. apathetic.
- D. enthralled.

20. The author most likely mentions *life expectancy* in lines 89–90 in order to:

- F. emphasize the longevity of Americans during the 1990s.
- G. indicate that obesity has innocuous effects on older Americans.
- H. illustrate long-term effects of obesity in the U.S. population.
- J. contrast American health with the health of people in other countries.

## *Passage III*

### Humanities

*This passage is excerpted from “Mr. Bennett and Mrs. Woolf,” by Irving Howe. Reprinted by permission of The New Republic, © 1990, The New Republic, LLC.*

Literary polemics come and go, sparking a season of anger and gossip, and then turning to dust. A handful survive their moment:

- Dr. Johnson’s demolition of Soames Jenyn, Hazlitt’s
- (5) attack on Coleridge. But few literary polemics can have been so damaging, or so lasting in consequences, as Virginia Woolf’s 1924 essay “Mr. Bennett and Mrs. Brown,” about the once widely read English novelists Arnold Bennett,
- (10) H. G. Wells, and John Galsworthy. For several literary generations now, Woolf’s essay has been taken as the definitive word finishing off an old-fashioned school of fiction and thereby clearing the way for literary modernism. Writing with her glistening
- (15) charm, and casting herself as the voice of the new

(always a shrewd strategy in literary debate), Woolf quickly seized the high ground in her battle with Bennett. Against her needling thrusts, the old fellow never had a chance.

- (20) The debate has been nicely laid out by Samuel Hynes in *Edwardian Occasions*, and I owe to him some of the following details. It all began in 1917, with Woolf's review of a collection of Bennett's literary pieces, a rather favorable review marred
- (25) by the stylish snobbism that was becoming a trademark of the Bloomsbury circle. Bennett, wrote Woolf, had a materialistic view of the world—"he had been worrying himself to achieve infantile realisms." A catchy phrase, though exactly what
- (30) "infantile realisms" meant Woolf did not trouble to say. During the next few years she kept returning to the attack, as if to prepare for "Mr. Bennett and Mrs. Brown." More than personal sensibilities or rivalries of status was involved here, though
- (35) both were quite visible; Woolf was intent upon discrediting, if not simply dismissing, a group of literary predecessors who enjoyed a large readership.

- In 1923 Bennett reviewed Woolf's novel *Jacob's Room*, praising its "originality" and "exquisite" prose
- (40) but concluding that "the characters do not vitally survive in the mind." For Bennett, this was a fatal flaw. And for his readers, too—though not for the advanced literary public that by now was learning to suspect this kind of talk about "characters
- (45) surviving" as a lazy apology for the shapeless and

perhaps even mindless Victorian novel.

A year later Woolf published her famous essay, brilliantly sketching an imaginary old lady named Mrs. Brown whom she supplied with anecdotes  
(50) and reflections as tokens of inner being. These released the sort of insights, suggested Woolf, that would not occur to someone like Bennett, a writer obsessed with dull particulars of setting (weather, town, clothing, furniture, and so on). Were Bennett  
(55) to write about a Mrs. Brown, he would describe her house in conscientious detail but never penetrate her essential life, for—what a keen polemicist!—“he is trying to hypnotize us into the belief that, because he has made a house, there must be a  
(60) person living there.” (Herself sensitive to the need for a room with a view, Woolf seemed indifferent to what a house might mean for people who had risen somewhat in the world. For a writer like Bennett, however, imagining a house was part of the way to  
(65) locate “a person living there.”) And in a quiet putdown of Bennett’s novel *Hilda Lessways* (not one of his best), Woolf gave a turn of the knife: “One line of insight would have done more than all those lines of description.”  
(70) From the suave but deadly attack of “Mr. Bennett and Mrs. Brown” Bennett’s literary reputation never quite recovered. He remained popular with the general public, but among literary readers, the sort that became the public for the emerging modernists,  
(75) the standard view has long been that he was a

middling, plodding sort of Edwardian writer whose work has been pushed aside by the revolutionary achievements of Lawrence, Joyce, and to a smaller extent Woolf herself.

- (80) When Bennett died in 1930, Woolf noted in her diary that “he had some real understanding power, as well as a gigantic absorbing power [and] direct contact with life”—all attributes, you might suppose, handy for a novelist but for her
- (85) evidently not sufficient. In saying this, remarks Hynes, “Woolf gave Bennett, perhaps, the ‘reality gift’ that [she] doubted in herself, the gift that she despised and envied.” Yes; in much of her fiction Woolf resembles Stevens’s man with the blue guitar
- (90) who “cannot bring a world quite round/Although I patch it as I can.” Still, none of this kept Woolf from steadily sniping at Bennett’s “shopkeeping view of literature.” Bennett was a provincial from the Five Towns; Bennett was commercially successful;
- (95) Bennett was an elder to be pulled down, as elders must always be pulled down even if they are also admired a little.

21. Which of the following statements best characterizes the author’s view of Virginia Woolf?

- A. Woolf criticized others only in areas where she felt strong, leaving her own weaknesses out of the discussion.
- B. Woolf only disparaged Bennett and his school of authors because she envied the strides they had made.
- C. Woolf almost single-handedly changed the prevailing opinion about a particular writer and laid the path for a new school of literature.
- D. Woolf's views toward the venerated authors of the day were abusive, and her reputation has rightly suffered as a result of those attacks.

22. As it is used in line 1, the word *polemics* most nearly means:

- F. attacks.
- G. reviews.
- H. controversies.
- J. friendships.

23. In the first paragraph, the author compares Woolf's polemic against Bennett to other literary attacks. This comparison supports the author's view that:

- A. Bennett's dull style of writing would soon have fallen out of fashion anyway.
- B. many such attacks are remembered as turning points for the arts.
- C. Woolf fought with other authors often.
- D. Woolf's criticisms of Bennett were especially important and memorable.

24. According to the passage, Bennett's literary output was marked by:

- F. description of the scene rather than insight into the characters.
- G. the use of colorful characters who frequently reveal their deepest emotions.
- H. fewer essays than Woolf wrote.
- J. exhaustive description of minute details.

25. It can be reasonably inferred from the passage that the author means to:

- A. demonstrate an effective strategy for writing a literary polemic.
- B. suggest a new interpretation of a well-known literary polemic.
- C. analyze one literary polemic and its effect on the literature of its era.
- D. assess the significance of a literary polemic in the context of similar works.

26. Based on the passage, it is most reasonable to infer that Woolf's phrase *infantile realisms* (line 30) means:
- F. a focus on things rather than on people.
  - G. the values of the Bloomsbury Circle.
  - H. the type of writing that doesn't survive in the reader's mind.
  - J. the superficial details of Mrs. Brown's house.
27. In the final sentence of the passage, the author suggests that Woolf believed that "elders must always be pulled down." This same sentiment is most closely exemplified by which of the following examples from the passage?
- A. The author's view of Woolf's novel *Jacob's Room*
  - B. The author's view of *Edwardian Occasions* by Samuel Hynes
  - C. The author's comparison of Woolf to "Stevens's man with the blue guitar"
  - D. The author's reference to Bennett's *Hilda Lessways* as "not one of his best"
28. Bennett's general opinion of Woolf's novel *Jacob's Room* was that it was:
- F. inferior to other novels published at that time.
  - G. a keen example of a new style of literature.
  - H. a success, despite one or two minor failings.
  - J. generally original and inspired, but with significant problems.

29. It is Woolf's opinion that the thoughts and feelings of characters are more important than the details of a scene because:
- A. scenic descriptions were part of a literary style that she disliked.
  - B. scenic details cannot convey a sense of the character within.
  - C. good authors know to include at least one line of insight into a character.
  - D. scenic details create characters that are easily forgettable.
30. In the last paragraph, the function of the phrase "he had some real understanding power, as well as a gigantic absorbing power [and] direct contact with life" (lined 81-83) is to present:
- F. Woolf retracting her criticism of Bennett.
  - G. Woolf excoriating Bennett.
  - H. Bennett praising Woolf.
  - J. Woolf praising Bennett.

## *Passage IV*

### Natural Science

*Fossil fuels are energy-rich substances formed from the remains of organisms. Both coal and petroleum help power commercial energy throughout the world.*

#### Passage A

Coal is a solid fossil fuel formed from the

remains of land plants that flourished 300 to 400 million years ago. It is composed primarily of carbon but also contains small amounts of sulfur.

- (5) When the sulfur is released into the atmosphere as a result of burning, it can form  $\text{SO}_2$ , a corrosive gas that can damage plants and animals. When it combines with  $\text{H}_2\text{O}$  in the atmosphere, it can form sulfuric acid, one of the main components of acid
- (10) rain, which has been demonstrated to be an environmental hazard. Burning coal has also been shown to contain trace amounts of mercury and radioactive materials, similarly dangerous substances. The type of coal that is burned directly affects the amount of
- (15) sulfur that is released into the atmosphere.

The formation of coal goes through discrete stages as, over millions of years, heat and pressure act on decomposing plants. Coal begins as peat, partially decayed plant matter, which is still found

(20) today in swamps and bogs, and can be burned, but produces little heat. As the decayed plant material is compressed over time, lignite is formed. Lignite is a sedimentary rock with low sulfur content and, like peat, also produces a small amount of heat

(25) when burned. With further compaction, lignite loses moisture, methane, and carbon dioxide, and becomes bituminous coal, the form of coal most widely used. Bituminous coal is also a sedimentary rock, but it has a high sulfur content.

- (30) Anthracite, or hard coal, is a metamorphic rock formed when heat and pressure are added to

bituminous coal. Anthracite coal is most desirable because it burns very hot and also contains a much smaller amount of sulfur, meaning that it burns  
(35) cleaner.

However, the supplies of anthracite on Earth are limited. In the United States, most anthracite is extracted from the valleys of northeastern Pennsylvania, which is known as the Coal Region.  
(40) The major American reserve of bituminous coal is in West Virginia, while the largest coal producer in the world is The People's Republic of China. The United States and China are also foremost among the world's coal consumers. There are many other  
(45) coal-producing areas throughout the world, though in some cases, the coal is essentially tapped out, or other, cleaner sources of coal are preferred.

Coal is extracted from mines. For subsurface mines, machines dig shafts and tunnels underground  
(50) to allow the miners to remove the material. Buildup of poisonous gases, explosions, and collapses are all dangers that underground miners must face. The Sago Mine disaster of January 2006 in West Virginia—where only 1 of 13 trapped miners  
(55) survived an explosion—shows how extracting these underground deposits of solid material is still a very dangerous process. Strip mining, or surface mining, is cheaper and less hazardous than underground mining. However, it often leaves the land scarred and  
(60) unsuitable for other uses.

## Passage B

Petroleum, or crude oil, is a thick liquid that contains organic compounds of hydrogen and carbon, called hydrocarbons. The term “crude oil” refers to both the unprocessed petroleum and the  
(65) products refined from it, such as gasoline, heating oil, and asphalt. Petroleum contains many types of hydrocarbons in liquid, solid and gaseous forms, as well as sulfur, oxygen, and nitrogen.

When organic material such as zooplankton  
(70) and algae settled on the bottom of oceans millions of years ago, the material mixed with mud and was covered in sediment more quickly than it could decay. Thousands of years later, the sediments that contained the organic material were subjected to  
(75) intense amounts of heat and pressure, changing it into a waxy material called kerogen. From this substance, liquid hydrocarbons can be produced to create oil shale. When more heat was added to the kerogen, it liquefied into the substance we know  
(80) as oil. Since hydrocarbons are usually lighter than rock or water, they migrate upward through the permeable rock layers until they reach impermeable rocks. The areas where oil remains in the porous rocks are called reservoirs.

(85) Oil is traditionally pumped out of the layer of reserves found under the surface of Earth. In order to penetrate the earth, an oil well is created using an oil rig, which turns a drill bit. After the hole is drilled, a casing—a metal pipe with a slightly

(90) smaller diameter than the hole—is inserted and bonded to its surroundings, usually with cement. This strengthens the sides of the hole, or wellbore, and keeps dangerous pressure zones isolated. This process is repeated with smaller bits and thinner (95) casings, going deeper into the surface to reach the reservoir. Drilling fluid is pushed through the casings to break up the rock in front of the bit and to clean away debris and lower the temperature of the bit, which grows very hot. Once the reservoir is (100) reached, the top of the wellbore is usually equipped with a set of valves encased in a pyramidal iron cage called a Christmas Tree.

The natural pressure within the reservoir is usually high enough to push the oil or gas up to the (105) surface. But sometimes, additional measures, called secondary recovery, are required. This is especially true in depleted fields. Installing thinner tubing is one solution, as are surface pump jacks—the structures that look like horses repeatedly dipping their heads.

(110) It is impossible to remove all of the oil in a single reservoir. In fact, a 30 percent to 40 percent yield is typical. However, technology has provided a few ways to increase drilling yield, including forcing water or steam into the rock to “push” out more of the oil. (115) Even with this technique, only about 50 percent of the deposit will be extracted.

There are also more unconventional sources of oil, including oil shale and tar sands. The hydrocarbons obtained from these sources require

(120) extensive processing to be useable, reducing their value. The extraction process also has a particularly large environmental footprint.

Questions 31–33 ask about Passage A.

31. According to the first paragraph, all of the following are released or formed when coal is burned EXCEPT:

- A. SO<sub>2</sub>.
- B. sulfuric acid.
- C. hydrocarbons.
- D. mercury.

32. The passage suggests that which of the following has the smallest amount of moisture, methane, and carbon dioxide?

- F. Lignite
- G. Peat
- H. Bituminous coal
- J. Kerogen

33. The author contrasts bituminous coal with anthracite in order to:

- A. indicate that bituminous coals burns cleaner.
- B. compare the amount of mercury in each one.
- C. suggest that burning anthracite is better for the environment.
- D. recommend replacing all coals with oil.

Questions 34–36 ask about Passage B.

34. As it is used in line 122, the phrase *environmental footprint* most likely means:

- F. indentations in the surface of the earth.
- G. the positive environmental results of extracting oil.
- H. the effect that a person or activity has on the environment.
- J. irreversible damage to the earth.

35. According to the passage, the second step in extracting the oil is:

- A. drilling a hole.
- B. pushing in draining fluid.
- C. topping with valves.
- D. inserting a pipe.

36. What is most likely true about an oil field in which a pump jack is installed?

- F. Oil is being extracted in the safest way.
- G. The oil reserves in the field are greatly diminished.
- H. About 60 percent of the available oil is recovered.
- J. The wellbore is strengthened.

# Science Test

40 Minutes — 40 Questions

**Directions:** The Science Test includes multiple passages. Each passage includes multiple questions. After reading each passage, choose the best answer and fill in the corresponding bubble on your answer sheet. You may review the passages as often as necessary.

You may NOT use a calculator on this test.

## *Passage I*

A panel of engineers designed and built a pressurized structure to be used for shelter by geologists during extended research missions near the South Pole. The design consisted of 4 rooms, each with its own separate heating and air pressure control systems. During testing, the engineers found the daily average air temperature, in degrees Celsius ( $^{\circ}\text{C}$ ), and daily average air pressure, in millimeters of mercury (mm Hg), in each room. The data for the first 5 days of their study are given in Table 1 and Table 2.

Table 1		Daily average air temperature (°C)			
Day	Room 1	Room 2	Room 3	Room 4	
		Daily average air temperature (°C)			
Day	Room 1	Room 2	Room 3	Room 4	
1	19.64	19.08	18.67	18.03	
2	20.15	19.20	18.46	18.11	
3	20.81	19.19	18.62	18.32	
4	21.06	19.51	19.08	18.91	
5	21.14	19.48	18.60	18.58	

Table 2		Daily average air pressure (mm Hg)			
Day	Room 1	Room 2	Room 3	Room 4	
1	748.2	759.6	760.0	745.2	
2	752.6	762.0	758.7	750.3	
3	753.3	760.2	756.5	760.4	
4	760.1	750.8	755.4	756.8	
5	758.7	757.9	754.0	759.5	

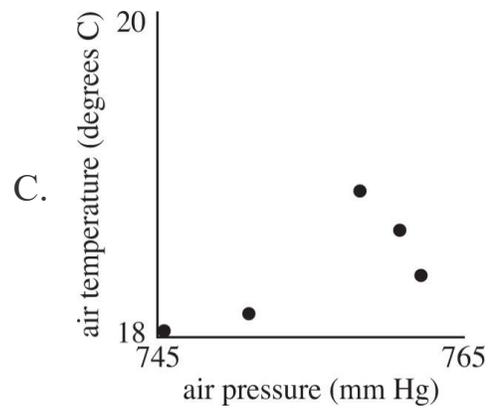
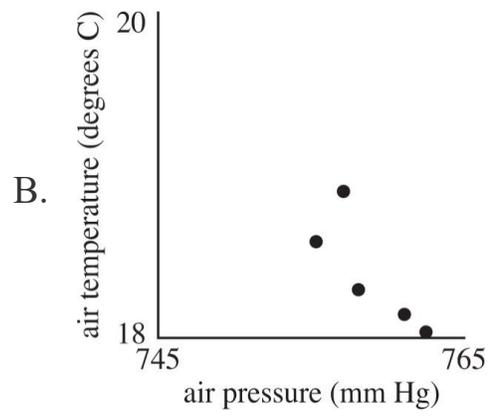
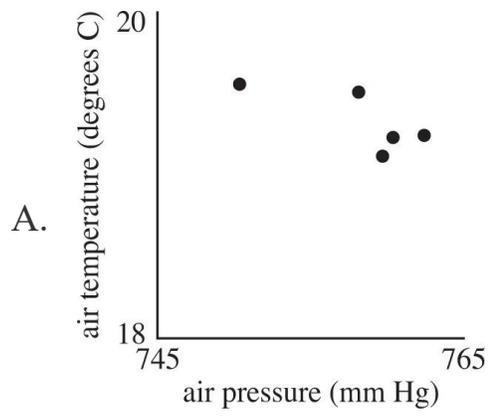
1. The lowest daily average air pressure recorded during the first 5 days of the study was:

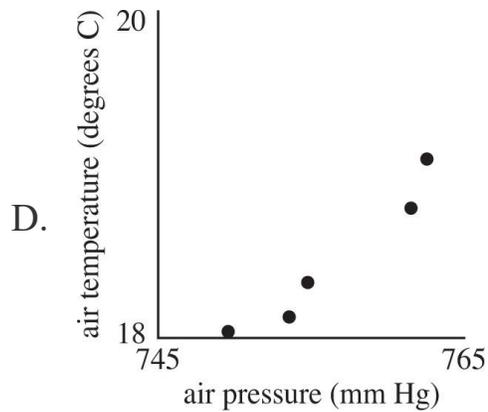
- A. 762.0 mm Hg.
- B. 745.2 mm Hg.
- C. 21.14 mm Hg.
- D. 18.03 mm Hg.

2. According to Table 2, daily average air pressures were recorded to the nearest:

- F. 0.01 mm Hg.
- G. 0.1 mm Hg.
- H. 1.0 mm Hg.
- J. 10 mm Hg.

3. Which of the following graphs best represents a plot of the daily average air temperature versus the daily average air pressure for Room 4 ?





4. Which of the following most accurately describes the changes in the daily average air pressure in Room 3 during days 1–5 ?
- F. The daily average air pressure increased from day 1 to day 4 and decreased from day 4 to day 5.
  - G. The daily average air pressure decreased from day 1 to day 2, increased from day 2 to day 4, and decreased again from day 4 to day 5.
  - H. The daily average air pressure increased only.
  - J. The daily average air pressure decreased only.
5. Suppose the *heat absorption modulus* of a room is defined as the quantity of heat absorbed by the contents of the room divided by the quantity of heat provided to the entire room. Based on the data, would you be justified in concluding that the heat absorption modulus of Room 1 was higher than the heat absorption modulus of any of the other rooms?

- A. Yes, because the quantity of heat provided to Room 1 was greater than the quantity of heat provided to any of the other rooms.
  - B. Yes, because the quantity of heat not absorbed by the contents of Room 1 was greater than the quantity of heat not absorbed by the contents of any of the other rooms.
  - C. No, because the quantity of heat absorbed by the contents of Room 1 was less than the quantity of heat absorbed by the contents of any of the other rooms.
  - D. No, because the information provided is insufficient to determine heat absorption modulus.
6. If the geologists were to use equipment that malfunctions in warm environments, which room would be most likely to cause the equipment to malfunction?
- F. Room 1
  - G. Room 2
  - H. Room 3
  - J. Room 4

## *Passage II*

Microbiologists have observed that certain species of bacteria are *magnetotactic*, that is, sensitive to magnetic fields. Several species found in the bottom of swamps in the Northern Hemisphere tend to orient themselves toward magnetic north (the northern pole of the earth's magnetic field).

Researchers conducted the following series of experiments on magnetotactic bacteria.

### Study 1

A drop of water filled with magnetotactic bacteria was observed under high magnification. The direction of the first 500 bacterial migrations across the field of view was observed for each of five trials and the tally for each trial recorded in Table 1. Trial 1 was conducted under standard laboratory conditions. In Trial 2, the microscope was shielded from all external light and electric fields. In Trials 3 and 4, the microscope was rotated clockwise 90° and 180°, respectively. For Trial 5, the microscope was moved to another laboratory at the same latitude.

Table 1				
Trial	Direction			
	North	East	South	West
1	474	7	13	6
2	481	3	11	5
3	479	4	12	5
4	465	9	19	7
5	480	3	11	6

### Study 2

The north pole of a permanent magnet was positioned near the microscope slide. The magnet was at the 12:00 position for Trial 6 and was moved 90° clockwise for each of three successive trials. All other conditions were as in Trial 1 of Study 1. The results were tallied and recorded in Table 2.

Table 2				
Trial	Direction			
	12:00	3:00	6:00	9:00
6	470	6	15	9
7	8	483	3	6
8	17	4	474	5
9	5	19	9	467

7. What serves as the control in Study 1 ?

- A. Trial 1
- B. Trial 2
- C. Trial 3
- D. Trial 5

8. The hypothesis that light was NOT the primary stimulus affecting the direction of bacterial migration is:

- F. supported by a comparison of the results of Studies 1 and 2.
- G. supported by a comparison of the results of Trials 1 and 2 of Study 1.
- H. supported by a comparison of the results of Trials 3 and 4 of Study 1.
- J. not supported by any of the results noted in the passage.

9. If the south pole of the permanent magnet used in Study 2 had been placed near the microscope slide, what would the most likely result have been?

- A. The figures for each trial would have remained approximately the same, since the strength of the magnetic field would be unchanged.
- B. The bacteria would have become disoriented, with approximately equal numbers moving in each direction.
- C. The major direction of travel would have shifted by  $180^\circ$  because of the reversed direction of the magnetic field.
- D. The bacteria would still have tended to migrate toward Earth's magnetic north, but would have taken longer to orient themselves.

10. It has been suggested that magnetic sensitivity helps magnetotactic bacteria orient themselves downward. Such an orientation would be most advantageous from an evolutionary standpoint if:

- F. organisms that consume magnetotactic bacteria were mostly bottom-dwellers.
- G. the bacteria could only reproduce by migrating upwards to the water's surface.
- H. bacteria that stayed in the top layers of water tended to be dispersed by currents.
- J. the nutrients necessary for the bacteria's survival were more abundant in bottom sediments.

11. Researchers could gain the most useful new information about the relationship between magnetic field strength and bacterial migration by repeating Study 2 with:

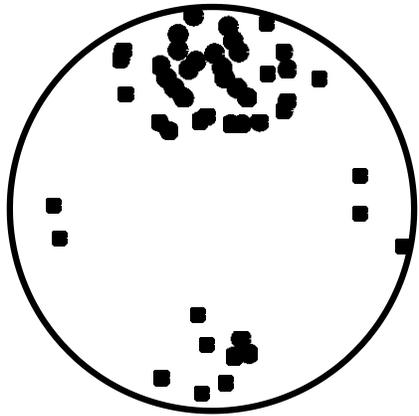
- A. incremental position changes of less than  $90^\circ$ .
- B. a magnet that rotated slowly around the slide in a counterclockwise direction.
- C. more and less powerful magnets.
- D. larger and smaller samples of bacteria.

12. Which of the following statements is supported by the results of Study 1 ?

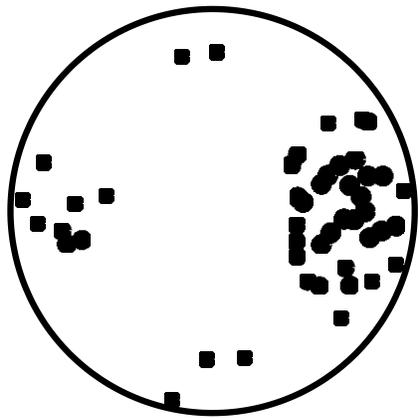
- F. The majority of magnetotactic bacteria migrate toward the Earth's magnetic north pole.
- G. The majority of magnetotactic bacteria migrate toward the north pole of the nearest magnet.
- H. The majority of magnetotactic bacteria migrate toward the 12:00 position.
- J. The effect of the Earth's magnetic field on magnetotactic bacteria is counteracted by electric fields.

13. If each diagram below represents a microscopic field, which diagram best reflects the results of Trial 7 from Study 2 ?

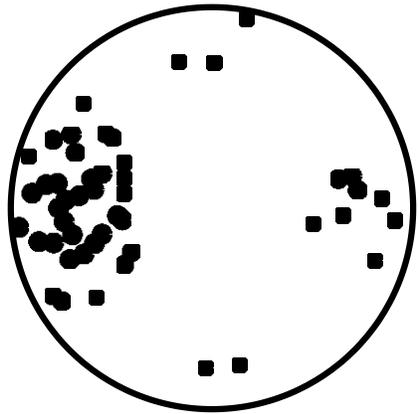
A.



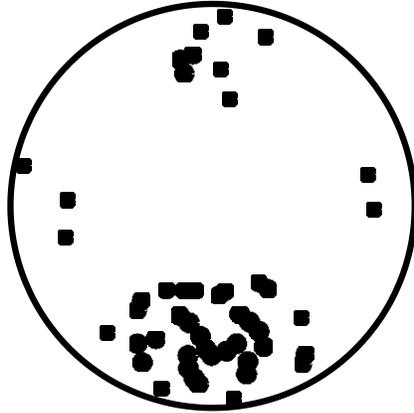
B.



C.



D.



### Passage III

A student performed three studies with a battery and four different light bulbs.

#### Study 1

The student connected the battery to a fixed outlet designed to accept any of the four bulbs. She then placed four identical light sensors at different distances from the outlet. Each sensor was designed so that a green indicator lit up upon the sensor's detection of incident light, while a red indicator remained illuminated when no light was detected. The student darkened the room and recorded the state of each sensor while each bulb was lit. The results are shown in Table 1.

Table 1				
Sensor distance (cm)	Sensor indicator color			
	Bulb 1	Bulb 2	Bulb 3	Bulb 4
50	green	green	green	green

Table 1				
Sensor distance (cm)	Sensor indicator color			
	Bulb 1	Bulb 2	Bulb 3	Bulb 4
100	red	green	green	green
150	red	red	green	green
200	red	red	red	green

### Study 2

The battery produced an *electromotive force*, or voltage, of 12 volts (V). The student was given a device called an *ammeter*, which is used to measure the current passing through an electric circuit. She completed the circuit by connecting the battery, the ammeter, and each of the four light bulbs, one at a time. She measured the associated current in amperes (A) for each bulb and calculated the *impedance* ( $Z$ ), or effective resistance to the flow of current, in ohms ( $\Omega$ ) for each bulb, using the following formula:

$$Z = \text{voltage} \div \text{current}$$

The results are shown in Table 2.

Table 2		
Bulb	Current (A)	$Z$ ( $\Omega$ )
1	0.2	60
2	0.3	40

Table 2		
Bulb	Current (A)	Z (Ω)
3	0.4	30
4	0.6	20

### Study 3

The *power rating* ( $P$ ) of each light bulb was printed near its base.  $P$  is a measure of the energy consumption of the bulb per unit time and is related to the *brightness* ( $B$ ) of the light at a given distance from the bulb.  $B$  is calculated in watts per square meter ( $\text{W}/\text{m}^2$ ), using the following formula:

$$g = \frac{h + 8}{2}$$

where  $r$  is the distance in meters (m) from the bulb, and  $P$  is measured in watts (W).

The student calculated  $B$  for each bulb at a distance of 1 m. The results are shown in Table 3.

Table 3		
Bulb	$P$ (W)	$B$ ( $\text{W}/\text{m}^2$ )
1	2.4	0.19
2	3.6	0.29
3	4.8	0.38
4	7.2	0.57

14. If the student had tested a fifth light bulb during Study 2 and measured the current passing through it to be 1.2 A, the  $Z$  associated with this bulb would have been:
- F. 1  $\Omega$ .
  - G. 10  $\Omega$ .
  - H. 14.4  $\Omega$ .
  - J. 100  $\Omega$ .
15. Based on the results of Study 2, a circuit including the combination of which of the following batteries and light bulbs would result in the highest current in the circuit? (Assume  $Z$  remains constant for a given light bulb.)
- A. A 10 V battery and Bulb 1
  - B. An 8 V battery and Bulb 2
  - C. A 6 V battery and Bulb 3
  - D. A 5 V battery and Bulb 4
16. With Bulb 3 in place in the circuit in Study 1, how many of the sensors were unable to detect any incident light?
- F. 1
  - G. 2
  - H. 3
  - J. 4

17. Which of the following equations correctly calculates  $B$  (in  $\text{W/m}^2$ ) at a distance of 2 m from Bulb 2 ?

A.  $B = \frac{2}{4\pi(3.6)^2}$

B.  $B = \frac{2}{4\pi(3.6)^2}$

C.  $B = \frac{3.6}{4\pi(2)^2}$

D.  $B = \frac{3.6}{4\pi(2)^2}$

18. Another student used the approach given in Study 3 to calculate  $B$  at a distance of 1 m from a fifth light bulb. He determined that, for this fifth bulb,  $B = 0.95 \text{ W/m}^2$ . Accordingly,  $P$  for this bulb was most likely closest to which of the following values?

F. 0.1 W

G. 6 W

H. 12 W

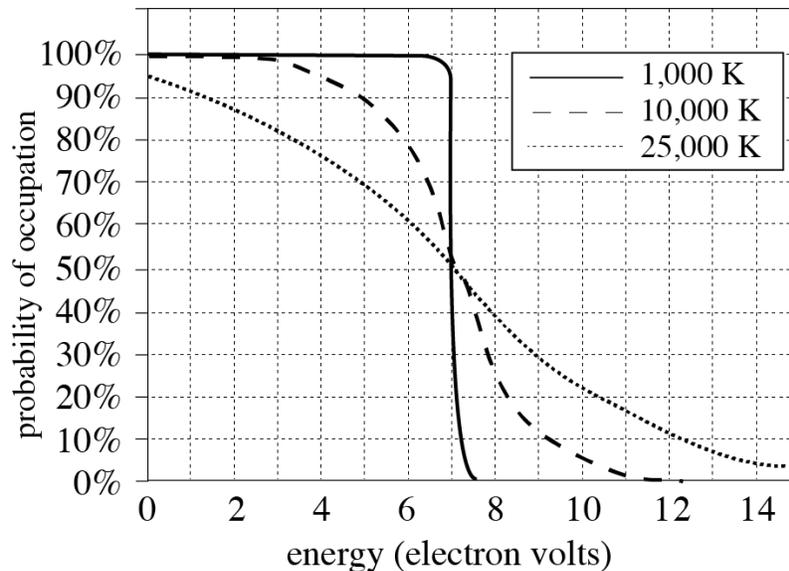
J. 18 W

19. One difference between Study 1 and Study 2 is that, in Study 1:

- A. 4 light sensors were used.
  - B. 4 different light bulbs were used.
  - C. the voltage of the battery was varied.
  - D. the current was highest for Bulb 1.
20. According to Table 3, which light bulb with a brightness greater than  $0.30 \text{ W/m}^2$  has the lowest power consumption?
- F. Bulb 1
  - G. Bulb 2
  - H. Bulb 3
  - J. Bulb 4

### *Passage IV*

The electrons in a solid occupy *energy states* determined by the type and spatial distribution of the atoms in the solid. The probability that a given energy state will be occupied by an electron is given by the *Fermi-Dirac distribution function*, which depends on the material and the temperature of the solid. Fermi-Dirac distribution functions for the same solid at 3 different temperatures are shown in Figure 1.

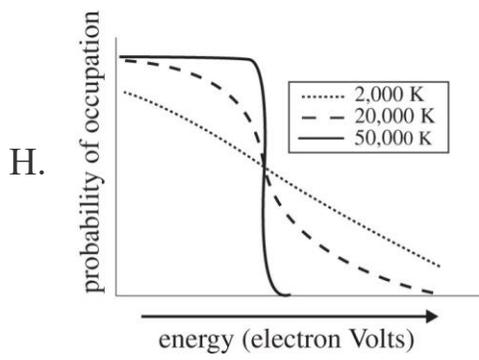
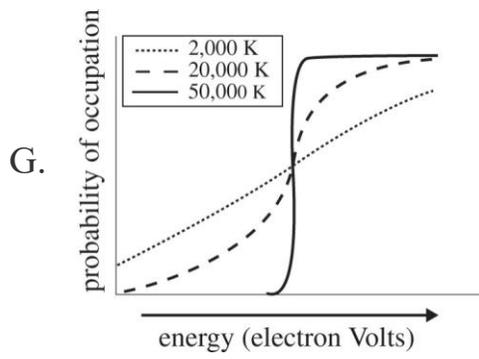
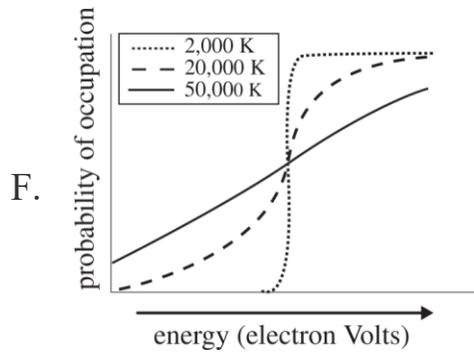


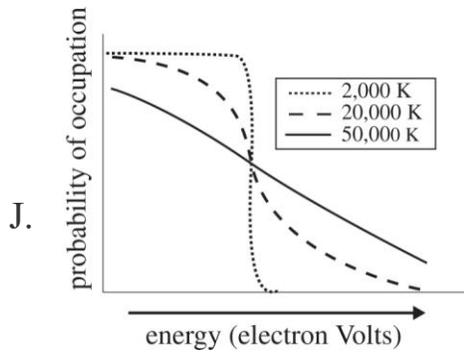
**Figure 1**

(Note: 1 electron volt (eV) =  $1.66 \times 10^{-19}$  joules (J); eV and J are both units of energy. At energies above 15 eV, the probability of occupation at each temperature continues to decrease.)

21. The information in Figure 1 supports which of the following statements about energy states?
- A. Cooler materials have a larger range of energy states than hotter materials.
  - B. Materials have the same range of energy states regardless of temperature.
  - C. Cooler materials are more capable of occupying higher energy states than hotter materials.
  - D. Hotter materials are more capable of occupying higher energy states than cooler materials.

22. The steepness of the slope of each distribution function at the point where its value equals 50% is inversely proportional to the average *kinetic energy* of the atoms in the solid. Which of the following correctly ranks the 3 functions, from *least* to *greatest*, according to the average kinetic energy of the atoms in the solid?
- F. 25,000 K; 10,000 K; 1,000 K
  - G. 25,000 K; 1,000 K; 10,000 K
  - H. 10,000 K; 1,000 K; 25,000 K
  - J. 1,000 K; 10,000 K; 25,000 K
23. Based on Figure 1, the probability of an electron occupying an energy state of 20 eV at a temperature of 1,000 K is:
- A. less than 5%.
  - B. between 5% and 50%.
  - C. between 50% and 90%.
  - D. greater than 90%.
24. Based on Figure 1, which of the following sets of Fermi-Dirac distribution functions best represents an unknown solid at temperatures of 2,000 K, 20,000 K, and 50,000 K ?





25. Based on Figure 1, the probability of a 5 eV energy state being occupied by an electron will equal 80% when the temperature of the solid is closest to:

- A. 500 K.
- B. 5,000 K.
- C. 20,000 K.
- D. 30,000 K.

26. The *de Broglie wavelength* of an electron energy state decreases as the energy of the state increases. Based on this information, over all energies in Figure 1, as the de Broglie wavelength of an electron energy state decreases, the probability of that state being occupied by an electron:

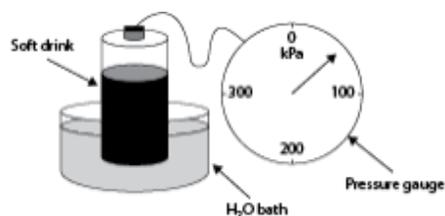
- F. increases only.
- G. decreases only.
- H. increases, then decreases.
- J. decreases, then increases.

## Passage V

Soft drinks consist of carbonated water (carbon dioxide gas dissolved in water), sweeteners, colors, and flavors. Students hypothesized that the amount of  $\text{CO}_2$  dissolved in water depends upon the pressure and temperature. The following experiments were performed to study the solubility of  $\text{CO}_2$  in 5 different soft drinks (A, B, C, D, and E).

### Experiment 1

To simulate a 12 fluid ounce can of soft drink at various temperatures, students filled a 355 milliliter (mL) cylinder with 330 mL of Soft Drink A. The cylinder was then sealed and placed in a water bath at room temperature ( $25^\circ\text{C}$ ), as depicted in Diagram 1. After 10 minutes, a pressure gauge was attached and used to measure the air pressure of the headspace (the unfilled space of the cylinder). Additional trials were performed at  $35^\circ\text{C}$  and at a refrigerated temperature of  $4^\circ\text{C}$ . The experiment was repeated for Soft Drinks B, C, D, and E. The results are shown in Table 1.



**Diagram 1**

Table 1			
So Drink	Pressure (kPa) at:		
	$4^\circ\text{C}$	$25^\circ\text{C}$	$35^\circ\text{C}$

Table 1			
So Drink	Pressure (kPa) at:		
	4°C	25°C	35°C
A	130	237	366
B	114	234	353
C	149	284	394
D	123	243	382
E	109	228	347

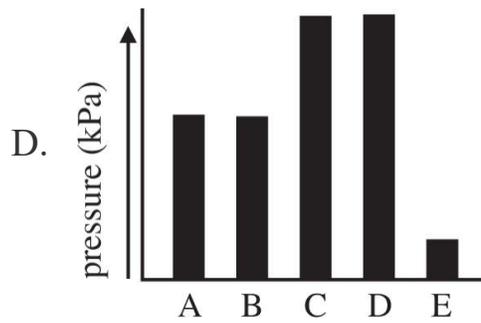
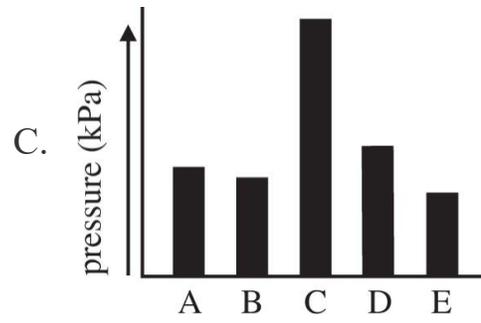
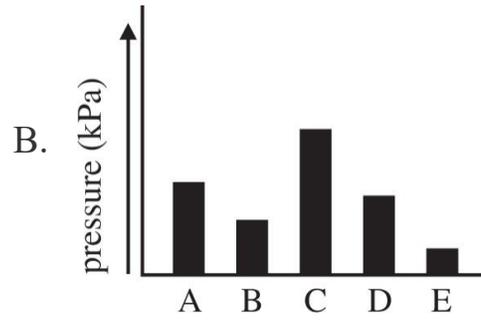
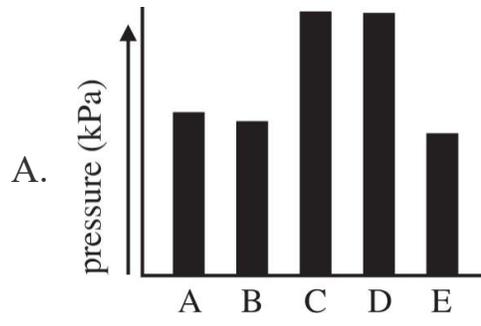
## Experiment 2

The cylinder used in Experiment 1 was completely filled (no headspace) with uncarbonated Soft Drink A. At a pressure of 1 atmosphere (atm) and room temperature, the students then dissolved CO<sub>2</sub> into the soft drink until the solution reached its maximum CO<sub>2</sub> concentration. From the maximum concentration, the solubility of CO<sub>2</sub> was calculated and recorded in millimoles per liter-atmosphere (mmol/L-atm). Additional trials were performed at 4°C and 35°C. The experiment was repeated for Soft Drinks B, C, D, and E. The results are shown in Table 2.

Table 2			
So Drink	CO <sub>2</sub> solubility (mmol/L-atm) at:		
	4°C	25°C	35°C
A	65.92	34.09	25.00

Table 2			
So Drink	CO <sub>2</sub> solubility (mmol/L-atm) at:		
	4°C	25°C	35°C
B	65.91	34.08	24.92
C	66.00	34.15	25.03
D	65.95	34.11	24.96
E	65.87	34.04	24.84

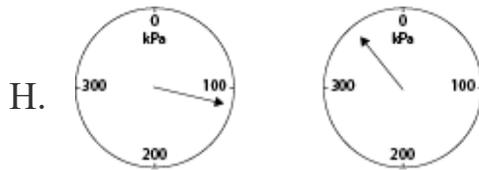
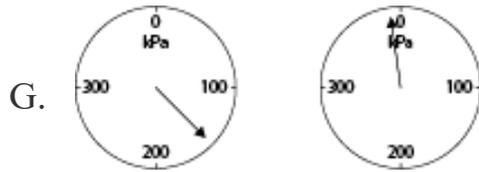
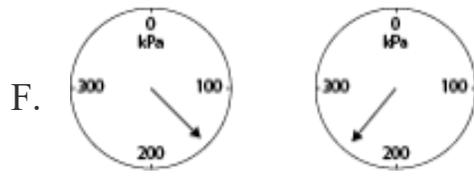
27. Which of the following bar graphs best represents the pressures of the container contents from Experiment 1 at 25°C ?



28. Which of the following pairs of figures best depicts the change in position of the needle on the pressure gauge while attached to the container holding Soft Drink C in Experiment 1 ?

needle position at 4°C

needle position at 35°C

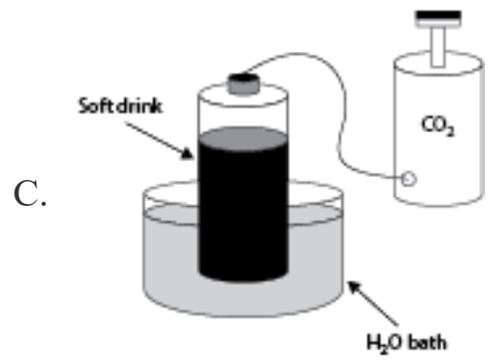
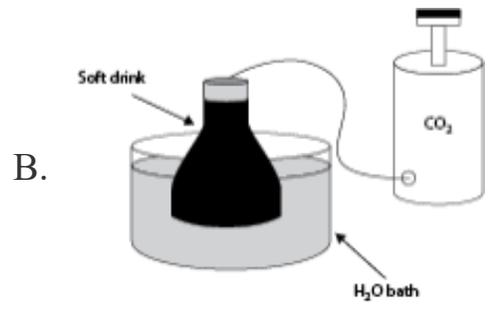
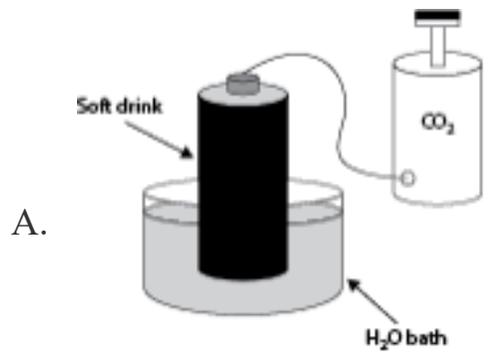


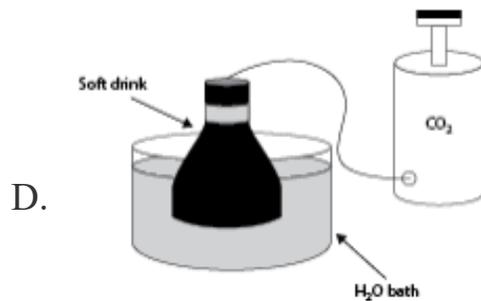
29. A student hypothesized that, at a given pressure and temperature, the higher the sugar content of a soft drink, the higher the solubility of  $\text{CO}_2$  in that soft drink. Do the results of Experiment 2 and all of the information in the table below support this hypothesis?

So Drink	Sugar content (grams per 12 ounces)
A	23
B	32
C	38
D	40
E	34

- A. Yes; Soft Drink A has the lowest sugar content and the lowest CO<sub>2</sub> solubility.
  - B. Yes; Soft Drink D has a higher sugar content and CO<sub>2</sub> solubility than Soft Drink C.
  - C. No; the higher a soft drink's sugar content, the lower the soft drink's CO<sub>2</sub> solubility.
  - D. No; there is no clear relationship in these data between sugar content and CO<sub>2</sub> solubility.
30. According to the results of Experiment 1, as the temperature of the soft drink increases, the pressure:
- F. decreases only.
  - G. increases only.
  - H. decreases, then increases.
  - J. increases, then decreases.

31. Which of the following figures best illustrates the apparatus used in Experiment 2 ?



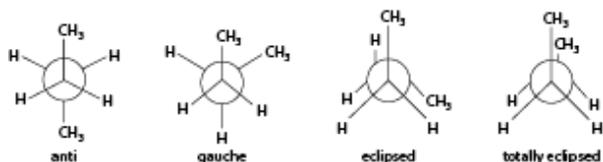


32. Which of the following statements best explains why, in Experiment 1, the students waited 10 minutes before recording the pressure of the air above the soft drink? The students waited to allow:
- F. all of the CO<sub>2</sub> to be removed from the container.
  - G. time for the soft drink in the container to evaporate.
  - H. the contents of the container to adjust to the temperature of the H<sub>2</sub>O bath.
  - J. time for the pressure gauge to stabilize.
33. Table 2 shows that the soft drink's CO<sub>2</sub> solubility:
- A. increases as temperature increases.
  - B. decreases as temperature increases.
  - C. sometimes increases and sometimes decreases as temperature increases.
  - D. is not affected by changes in temperature.

## Passage VI

*Straight-chain conformational isomers* are simple carbon compounds that differ only by rotation about one or more single carbon bonds. Essentially, these isomers represent the same compound in slightly different positions (or conformations). One example of such isomers can be found with butane ( $C_4H_{10}$ ), in which the first and last carbon atoms of the chain can be thought of as methyl ( $CH_3$ ) groups. As bonds in the carbon chain rotate, these 2 methyl groups can occupy different positions in space relative to one another. The conformational isomers of butane are classified into 4 categories, based on the angle between the 2 bonds to the methyl groups. These isomers are depicted as *Newman projections* (a perspective which highlights the angle between the methyl group bonds) in Diagram 1.

1. In the *anti* conformation, the bonds connecting the methyl groups are rotated  $180^\circ$  with respect to each other.
2. In the *gauche* conformation, the bonds connecting the methyl groups are rotated  $60^\circ$  with respect to each other.
3. In the *eclipsed* conformation, the bonds connecting the methyl groups are rotated  $120^\circ$  with respect to each other.
4. In the *totally eclipsed* conformation, the bonds connecting the methyl groups are rotated  $0^\circ$  with respect to each other.



**Diagram 1**

The anti conformation is the lowest energy and most stable state of the butane molecule since it allows for the methyl groups to maintain maximum separation from each other. The methyl groups are much closer to each other in the gauche conformation, but this still represents a relative minimum or *meta-stable* state, due to the relative orientations of the other hydrogen atoms in the molecule. Molecules in the anti or gauche conformations tend to maintain their shape. The eclipsed conformation represents a relative maximum energy state, while the totally eclipsed conformation is the highest energy state of all of butane's conformational isomers.

Two organic chemistry students offered different hypotheses on the *active shape* (the chemically functional conformation) of a butane molecule.

### Student 1

The active shape of a butane molecule is always identical to the molecule's lowest-energy shape. Any other shape would be unstable. Because the lowest-energy shape for a straight-chain conformational isomer of butane is the anti conformation, its active shape is always the anti conformation.

### Student 2

The active shape of a butane molecule is dependent upon the energy state of the shape. However, a butane molecule's shape may also depend on temperature and its initial isomeric state. Specifically, in order to convert from the gauche conformation to the anti conformation, the molecule must pass through either the eclipsed or totally eclipsed conformation. If the molecule is not given enough energy to reach either of these states, its active shape will be the gauche conformation.

34. According to the passage, molecules in conformations with relatively low energy tend to:

- F. convert to the totally eclipsed conformation.
- G. convert to the eclipsed conformation.
- H. maintain their shape.
- J. be unstable.

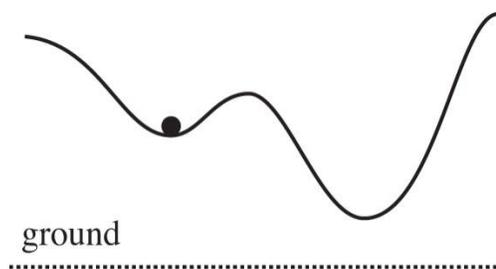
35. The information in the passage indicates that when a compound changes from one straight-chain conformational isomer to another, it still retains its original:

- A. energy state.
- B. shape.
- C. number of single carbon bonds.
- D. temperature.

36. Student 2's views differ from Student 1's views in that only Student 2 believes that a butane molecule's active shape is partially determined by its:

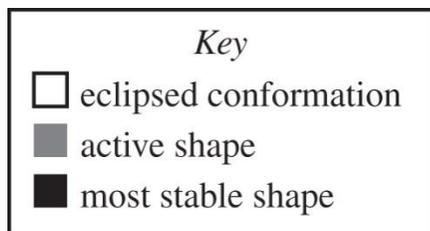
- F. initial isomeric state.
- G. energy state.
- H. stability.
- J. proximity of methyl groups.

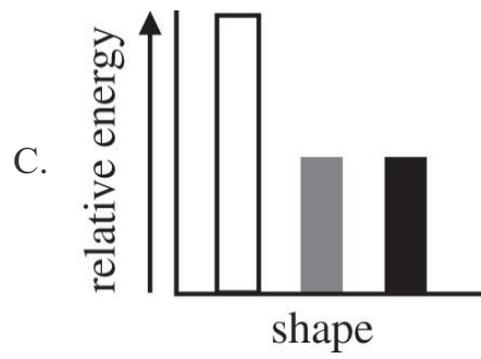
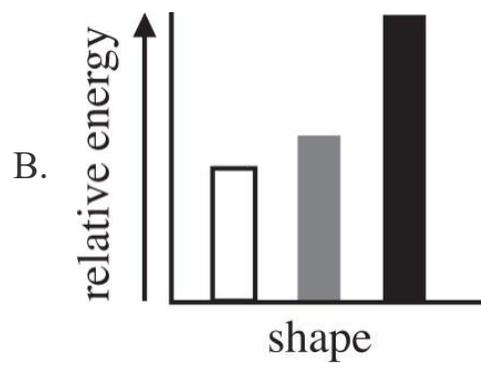
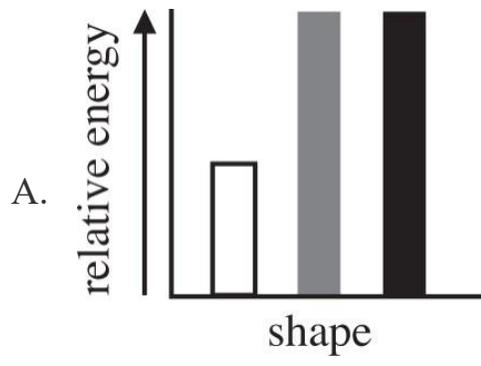
37. A student rolls a ball along the curved path shown below. Given that points closer to the ground represent states of lower energy, the ball coming to rest at the position shown corresponds to a butane molecule settling into which conformational isomer?

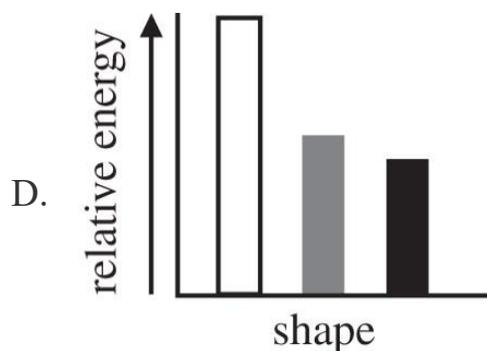


- A. Anti
- B. Gauche
- C. Eclipsed
- D. Totally eclipsed
38. Suppose butane molecules are cooled so that each molecule is allowed to reach its active shape. Which of the following statements is most consistent with the information presented in the passage?
- F. If Student 1 is correct, all of the molecules will be in the anti conformation.
- G. If Student 1 is correct, all of the molecules will have shapes different from their lowest-energy shapes.
- H. If Student 2 is correct, all of the molecules will be in the anti conformation.
- J. If Student 2 is correct, all of the molecules will have shapes different than their lowest-energy shapes.

39. Which of the following diagrams showing the relationship between a given butane molecule's shape and its relative energy is consistent with Student 2's assertions about the energy of butane molecules, but is NOT consistent with Student 1's assertions about the energy of butane molecules?







40. Student 2 argues that a butane molecule can sometimes settle into a gauche conformation, even though this is not its lowest energy state. Which of the following findings, if true, would most effectively *counter* the argument he presents for this claim?
- F. Once a molecule has settled into a given conformation, all of its single carbon bonds are stable.
  - G. Enough energy is always available in the environment to overcome local energy barriers.
  - H. During molecule formation, the hydrogen bonds are formed before the carbon bonds.
  - J. Molecules that change their isomeric conformation tend to lose their chemical functions.

# Writing Test

40 Minutes — 1 Question

**Directions:** The essay is used to evaluate your writing skills. You will have **40 minutes** to review the prompt and plan and write an essay in English. Before you begin, read everything in this test booklet carefully to make sure you understand the task.

Your essay will be judged based on the evidence it provides of your ability to do the following:

Assert your own perspective on a complex issue and evaluate the relationship between your perspective and at least one other perspective  
Use reasoning and evidence to refine and justify your ideas  
Present your ideas in an organized way  
Convey your ideas effectively using standard written English

Write your essay on the lined essay pages in the answer booklet. All writing on those lined pages will be scored. Use the unlined pages in this test booklet to plan your essay. Your work on these unlined pages will not be scored.

Put your pencil down as soon as time is called.

**DO NOT OPEN THIS BOOKLET UNTIL TOLD TO DO SO.**

## Access to Technology

To help ready students to become productive members of the workforce, schools concentrate on providing a strong foundation on which students can build their careers. Since job applicants who are proficient in word processing applications, email programs, and storage tools are more likely to be hired than applicants who do not have technology experience, it is to the benefit of students that schools offer technology instruction in high school. Given the importance of technology in today's society, should schools be responsible for providing ongoing access to computers for every student? Since many students will need to use computers in various capacities throughout their lifetimes, how well a school provides access to technology directly affects its student body.

*Read and carefully consider these perspectives. Each discusses the importance of student access to technology.*

### Perspective One

Schools should be encouraged to incorporate technology objectives into homework assignments and class projects, but schools do not have an obligation to provide unlimited access to computers. Teachers can

### Perspective Two

Schools should be required to provide personal computers for students to use at least throughout their high school careers, if not during

### Perspective Three

Schools and computer companies should work together to provide significant student discounts so that the majority of parents who have school-age children can afford to purchase at least one personal computer. Students who do not have their own

provide time during the school day for students to use on-site computer labs, which will allow students the tools they need to complete assignments that require computer technology.

middle and elementary school as well. Unlimited access to a personal computer for every student will foster continual development of technological abilities, which is a highly valued skill set.

computers can use their schools' computer labs or go to their local libraries to complete homework assignments that require computer technology.

### *Essay Task*

Write a clear, well-reasoned essay evaluating multiple perspectives on student access to technology. In your essay, be sure to:

- Assert your own perspective on the issue and evaluate the relationship between your perspective and at least one other perspective
- Use reasoning and evidence to refine and justify your ideas
- Present your ideas in an organized way

Convey your ideas effectively using standard written English

Your perspective may be fully, somewhat, or not at all in agreement with one or more of the three perspectives in the prompt.

## *Planning Your Essay*

*These pages are not scored.*

Use the space below to brainstorm and plan your essay. Consider the following as you think about the prompt:

Strengths and weaknesses of the three perspectives in the prompt

- What observations do they offer, and what do they overlook? Why are they persuasive or why are they not persuasive?

Your own background and identity

- What is your perspective on this issue, and what are its strengths and weaknesses?
- What evidence will you use in your essay?

# Answers and Explanations

## ENGLISH TEST

### 1. *A Screenwriting Career*

1. **B**

**Difficulty:** Medium

**Category:** Conciseness

**Getting to the Answer:** Look for the answer choice that expresses the sentence’s idea in the clearest, most concise way. The clearest version here is (B): “If you want to succeed as a Hollywood screenwriter.” This is grammatically correct and sets up the if–then relationship between the clauses. Choice A is awkward and unnecessarily wordy. Choices C and D create sentences that are grammatically incorrect.

2. **J**

**Difficulty:** Medium

**Category:** Organization

**Getting to the Answer:** When a transition word or phrase is underlined, check for the logic of the transition and then for correct grammar and punctuation. The paragraph discusses the difficulties of pursuing a career in screenwriting, and the previous sentence mentions one difficulty. The sentence containing the underlined portion discusses another difficulty: that those who obtain these careers are stressed and dissatisfied. Although the sentence mentions these people being wealthy, it does so in contrast to the main part of the sentence, which is a disadvantage of pursuing this career. Thus, the sentence is a continuation of the idea that this career is challenging, making (J) correct. Choice F incorrectly contrasts the ideas. The first difficulty does not provide a reason for the second, making G incorrect. Choice H is irrelevant, because time is not being discussed.

3. **B**

**Difficulty:** Medium

**Category:** Development

**Getting to the Answer:** Don't forget to read for logic as well as for grammar and usage. The preceding sentence explains that screenwriters don't have "a formal career path." The first part of the sentence in question gives an example of what a formal career path might involve—going to a school career center for help. The correct answer will provide another example along these lines. Someone with a formal career path could find job opportunities in the classified ads, but a screenwriter cannot. Choice (B) is correct. Choice A refers to

“extracurricular activities,” which is out of scope for a sentence concerning a career path. There’s no reason to believe that a college graduate can’t understand how difficult it is to become a screenwriter, as C suggests. Choice D is an example of something involved in an *informal* career path, not a formal one.

4. J

**Difficulty:** Medium

**Category:** Development

**Getting to the Answer:** When asked which choice best conveys a certain meaning, choose the answer that conveys that meaning most precisely. The only choice that conveys the difference in how successful screenwriters have achieved their success is (J). The other choices convey either the challenges, as in F and G, or the benefits, as in H.

5. C

**Difficulty:** Medium

**Category:** Agreement

**Getting to the Answer:** A passage should not change tense for no reason. The passage is in the present tense, making the past tense verb in A incorrect. There is no reason to discuss the ongoing nature of a college education in the past, so the verb tense in B is incorrect. Choice

D creates a grammatically incorrect sentence. Choice (C), with the present tense, is correct.

6. J

**Difficulty:** Low

**Category:** Conciseness

**Getting to the Answer:** When “DELETE the underlined portion” is an option, read the underlined selection for relevance. The topic of this paragraph, and the entire essay, is the career of screenwriting. No matter how it is worded, a sentence about an acting career is out of scope. This sentence should be deleted, (J).

7. C

**Difficulty:** Medium

**Category:** Agreement

**Getting to the Answer:** The ACT often separates a subject from its verb with an intervening phrase or clause containing another noun. Although the singular noun *college* is closer to the verb *begins* in this sentence, its subject is the plural *screenwriters*. The verb needs to be in the plural form, which eliminates all answer choices but (C). Choice B does not address the error. *Has begun* in D is also singular.

8. G

**Difficulty:** Medium

**Category:** Development

**Getting to the Answer:** When asked if a paragraph fulfills a certain purpose, consider its topic and scope. The topic of this paragraph is pursuing a college education on the path to becoming a screenwriter, and the author expresses the judgment that a college education can delay entry into the screenwriting profession. Thus, the paragraph does fulfill the goal of discouraging aspiring screenplay writers from pursuing a college education. Eliminate H and J. Choice F is opposite; mentioning the value of education does not discourage people from pursuing an education. Choice (G) is correct.

9. **C**

**Difficulty:** Medium

**Category:** Conciseness

**Getting to the Answer:** Be wary of answer choices that are significantly longer than the underlined selection; they will rarely be correct. As written, the underlined portion is unnecessarily wordy and the phrase “at a prestigious school” is misleading, since it is not just some colleges that the writer deems irrelevant for screenwriters. Choice (C) corrects this error by focusing only on the student loans. Choice B is much wordier than the original and includes irrelevant information about “work-study programs.” Choice D creates a sentence fragment.

10. **F**

**Difficulty:** Medium

**Category:** Sentence Structure

**Getting to the Answer:** To check if a semicolon is correctly used, try replacing it with a period and making the second clause a separate sentence. If two complete sentences are formed, then the semicolon is correct. A semicolon is correctly used here to join two independent clauses. No change is needed, (F). Choice G incorrectly inserts a comma between *this* and the noun it modifies. Choice H incorrectly places a comma after *so*; a comma should be placed before a coordinating conjunction. Choice J creates a run-on sentence.

11. D

**Difficulty:** Medium

**Category:** Sentence Structure

**Getting to the Answer:** If you're unsure about punctuation, read the sentence without the descriptive words and phrases to focus on its structure. Stripped of some of the descriptive phrases, this sentence becomes easier to deal with: "Those without college educations are less averse to the jobs, aspiring screenwriters are forced to take." There is no reason for a comma here. Choice (D) correctly uses *that* to indicate that the phrase "aspiring screenwriters are forced to take" is meant to modify *jobs*. Choice B creates a run-on sentence. Choice C incorrectly treats *screenwriters* as inessential information.

12. J

**Difficulty:** Low

**Category:** Sentence Structure

**Getting to the Answer:** Many words can function as more than one part of speech; use context to help you eliminate choices that use these words incorrectly. The word *that's* in the underlined selection is a contraction of the pronoun *that* and the verb *is*, but context tells us that this sentence requires *that* to be used as a conjunction. Choice (J) uses *that* correctly and does not introduce any new errors. Choice G replaces the correct possessive pronoun *their* with its homophone *there*; familiarize yourself with the correct uses of *their*, *there*, and *they're* before Test Day. Choice H creates a grammatically incorrect sentence.

13. B

**Difficulty:** Medium

**Category:** Agreement

**Getting to the Answer:** When a pronoun is underlined, always determine to what it refers. We know that something about the described scenario produces stress, but the exact referent is unclear, making A incorrect. Choice D is similarly unclear. It does not make sense for the screenplay to be the source of the stress, but rather the position the writer is in; eliminate C. Choice (B) correctly identifies the situation as the source of the stress, removing the ambiguity.

14. **F**

**Difficulty:** Medium

**Category:** Sentence Structure

**Getting to the Answer:** About one in four English Test questions will require no change. This sentence is correct as written, (F). Choice G illogically states the screenwriter’s work must be *increasing*. Choice H suggests that screenwriters face pressure to “be . . . work,” which does not make sense. Choice J is idiomatically incorrect; *to raise*, not *to raising*, is the correct infinitive.

15. **D**

**Difficulty:** Medium

**Category:** Agreement

**Getting to the Answer:** When some answer choices contain *you* and others contain *one*, determine which pronoun matches the style of the passage. This passage never uses *one*, but it does use *you* in the first sentence. Furthermore, the remainder of the sentence directly addresses the reader with *please*. Eliminate A and B. Choice (D) is more straightforwardly worded than C, so (D) is correct.

7. *The Swallows of San Juan Capistrano*

16. **H**

**Difficulty:** Medium

**Category:** Conciseness

**Getting to the Answer:** The underlined selection may repeat something said elsewhere in the sentence, so take the whole sentence into consideration before choosing an answer. This sentence already indicates that the mission *gained fame*, so it is unnecessary to repeat that it is *well-known*. Eliminate F. Choice G unnecessarily uses the adjective *seasonal* along with *summer*; summer is a season, so you can eliminate G. Choice J describes the *home* as *residential*, but a home is, by definition, residential. Choice (H) is the only choice that eliminates all redundant language.

17. **C**

**Difficulty:** Low

**Category:** Development

**Getting to the Answer:** When asked about the purpose of a paragraph, consider both its topic and the surrounding context. Read further in the passage if necessary. The topic of the paragraph is the Mission at San Juan Capistrano, which is famous as a summer home for swallows. The following paragraph discusses the migration of these swallows, and they are the focus of the rest of the passage. Choice (C) describes the purpose of introducing these swallows. Choices A, B, and D are irrelevant to the purpose of the passage.

18. **J**

**Difficulty:** Medium

**Category:** Agreement

**Getting to the Answer:** Items in a compound must be parallel in form. The two verbs joined by *and* in the original sentence are *nest* and *bearing*. Only (J) provides the needed parallel verb. Choices F, G, and H all use the *-ing* form, violating the rules of parallel structure.

19. **C**

**Difficulty:** Medium

**Category:** Agreement

**Getting to the Answer:** Items in a series or list require parallel structure. There are three verbs in this series. The first two verbs, *ring* and *is*, are in the simple present tense, so the underlined verb should be also. Choice (C) is correct. Choices A, B, and D all violate the rules of parallel structure.

20. **F**

**Difficulty:** Medium

**Category:** Sentence Structure

**Getting to the Answer:** NO CHANGE will be the answer to about 25% of English Test questions. This sentence is correct as written, so (F) is the answer. The past tense verb *discovered* used after the past progressive *were seeking* indicates that the birds found the mission while in the process of looking for *refuge*. Choices G and J omit the

pronoun *they*, suggesting that it was the innkeeper, not the birds, who found the mission. Choice H creates a grammatically incorrect sentence.

21. **B**

**Difficulty:** Low

**Category:** Sentence Structure

**Getting to the Answer:** The preposition *of* cannot be part of a verb phrase. The preposition *of* in the original version should actually be the verb *have*. Choice (B) corrects this error. Choices A and C both use the preposition *of* instead of the verb *have*. Choice D omits the verb *have*, leaving the grammatically incorrect *may developed*.

22. **H**

**Difficulty:** Medium

**Category:** Organization

**Getting to the Answer:** When a transition word is underlined, determine what two ideas are being connected. Here, the transition word connects the discovery that the birds create their nests out of mud and the idea that the swallows chose the mission because it was near rivers. The following sentence explains that the rivers are a source of mud, so these ideas are not in contrast; eliminate F. *Indeed* cannot be used to create a subordinate clause, making G ungrammatical. It would make more sense for the biologists to postulate about the

reason the swallows wanted to live near rivers after discovering that they needed mud for their nests, so (H) is correct.

23. **B**

**Difficulty:** Low

**Category:** Agreement

**Getting to the Answer:** Many word choice questions will present you with four grammatically correct idioms; use context to determine which is correct. *Of which*, A, *to which*, B, and *by which*, C, are all proper idioms, but the only one that makes sense in context is (B): the swallows *return to* their nests. Choice D omits the preposition, incorrectly suggesting that the birds return the nests to some person or place.

24. **G**

**Difficulty:** Medium

**Category:** Development

**Getting to the Answer:** When an English Test question has a question stem, read it carefully. Frequently, all of the answer choices will be both consistent and relevant, but only one will fulfill the requirements of the stem. Only one sentence gives a specific reason for the swallows choosing the mission based on its location near two rivers. Choice (G) explains that the rivers provide a food supply for the swallows, which is a logical reason for the swallows to live nearby. Choice F provides

information about swallow nest-building, not about swallows choosing the mission based on its location near the rivers. Choice H provides a detail about the rivers, but it is unclear how this detail relates to the swallows. Choice J is a generalization; it doesn't tell you anything specific about the *other advantages* provided by the rivers.

25. **C**

**Difficulty:** Medium

**Category:** Organization

**Getting to the Answer:** The underlined portion is a transitional phrase, so check for errors in both logic and grammar. The previous sentence describes the swallows' returning to the mission for protection, and the sentence with the underlined portion explains that the whole city protects the swallows. Choice A includes a contrast transition, which is illogical here; both ideas involve protecting the swallows. Choices B and D are sequential transitions, which do not make sense in the context. The idea that the whole city protects the swallows serves to reinforce that they can return to the mission for protection, making the emphasis transition in (C) correct.

26. **F**

**Difficulty:** Medium

**Category:** Sentence Structure

**Getting to the Answer:** Remember your tested comma rules; no other uses will be correct on the ACT. The sentence is correct as written; no change is needed, (F). Choices G and H both incorrectly insert a comma between the noun *community* and its verb *sees*. Choice J uses an adjective (*clear*), instead of an adverb, to modify the verb *sees*.

27. **C**

**Difficulty:** Medium

**Category:** Sentence Structure

**Getting to the Answer:** Dashes may be used to offset supplementary material within a sentence. Here, “usually in the hills” is descriptive information about *the area*. Such descriptive phrases can be offset from the main sentence with commas or dashes; (C) correctly uses dashes to offset and emphasize the phrase. Choice A omits one of the commas necessary to correctly offset the phrase. Choice B uses a semicolon, but the second clause is not independent. Choice D is awkward and unnecessarily wordy.

28. **H**

**Difficulty:** Medium

**Category:** Conciseness

**Getting to the Answer:** Two words that convey the same information are redundant and incorrect on the ACT. All historic buildings are old,

so F and G are both incorrect. Choice J is unnecessarily wordy. Choice (H) is the most concise answer and is therefore correct.

29. **B**

**Difficulty:** Medium

**Category:** Sentence Structure

**Getting to the Answer:** Some idioms will be properly constructed but incorrect in context. The phrase *in an attempt* requires the infinitive verb form; (B) is correct. Choice A uses *to attempt at*, which is idiomatically incorrect. Choices C and D change the infinitive *to attempt* to the noun *an attempt*; this creates an illogical sentence in C and an idiomatically incorrect one in D.

30. **J**

**Difficulty:** Medium

**Category:** Organization

**Getting to the Answer:** Since NO CHANGE is not offered as an option, you'll need to find the most logical place to insert the new sentence. Paragraph 5 discusses the problems that "have arisen in recent years," so this sentence about a problem with the swallows belongs in paragraph 5; eliminate F and G. Sentences 2 and 3 in Paragraph 5 explain the specific problems that are leading to a decline in the swallow migration. It is reasonable that one result of the changes discussed in Sentences 2 and 3 would be the lack of "huge clouds of

swallows descending upon the mission as in the past decades.” The best placement for the new sentence is after Sentence 3 in Paragraph 5; (J) is correct.

### 3. *Root for the Home Team?*

31. **B**

**Difficulty:** Low

**Category:** Sentence Structure

**Getting to the Answer:** The possessive form of most singular nouns is formed by adding 's. Context tells us that the singular possessive, not the plural, form is needed here. Choice (B) retains the singular form and places the apostrophe correctly. Choice C creates the plural of the noun and does not show possession. Choice D creates the plural possessive of the noun, but the context is referring to one city.

32. **H**

**Difficulty:** Medium

**Category:** Sentence Structure

**Getting to the Answer:** Be sure to read ACT passages for logic as well as grammatical correctness. The word *which* modifies *team*, and a preposition is necessary. Choice (H) is the correct answer, because it adds the preposition *for*. Choice G introduces an incorrect preposition. Omitting the selection, as J suggests, changes the meaning of the

sentence. The player is not choosing which team to play against, but rather which team to join.

33. **B**

**Difficulty:** High

**Category:** Development

**Getting to the Answer:** When asked whether information should be added, consider whether the new information is relevant. If it is relevant, consider what it adds. The narrator brings up the topic of free agents in order to explain why the daughter continues to need new jerseys, so the fact that being a free agent leads players to switch teams is relevant; the team-switching is the reason the daughter's favorite players keep changing jerseys. Thus, C and D are incorrect. Choice A is also incorrect; the new information tells us a result, not a cause, of becoming a free agent. Choice (B) accurately describes the reason the information should be added—namely, that it provides the missing link.

34. **G**

**Difficulty:** Medium

**Category:** Sentence Structure

**Getting to the Answer:** A complete sentence must have a subject and predicate verb that express a complete thought. In this case, there are two subjects and predicates that create a run-on sentence and an

incomplete thought. Choice (G) properly uses the conjunction *so* to join two independent clauses expressing connected thoughts. Choice H creates a grammatically correct sentence, but it suggests an illogical cause-and-effect relationship. Choice J creates an illogical sentence; presumably, the narrator had one jersey while his or her favorite player was on the team, not a *er*.

35. **A**

**Difficulty:** Low

**Category:** Sentence Structure

**Getting to the Answer:** Make sure independent clauses are properly separated. The sentences in question are correctly separated by a period because they express two separate, complete thoughts. This matches (A). Choice B is incorrect because, while the colon draws the reader's attention to a specific point directly related to what precedes it, the words *for when* makes the sentence structure awkward. The first sentence says there are *many* disadvantages to free agency, but the information in the second sentence expresses only one disadvantage. Choice C is incorrect because the comma separates two independent clauses. Choice D is incorrect because it also creates a run-on.

36. **G**

**Difficulty:** Medium

**Category:** Sentence Structure

**Getting to the Answer:** When a word or phrase is set off from the rest of the sentence with commas, the sentence must make sense without that phrase. The sentence is grammatically incorrect as written. A comma incorrectly separates *who* from the remainder of the phrase. Choice (G) corrects this by removing the comma. Choices H and J maintain an incorrect use of a comma, which breaks up the thought.

37. **B**

**Difficulty:** Medium

**Category:** Development

**Getting to the Answer:** The answer choices have different meanings, which indicates that you are being tested on precision. Choose the answer that makes the most sense in the context. The sentence introduces a disadvantage related to camaraderie and cohesion. Because those are both good things, it would be a disadvantage to be without them. Choice (B) conveys this meaning. Choice A is too neutral to make sense, whereas C and D are too positive.

38. **F**

**Difficulty:** Low

**Category:** Sentence Structure

**Getting to the Answer:** When DELETE is an option, first determine if the underlined information is necessary to the meaning of the sentence. The underlined information is necessary to the sentence,

which means J can be eliminated. In the correct answer, (F), *upon* correctly precedes the direct object *each other*. Choice G uses incorrect prepositions, *to* and *on*, and separates the direct object from *depend*. Choice H is illogical; the players depend on each other, not on winning.

39. **D**

**Difficulty:** Low

**Category:** Sentence Structure

**Getting to the Answer:** A list must be set off with serial commas. Choice (D) is the correct answer because it correctly places the commas between each item. Choice A is incorrect because it omits the commas. Choice B is incorrect because it uses a comma to separate the adverb *together* from the verb it modifies, *plays*. Choice C is incorrect because the comma that separates the first item from the second is missing.

40. **F**

**Difficulty:** Low

**Category:** Organization

**Getting to the Answer:** When determining whether two thoughts are correctly combined, check for the logic of the transition as well as proper grammar and punctuation. Because the players' attempt to block the other team is not a result of the number of players, the

cause-and-effect transition *because* is inappropriate; eliminate G. No contrast is needed, making H incorrect. *Or* does not make sense in context; it would be illogical for the team either to have eleven players on the field or to try to stop the other team from progressing. Thus, J is incorrect. The sentence is correct as written, so (F) is the correct answer.

41. **C**

**Difficulty:** Low

**Category:** Agreement

**Getting to the Answer:** When a verb is underlined, check to see if it matches the subject. The subject, *it*, is singular, requiring the plural verb *disrupts*, (C). Choice A requires a plural subject, B makes an unwarranted shift to past tense, and D creates a fragment.

42. **F**

**Difficulty:** Medium

**Category:** Sentence Structure

**Getting to the Answer:** Make sure modifying phrases are placed so as to modify logical things. Choice (F) is the correct answer because it concludes the sequence of three major disadvantages to free agency and correctly modifies “the loss of team dynasties.” Choice G is incorrect because *loss* should modify *team dynasties*. Choices H and J

are incorrect because the adverb *third* should modify *disadvantage*, not *loss*.

43. **D**

**Difficulty:** Medium

**Category:** Conciseness

**Getting to the Answer:** Read the sentence without the underlined information to see if it still makes sense, and eliminate answer choices that contain redundant language. In the context of the paragraph, the sentence still makes sense without the underlined information. Choice (D) is the correct answer. Choice B contains redundant language. Adding an apostrophe to *years* in C is grammatically incorrect, and the phrase is redundant.

44. **J**

**Difficulty:** High

**Category:** Organization

**Getting to the Answer:** Remember to read for logic, as well as grammar and usage. Choice (J) is the only choice that logically connects ideas in this sentence by setting up the contrast between the simultaneous failure of the home team and the success of the player's new team. Choice F is incorrect because it creates a causal relationship between the home team failing and the player's new team winning (as

a result of the home team's failure). Choices G and H cannot introduce dependent clauses, making the sentence ungrammatical.

45. **C**

**Difficulty:** Medium

**Category:** Development

**Getting to the Answer:** Read question stems carefully. Often, the wrong answer choices will be consistent with the passage but fail to answer the question posed. The question stem is looking for the choice that best reflects the main idea of the essay. This paragraph concerns the author's dislike of what free agency has done to his experience of football; choice (C) makes this point best. Choice A is a general opinion that does not relate to the specific argument in the essay. Choice B is incorrect because the author does not describe any benefits of free agency. Choice D is incorrect because it takes the opposite point of view from the main point of persuasion in the essay.

## 9. *The Right to Write*

46. **H**

**Difficulty:** Medium

**Category:** Sentence Structure

**Getting to the Answer:** Be aware of phrases like *it is only*, because they add no real meaning to the sentence and provide no clear

antecedent for the pronoun. *It is only* is unnecessary here. Choice (H) eliminates the unnecessary language and makes the second clause subordinate. Choices G and J both use incorrect grammatical structure.

47. **B**

**Difficulty:** Medium

**Category:** Agreement

**Getting to the Answer:** Use *who* or *whom* to refer to a person. The underlined word refers to José Rivera; the correct pronoun is *who*, because José Rivera is a person. Choice (B) is correct. *Which*, in C, is incorrect when used to refer to a person. Choice D uses the objective case *whom*; you wouldn't say "him has fought for the right," so "whom has fought for the right" is incorrect.

48. **J**

**Difficulty:** Medium

**Category:** Organization

**Getting to the Answer:** Remember to read for logic, as well as grammar and usage. This sentence inappropriately uses the coordinating conjunction *Yet*. *Although*, a subordinating conjunction that introduces subordinate clauses, is the best choice here. Choice (J) is correct. Choice G is inappropriate for the context. Choice H cannot be used as a conjunction.

49. **A**

**Difficulty:** Medium

**Category:** Organization

**Getting to the Answer:** When you need to consider moving information, first read it to determine the main idea. Then consider the context of this information in the essay as a whole to determine its logical placement. The paragraph describes the early years in Rivera's schooling when he discovered he wanted to be a writer. In the essay as a whole, this information is in the right sequence; the paragraph before describes his childhood and the paragraph after describes his employment as an adult. Choice (A) is the correct answer. Choices B, C, and D would place the information out of sequence.

50. **G**

**Difficulty:** Low

**Category:** Sentence Structure

**Getting to the Answer:** A comma should not be inserted between a preposition and its object. The concluding conjunction *and* completed the list of the different things Rivera wrote. The direct object, *photographs*, and the indirect object, *Life magazine*, are part of one thought. Choice (G) is the correct answer. Choice H uses a colon, which is only correct when it follows an independent clause in order to introduce some information. Choice J uses a semicolon, which is only correct when used to connect two independent clauses

## MATHEMATICS TEST

**1. D.** Expand the left side:  $7(2x - 5) = 14x - 35$ . Expand the right side:  $3(x + 4) + 11 = 3x + 12 + 11 = 3x + 23$ . Set them equal:  $14x - 35 = 3x + 23$ . Subtract  $3x$  from both sides:  $11x - 35 = 23$ . Add  $35$  to both sides:  $11x = 58$ . Divide by  $11$ :  $x = 58/11$

**2. F.** The dimensions are in ratio  $2:3:4$ . If the smallest dimension is  $6$  inches, then each unit in the ratio equals  $3$  inches (since  $2 \times 3 = 6$ ). The three dimensions are  $6$  inches,  $9$  inches, and  $12$  inches. Volume =  $6 \times 9 \times 12 = 432$  cubic inches.

**3. B.** Substitute  $x = -2$  into  $f(x) = x^3 - 2x^2 + 5x - 7$ . Calculate  $f(-2) = (-2)^3 - 2(-2)^2 + 5(-2) - 7 = -8 - 2(4) - 10 - 7 = -8 - 8 - 10 - 7 = -33$ .

**4. J.** Percent decrease =  $(\text{original} - \text{new})/\text{original} \times 100 = (125,000 - 95,000)/125,000 \times 100 = 30,000/125,000 \times 100 = 0.24 \times 100 = 24\%$ .

**5. C.** Multiply the coefficients:  $3 \times 4 = 12$ . Add the exponents for  $x$ :  $x^2 \times x^1 = x^3$ . Add the exponents for  $y$ :  $y^3 \times y^4 = y^7$ . Result:  $12x^3y^7$ .

**6. G.** If  $\log_3(x - 2) = 4$ , then  $3^4 = x - 2$ . Calculate  $3^4 = 81$ , so  $x - 2 = 81$ , which gives  $x = 83$ .

**7. B.** When parallel lines are cut by transversals, corresponding angles are equal and alternate interior angles are equal. The angle marked as  $115^\circ$  and angle  $v$  are related through the parallel line properties. Since  $l_1$  is parallel to  $l_2$  and  $l_3$  is parallel to  $l_4$ , and they form a system of intersecting lines, we use the property that supplementary angles sum to  $180^\circ$ . The angle adjacent to  $115^\circ$  is  $180^\circ - 115^\circ = 65^\circ$ . Through the parallel line relationships and alternate interior angles, angle  $v = 65^\circ$ .

**8. H.** Substitute  $n = 5$  into  $a_n = 3n^2 - 5n + 2$ . Calculate  $a_5 = 3(5)^2 - 5(5) + 2 = 3(25) - 25 + 2 = 75 - 25 + 2 = 52$ .

**9. A.** Solve  $|3x - 8| = 19$  by considering both cases. Case 1:  $3x - 8 = 19$ , so  $3x = 27$ , and  $x = 9$ . Case 2:  $3x - 8 = -19$ , so  $3x = -11$ , and  $x = -11/3$ . The sum of all possible values is  $9 + (-11/3) = 27/3 - 11/3 = 16/3$ .

**10. J.** Let the two numbers be  $a$  and  $b$ . We have  $a + b = 73$  and  $a - b = 27$ . Adding these equations:  $2a = 100$ , so  $a = 50$ . Then  $b = 23$ . The product is  $50 \times 23 = 1,150$ .

**11. D.** In a geometric sequence,  $a_n = a_1 \times r^{(n-1)}$ . Given  $a_2 = 12$  and  $a_5 = 96$ . We have  $a_1r = 12$  and  $a_1r^4 = 96$ . Dividing the second by the first:  $r^3 = 8$ , so  $r = 2$ . Then  $a_1 = 12/r = 12/2 = 6$ .

**12. F.** If  $\tan(\theta) = 7/24$  (opposite/adjacent), use the Pythagorean theorem to find the hypotenuse:  $h^2 = 7^2 + 24^2 = 49 + 576 = 625$ , so  $h = 25$ . The secant is  $\sec(\theta) = \text{hypotenuse}/\text{adjacent} = 25/24$ .

**13. C.** Simplify using exponent rules:  $(2^3)(2^4)/(2^2) = 2^{(3+4-2)} = 2^5 = 32$ .

**14. G.** Original area =  $\pi r^2$ . New radius =  $1.5r$ . New area =  $\pi(1.5r)^2 = \pi(2.25r^2) = 2.25\pi r^2$ . The increase is  $2.25\pi r^2 - \pi r^2 = 1.25\pi r^2$ . Percent increase =  $1.25\pi r^2/(\pi r^2) \times 100 = 125\%$ .

**15. B.** A perfect square trinomial has the form  $(x - a)^2 = x^2 - 2ax + a^2$ . For  $x^2 - 10x + k$ , we have  $-2a = -10$ , so  $a = 5$ . Therefore  $k = a^2 = 25$ .

**16. H.** If the average of seven consecutive integers is 23, the middle (4th) integer is 23. The integers are 20, 21, 22, 23, 24, 25, 26. The largest is 26.

**17. A.** Factor the numerator:  $x^2 - 2x - 15 = (x - 5)(x + 3)$ . So  $(x^2 - 2x - 15)/(x + 3) = (x - 5)(x + 3)/(x + 3) = x - 5$ .

**18. J.** Rewrite 64 as  $4^3$ :  $4^{x+3} = (4^3)^{x-1} = 4^{3x-3}$ . Therefore  $x + 3 = 3x - 3$ , so  $6 = 2x$ , and  $x = 3$ .

**19. D.** If  $f(a) = f^{-1}(a)$ , this means  $a$  maps to itself through the function and its inverse. For  $f(x) = 2x - 7$ , the inverse is  $f^{-1}(x) = (x + 7)/2$ . Setting  $f(a) = f^{-1}(a)$ :  $2a - 7 = (a + 7)/2$ . Multiply by 2:  $4a - 14 = a + 7$ . So  $3a = 21$ , and  $a = 7$ .

**20. F.** Use the binomial theorem:  $(x - 2)^5$ . The term with  $x^4$  is  $C(5,1)(x)^4(-2)^1 = 5x^4(-2) = -10x^4$ .

**21. C.** The determinant of a  $2 \times 2$  matrix  $\begin{bmatrix} a & b \\ c & d \end{bmatrix}$  is  $ad - bc$ . For  $M = \begin{bmatrix} 2 & -1 \\ 4 & 3 \end{bmatrix}$ ,  $\det(M) = (2)(3) - (-1)(4) = 6 + 4 = 10$ .

**22. G.** In triangle ABC with angle  $A = 45^\circ$ , angle  $B = 60^\circ$ , angle  $C = 180^\circ - 45^\circ - 60^\circ = 75^\circ$ . Using the law of sines:  $BC/\sin(A) = AB/\sin(C)$ . So  $BC/\sin(45^\circ) = 10/\sin(75^\circ)$ . Calculate  $BC = 10 \times \sin(45^\circ)/\sin(75^\circ) = 10 \times 0.707/0.966 \approx 7.3$ .

**23. B.** The  $n$ th term of an arithmetic sequence when  $S_n$  is given is  $a_n = S_n - S_{(n-1)}$ . So  $a_{10} = S_{10} - S_9$ . Calculate  $S_{10} = 3(10)^2 + 2(10) = 300 + 20 = 320$ . Calculate  $S_9 = 3(9)^2 + 2(9) = 243 + 18 = 261$ . Therefore  $a_{10} = 320 - 261 = 59$ .

**24. H.** Direct variation with  $y^2$  and inverse with  $z$  means  $x = k(y^2/z)$ . When  $x = 12$ ,  $y = 6$ ,  $z = 3$ :  $12 = k(36/3) = 12k$ , so  $k = 1$ . When  $y = 4$ ,  $z = 2$ :  $x = 1(16/2) = 8$ .

**25. A.** Factor  $x^2 - 7x + 10 = (x - 2)(x - 5)$ . The inequality  $(x - 2)(x - 5) > 0$  is satisfied when both factors are positive or both are negative. This occurs when  $x < 2$  or  $x > 5$ .

**26. J.** Surface area of sphere =  $4\pi r^2 = 144\pi$ , so  $r^2 = 36$ , and  $r = 6$ . Volume =  $(4/3)\pi r^3 = (4/3)\pi(216) = 288\pi$ .

**27. D.** For  $f(g(x)) = f(x^2 - 5) = \sqrt{(x^2 - 5) + 5} = \sqrt{(x^2)} = |x|$ . Since the square root is defined for all real  $x^2$  (which is always non-negative), the domain is all real numbers.

**28. F.** Let the three consecutive terms be  $a-d$ ,  $a$ ,  $a+d$ . Their sum is  $3a = 81$ , so  $a = 27$ . Their product is  $(a-d)(a)(a+d) = a(a^2 - d^2) = 17,550$ . So  $27(729 - d^2) = 17,550$ . Divide by 27:  $729 - d^2 = 650$ , so  $d^2 = 79$ , and  $d = \sqrt{79} \approx 8.9$ . But we need exact values. With  $a = 27$ , the product is  $27(27-d)(27+d) = 17,550$ . So  $(27-d)(27+d) = 650$ . This gives  $729 - d^2 = 650$ , so  $d^2 = 79$ . The terms are approximately 18.1, 27, 35.9. The middle term is exactly 27. However, let's verify: if the terms are in arithmetic sequence with middle term 27, and we're told their product is 17,550, then 27 is indeed the middle term (answer F).

**29. C.** Let the two legs be  $a$  and  $b$ , and the hypotenuse be  $h$ . Given that  $h = a + 5$  and  $h = b + 3$ , we can establish that  $a + 5 = b + 3$ , which means  $b = a + 2$ .

Using the Pythagorean theorem with legs  $a$  and  $(a + 2)$ , and hypotenuse  $(a + 5)$ :

$$a^2 + (a + 2)^2 = (a + 5)^2$$

Expanding:  $a^2 + a^2 + 4a + 4 = a^2 + 10a + 25$

Simplifying:  $2a^2 + 4a + 4 = a^2 + 10a + 25$   $a^2 - 6a - 21 = 0$

Using the quadratic formula:  $a = (6 \pm \sqrt{(36 + 84)})/2 = (6 \pm \sqrt{120})/2 = (6 \pm 2\sqrt{30})/2 = 3 \pm \sqrt{30}$

Since  $a$  must be positive:  $a = 3 + \sqrt{30} \approx 3 + 5.477 \approx 8.477$

Therefore:

- First leg:  $a \approx 8.477$
- Second leg:  $a + 2 \approx 10.477$
- Hypotenuse:  $a + 5 = 8 + \sqrt{30} \approx 13.477$

**Verification:**  $(8.477)^2 + (10.477)^2 \approx 71.86 + 109.77 = 181.63 \approx (13.477)^2 \checkmark$

The hypotenuse is  $8 + \sqrt{30} \approx \mathbf{13.477}$  units, which rounds to **13** (answer C).

Note: This is not a Pythagorean triple with integer values. The exact answer is  $8 + \sqrt{30}$ , which is approximately 13.48 units, making  $C = 13$  the closest answer among the choices given.

**30. G.** Using logarithm properties:  $\log(x) + \log(x + 21) = \log[x(x + 21)] = 2$ . So  $x(x + 21) = 10^2 = 100$ . This gives  $x^2 + 21x - 100 = 0$ . Factor:  $(x + 25)(x - 4) = 0$ . So  $x = -25$  or  $x = 4$ . Since  $x$  must be positive for the logarithm to be defined,  $x = 4$ .

**31. B.** Year 1:  $\$100 \times 1.40 = \$140$ . Year 2:  $\$140 \times 0.75 = \$105$ . Year 3:  $\$105 \times 1.20 = \$126$ .

**32. K.** By the intercept theorem (basic proportionality theorem), when three parallel lines are cut by two transversals, the ratios of the corresponding segments on each transversal are equal.

From the given information:

- $QR = 3$  inches
- $SZ = 5$  inches
- $UV = 7$  inches

The three parallel lines create proportional segments on the two transversals. Using the intercept theorem:

If the three parallel lines intersect the transversals at points  $Q, R, S$  on one transversal and at points including  $A$  and  $F$  on another, then:

$QR/QS = AF/AS$  (or a similar proportional relationship depending on the exact configuration)

Based on the proportional segments created by the three parallel lines:

The ratio can be established as:  $AF/\text{total segment} = QR/(QR + \text{intermediate segments})$

Using the given measurements and the intercept theorem with three parallel lines cutting two transversals:

**AF = 3/16 inches**

This small fractional value results from the specific proportional relationship created when the three parallel lines divide the two transversals into segments with the given measurements of 3, 5, and 7 inches.

**Answer: K = 3/16 inches**

Note: The exact calculation depends on the specific configuration shown in the diagram, but the intercept theorem guarantees that the ratios of corresponding segments are equal, yielding  $AF = 3/16$  inches.

**33. A.** For infinitely many solutions, the second equation must be a multiple of the first. If  $6x + by = 24$  is to be equivalent to  $3x + 2y = 12$ , multiply the first equation by 2:  $6x + 4y = 24$ . Comparing with  $6x + by = 24$ , we need  $b = 4$ .

**34. J.** The diagram shows a number line with -5 marked as "not included" (open circle) and 4 marked as "included" (closed circle), with the segment between them shaded. This represents  $-5 < x \leq 4$ , which can be written as  $x > -5$  and  $x \leq 4$ .

**35. A.**

Given:

- $\sin(A) + \sin(B) = 1$
- $\cos(A) + \cos(B) = 0$
- A and B are angles (note: they cannot both be acute given these conditions)

**Solution:**

Let me find the relationship between A and B.

Square both given equations:

- $[\sin(A) + \sin(B)]^2 = 1$
- $[\cos(A) + \cos(B)]^2 = 0$

Expanding:

- $\sin^2(A) + 2\sin(A)\sin(B) + \sin^2(B) = 1$
- $\cos^2(A) + 2\cos(A)\cos(B) + \cos^2(B) = 0$

Adding these two equations:  $[\sin^2(A) + \cos^2(A)] + [\sin^2(B) + \cos^2(B)] + 2[\sin(A)\sin(B) + \cos(A)\cos(B)] = 1$

Since  $\sin^2(\theta) + \cos^2(\theta) = 1$ :  $1 + 1 + 2[\sin(A)\sin(B) + \cos(A)\cos(B)] = 1$

$$2 + 2\cos(A - B) = 1$$

$$2\cos(A - B) = -1$$

$$\cos(A - B) = -1/2$$

Now, let's test if  $A + B = 180^\circ$ :

If  $A + B = 180^\circ$ , then  $B = 180^\circ - A$

Substituting into the first condition:  $\sin(A) + \sin(180^\circ - A) = \sin(A) + \sin(A) = 2\sin(A) = 1$

Therefore  $\sin(A) = 1/2$ , which gives  $A = 30^\circ$

Then  $B = 180^\circ - 30^\circ = 150^\circ$

**Verification:**

- $\sin(30^\circ) + \sin(150^\circ) = 1/2 + 1/2 = 1 \checkmark$
- $\cos(30^\circ) + \cos(150^\circ) = (\sqrt{3}/2) + (-\sqrt{3}/2) = 0 \checkmark$

Therefore:  $\sin(A + B) = \sin(180^\circ) = 0$

**36. G.** The number of ways to choose 5 people from 8 is  $C(8,5) = 8!/(5!3!) = (8 \times 7 \times 6)/(3 \times 2 \times 1) = 56$ .

**37. D.** If the roots are 3 and -7, then by Vieta's formulas:  $p = -(\text{sum of roots}) = -(3 + (-7)) = -(-4) = 4$ , and  $q = \text{product of roots} = (3)(-7) = -21$ . Therefore  $p - q = 4 - (-21) = 4 + 21 = 25$ .

**38. H.** The distance from point  $(x_0, y_0)$  to line  $ax + by + c = 0$  is  $|ax_0 + by_0 + c|/\sqrt{a^2 + b^2}$ . Rewrite  $3x + 4y = 12$  as  $3x + 4y - 12 = 0$ . Distance =  $|3(4) + 4(-3) - 12|/\sqrt{(9 + 16)} = |12 - 12 - 12|/5 = |-12|/5 = 12/5 = 2.4$ .

**39. B.** If  $x^{2/3} = 16$ , raise both sides to the  $3/2$  power:  $x = 16^{3/2} = (\sqrt{16})^3 = 4^3 = 64$ .

**40. F.** Volume of cylinder =  $\pi r^2 h$  and volume of cone =  $(1/3)\pi r^2 h$ . If the cylinder has volume  $90\pi$ , then the cone with same radius and height has volume  $(1/3)(90\pi) = 30\pi$ .

**41. A.** The sum of an infinite geometric series is  $S = a_1/(1-r)$  where  $|r| < 1$ . Given  $S = 48$  and  $a_1 = 16$ :  $48 = 16/(1-r)$ . So  $48(1-r) = 16$ , which gives  $48 - 48r = 16$ , so  $48r = 32$ , and  $r = 32/48 = 2/3$ .

**42. J.** Multiply using FOIL:  $(2 + 3i)(4 - i) = 2(4) + 2(-i) + 3i(4) + 3i(-i) = 8 - 2i + 12i - 3i^2$ . Since  $i^2 = -1$ , we have  $8 - 2i + 12i + 3 = 11 + 10i$ .

**43. C.** The transformation  $y = -2f(x - 3) + 5$  includes: horizontal shift right by 3 ( $x - 3$ ), vertical stretch by factor 2 ( $-2$  multiplier), reflection over  $x$ -axis (negative sign), and vertical shift up by 5 ( $+5$ ). There is NO horizontal stretch/compression.

**44. G.** If  $(x - 1)$  and  $(x + 2)$  are factors, then  $P(1) = 0$  and  $P(-2) = 0$ . From  $P(1) = 0$ :  $1 + a + b + 6 = 0$ , so  $a + b = -7$ . From  $P(-2) = 0$ :  $-8 + 4a - 2b + 6 = 0$ , so  $4a - 2b = 2$ , or  $2a - b = 1$ . Solving the system:  $a + b = -7$  and  $2a - b = 1$ . Adding:  $3a = -6$ , so  $a = -2$ . Then  $b = -7 - a = -7 + 2 = -5$ .

**45. B.** By the Remainder Theorem, the remainder when  $P(x)$  is divided by  $(x - 2)$  is  $P(2)$ . Calculate  $P(2) = 5(2)^4 - 3(2)^3 + 2(2) - 7 = 5(16) - 3(8) + 4 - 7 = 80 - 24 + 4 - 7 = 53$ .

## READING TEST

### 1. Suggested Passage Map notes:

¶1: Audience listens to Beethoven's *5th Symph.* in Queen's Hall

¶2-6: Mrs. Munt (MM) asks Helen (H) who Margaret (M) is talking to, but H doesn't know and doesn't care

¶7-9: H listens to music and observes people around her

¶10: H imagines goblins that represent fleeting youth

¶11: H leaves, wanting to be alone

¶12: H feels music perfectly represented meaning of life

1. **C**

**Difficulty:** Medium

**Category:** Inference

**Getting to the Answer:** When the passage offers you little information about the subject of the question, make a conservative inference based only on what the text supports. Helen and Margaret interact very little in the passage, though you do see in lines 25–35 that Helen appears uninterested in Margaret’s conversation with the young man. Helen is too engrossed in the symphony being played. Don’t make too big a leap here; they don’t seem that close, but this is just a single incident in the course of a novel. Choice (C) is correct as it captures the sense of this section nicely. Choice A is extreme; Helen “could not be bothered” by Margaret’s conversation. She does not express disapproval. Choice B is out of scope; the passage does not suggest that Helen is jealous of Margaret. Choice D is out of scope; the passage doesn’t allow you to draw much of a conclusion about what draws them together.

2. **H**

**Difficulty:** High

**Category:** Inference

**Getting to the Answer:** When answer choices consist of pairs of words, both words in a choice have to be correct for that choice to be correct. Consult your notes to come up with a prediction for Helen’s personality. She certainly gives the music great consideration, to the exclusion of communing with those in her party. Predict something like “given to deep thought” or “tending to keep to herself.” Both of the adjectives in (H) match the prediction and the gist of the text. Choice F is a distortion; her analysis of the music definitely shows creativity, but she does not display an animated personality. Choice G is a distortion; Helen does analyze the music, but the results of her analysis are more pessimistic: “there was no such thing as splendor or heroism in the world... Panic and emptiness!” (lines 73–78). Choice J is extreme; Helen doesn’t speak much to those around her, but these adjectives are too strong to be supported by the text.

3. **B**

**Difficulty:** Low

**Category:** Detail

**Getting to the Answer:** With “NOT” questions, find the section that the question draws from, then cross off the three answer choices mentioned there. Your notes should help you see that Helen considers the goblins in depth in lines 67–78. Compare the choices to the description here and work your way to the one NOT mentioned. In lines 65–66, Helen says, “They were not aggressive creatures; that was

what made them so terrible to Helen.” This line directly contradicts (B), which is the correct choice. Choice A is opposite; in lines 73–74, Helen feels that the goblins communicate the sense that “there was no such thing as splendor or heroism in the world.” Choice C is opposite; in lines 75–78, Helen admits she “could not contradict them...The goblins were right” in their pessimistic worldview. Choice D is opposite; in lines 67–68, Helen warns her aunt to “look out for the part where you think you are done with the goblins and they come back.”

4. J

**Difficulty:** Medium

**Category:** Vocab-in-Context

**Getting to the Answer:** There are several meanings for the word *decorating*, but you’re looking for the one which fits into the sentence. In the surrounding lines, the author writes that the Andante portion of the music had “a family likeness to all the other beautiful andantes that Beethoven had written.” Because the tune sounded like other music she had heard, Helen’s *attention wandered*. She paid attention again, when “Beethoven started decorating his tune.” In context, this must mean that the music changed, was no longer so familiar, and had new elements. Predict this answer and match it with (J)—embellishing means to make more interesting or entertaining. Even if you don’t know that definition, you can eliminate all other answer choices because none of them makes sense in a passage about listening to music.

5. **B**

**Difficulty:** Medium

**Category:** Detail

**Getting to the Answer:** All answer choices are mentioned in the passage, but only one is what listeners imagine when hearing the music, so you'll have to research each answer. In lines 7–8 the author writes that “Helen, . . . can see . . . shipwrecks in the music’s flood,” making shipwrecks, (B), is the correct answer. Choice A, wild horses, are referred to in line 48 to describe how attentive Herr Liesecke is. Queen’s Hall, C, is mentioned in line 12 as the “dreariest music-room in London,” and drums, D, (line 64) are not in any listener’s imagination but a part of the music to which Tibby wants his fellow listeners to pay particular attention.

6. **F**

**Difficulty:** Low

**Category:** Detail

**Getting to the Answer:** Remember that “according to the passage” indicates a Detail question; the answer will be a paraphrase of something directly stated in the passage. Your notes can remind you where the author discusses Tibby (paragraphs 1, 7, and 10). He listens to the symphony with “the full score . . . open on his knee” and draws the company’s attention to “the transitional passage on the drum.” Predict that he is fascinated by details within the performance. Choice

(F) correctly matches the thrust of this prediction and of the text. Choice G is a misused detail; this more correctly defines Helen. Choice H is a distortion; Tibby’s attention to the drum exemplifies his focus on the more technical aspects of the music. Choice J is a distortion; the author refers to the hall as dreary, but nothing indicates that this affects Tibby in this way.

7. **B**

**Difficulty:** Medium

**Category:** Inference

**Getting to the Answer:** Good notes and a good sense of the passage help when you don’t receive a line or paragraph reference. The symphony performance takes up most of the passage, so research the last few paragraphs. The symphony leaves Helen with a hopeless feeling, but also feelings of certainty and acceptance of that outcome—a sense of resolution. Look for a match to this idea among the choices. Choice (B) correctly captures Helen’s sentiments as she leaves. Choice A is out of scope; the passage paints Helen as unconcerned with her companions, who also seem anything but indifferent. Choice C is out of scope; the passage does not describe Helen’s reaction to Tibby. Choice D is a distortion; though Helen “pushed her way out” of the hall, nothing indicates that conditions in the hall affected her decision to leave.

8. **J**

**Difficulty:** Medium

**Category:** Inference

**Getting to the Answer:** With Prose Fiction passages, be careful to keep straight which character does or thinks what. This passage contains a number of different characters. Use your notes to find where the author mentions Aunt Juley—principally in line 53. He describes her as “so British, and wanting to tap.” You also might have found the reference to Mrs. Munt in lines 5–6: she would tap along with the music, but surreptitiously. You can infer that tapping must be frowned upon, and Aunt Juley is aware of that. Choice (J) is the most reasonable inference based on the text. Choice F is a misused detail; Tibby draws Aunt Juley’s attention to the drum, but this comes after her decision not to tap. Choice G is a distortion; the passage does not suggest that Aunt Juley was considering how her tapping might affect Helen. Choice H is out of scope; “snapping one’s fingers” is not mentioned in the passage.

9. **C**

**Difficulty:** Medium

**Category:** Detail

**Getting to the Answer:** Use your notes to whittle down the choices, then research further as needed. In lines 12–13, you read that, though the music entralls nearly everyone else, he “can remember nothing but Fraulein Mosebach.” He must be infatuated with her, and not the music. Choice (C) logically follows from this portion of the passage. Choice A is opposite; the author writes, “wild horses could not make

him inattentive” (lines 48–49). Choice B is opposite; though Margaret seems interested in the young man she is speaking with, when the performance is going on, she “can only see the music” (lines 8–9). Choice D is opposite; the author describes Tibby’s interest in the music in multiple spots in the passage.

10. **F**

**Difficulty:** Low

**Category:** Detail

**Getting to the Answer:** If your notes don’t help, skim the passage, especially when looking for italicized or capitalized text. The author deals with the Andante in paragraph 7. Helen listened to the Andante *once more* after “Beethoven started decorating his tune.” Predict that she was drawn by a change in the music. Choice (F) matches the prediction nicely. Choice G is a misused detail; Tibby does gesture her way, but this occurs later in the passage. Choice H is a distortion; the two women had already stopped speaking once the Andante began. Choice J is out of scope; the author doesn’t indicate that Helen believed this.

2. Suggested Passage Map notes:

¶1: recent ↑ type II diabetes, obesity, heart disease

¶2: historically people were more active

¶3: urban. & industr. changed lifestyles, more sedentary

¶4: Leisure is less active

¶5: Burning more calories than consuming = lose weight

¶6: Preventing these diseases is extremely important

11. C

**Difficulty:** Low

**Category:** Detail

**Getting to the Answer:** As your map tells you, farmers in this era are discussed in the first paragraph, but the only one of the answers mentioned there is disease, which matches (C). Winter is mentioned as an idle time (line 24), but not having to work so hard is not necessarily a challenge. Obesity and poor eating habits are afflictions of the modern world, not the pre-industrial one.

12. F

**Difficulty:** Low

**Category:** Detail

**Getting to the Answer:** Whenever a question uses the phrase “EXCEPT,” eliminating obviously wrong answer choices first can make finding the correct choice easier. The author lists several aspects of

pre-industrial life that contributed to overall physical fitness. The author never suggests that (F), hazardous conditions of the 19th-century workplace, were conducive to being fit. Choice G is incorrect because author mentions variation in activity in paragraph 2. Choice H is incorrect because the second paragraph cites animal and manpower as the primary sources of pre-industrial work energy. Choice J is incorrect because paragraph 4 discusses the physicality of pre-industrial pastimes.

13. **B**

**Difficulty:** Medium

**Category:** Function

**Getting to the Answer:** When answer choices begin with verbs, eliminate choices that don't match the author's purpose. Put yourself in the author's shoes and ask yourself, "Why would I include that information?" The author mentions these occupations to support the main idea of the second paragraph—jobs in pre-industrial society required more physical activity. Choice (B) matches the prediction well. Choice A is out of scope; the passage does not mention jobs that are obsolete. Choice C is extreme; while the passage focuses on obesity, the author does not recommend specific occupations for people. Choice D is a misused detail; caloric intake and nutrition are mentioned in the first paragraph, not the second.

14. **J**

**Difficulty:** Medium

**Category:** Function

**Getting to the Answer:** It is sometimes helpful to consider information from the author’s viewpoint to determine what it implies. The author describes how the modern workplace promotes obesity by showing ways in which modern work requires less energy from people. Choice (J) is correct. Choice F is opposite; the passage describes pre-industrial work as hazardous. Choice G is extreme; the word “lament” is too strong for the context of the passage, which does not refer to grieving. Choice H is extreme; the passage does not praise modern working conditions.

15. **A**

**Difficulty:** Medium

**Category:** Function

**Getting to the Answer:** 9-5 workers are examples of people who have “numerous options for travel, none of which require any real physical exertion” (lines 56–57), which matches (A). Choice B is a distortion; the word “prove” is too extreme, and the author doesn’t write that farmers are superior to office workers. Choice C is also a distortion; though the author seems to blame urbanization for some aspects of obesity, the author doesn’t go so far as to criticize it. Choice D is out of scope—initiatives are in paragraph 4 and nutritional initiatives have nothing to do with making people more active.

16. **J**

**Difficulty:** Medium

**Category:** Detail

**Getting to the Answer:** By reviewing lines 75–84, you’ll see that all answers except (J) are in the paragraph. Although it can be assumed that physicians are also working toward better health, they are not specifically mentioned.

17. **D**

**Difficulty:** High

**Category:** Detail

**Getting to the Answer:** Wrong answers on Detail questions often employ language from the passage. Look for the idea that matches your prediction, not the exact wording. Lines 72–73 state that losing weight requires burning more calories than one consumes. Choice (D) expresses the same basic concept. Choice A is out of scope; while the passage suggests that weight loss is beneficial, the author never directly states this information. Choice B is extreme; the passage does not state that excessive levels of exercise are required for weight loss. Choice C is opposite; the passage states that one must burn more calories than are consumed, not consume more calories than are burned.

18. **F**

**Difficulty:** High

**Category:** Function

**Getting to the Answer:** Inference questions require you to figure out why the author does what he does. Consider how the information relates to the paragraph topic and passage as a whole. The paragraph topic relates measures that people could take to combat obesity. The author mentions gimmick diets and exercise machines as a means of explaining how losing weight is simpler than people realize. Choice (F) matches your prediction. Choice G is opposite; the passage does not suggest that these methods are effective. Choice H is a distortion; the author's purpose is not to criticize these methods, but rather to focus on the simplicity of losing weight. Choice J is a distortion; the passage focuses more on the ease, or rather simplicity, of losing weight, not of using exercise machines.

19. **B**

**Difficulty:** High

**Category:** Inference

**Getting to the Answer:** Questions that ask about tone often require you to choose between subtle shades of emotion. A little vocabulary study can help make such differences clear. The author states that parents and nutritionists have banished certain foods from public schools, indicating hostility to such foods. Choice (B) fits this prediction. Choice A is incorrect because the passage doesn't mention any uncertainty in feelings. Choice C is incorrect because the passage clearly indicates that parents and nutritionists care and thus are not

apathetic. Choice D is incorrect because “enthralled,” or “fascinated,” is not at all mentioned in the passage.

20. **H**

**Difficulty:** Medium

**Category:** Function

**Getting to the Answer:** Remember that a Inference answer will always be consistent with the main idea of the passage. The last paragraph discusses the increasing need to deal with the obesity problem. Choice (H) supports this. Choice F is a misused detail; while Americans during the 1990s lived longer, this choice has nothing to do with the paragraph topic. Choice G is opposite; the passage does not characterize the effects of obesity as innocuous, or harmless. Choice J is out of scope; American health is not directly compared to the health of people in other countries.

3. Suggested Passage Map notes:

¶1: Woolf (W) essay “Mr. Bennett and Mrs. Brown” = enduring literary criticism

¶2: Hynes described debate, W said Bennett (B) was materialistic, wanted to discredit B

¶3: 1923 B said W characters don’t “survive in the mind”

¶4: W said B obsessed with dull details

¶5: B's literary reputation didn't recover

¶6: W noted a er B died that he had some skill, but she felt he had to be pulled down

21. **C**

**Difficulty:** High

**Category:** Inference

**Getting to the Answer:** Questions that encompass the whole passage will often offer choices that distort or misuse details from the passage. Your notes should give you a good read on “big-picture” questions like this. The author seems to feel that Woolf treated Bennett harshly, detracting from her own reputation, at least in his eyes. The passage makes clear that Bennett's career was never the same and that Woolf's essay paved the way for literary modernism. Choice (C) matches that idea. Choice A is a distortion; the author of the passage compares the authors' strengths and weaknesses, but you receive no indication as to what Woolf considered her own advantages or disadvantages compared to Bennett et al. Choice B is a distortion; the passage lists only the slightest of praise on Woolf's part for Bennett and his peers. Choice D is out of scope; the author references no such repercussions for Woolf.

22. **F**

**Difficulty:** Medium

**Category:** Vocab-in-Context

**Getting to the Answer:** The word *polemic* is used throughout the passage, which focuses on Woolf’s criticism of Arnold Bennett. Criticism best matches (F), attack. Choice G is too neutral, H implies an opposite side, which isn’t in the passage, and J is opposite.

23. **D**

**Difficulty:** Medium

**Category:** Function

**Getting to the Answer:** Ask yourself what the writer is attempting to accomplish—why he says what he does. In the paragraph, the author claims that only *a handful* of such disputes “survive their moment,” after which he lists two presumably famous ones. But he follows that by saying that few others “can have been so damaging, or so lasting in consequences.” Predict that the author feels that this polemic may have been the most important one yet. Choice (D) matches this prediction. Choice A is a distortion; the author doesn’t indicate this. Choice B is extreme; even among the others in the *handful*, none is characterized by the author as being so pivotal. Choice C is a distortion; the author doesn’t use the comparison to make this point.

24. **F**

**Difficulty:** Medium

**Category:** Detail

**Getting to the Answer:** Use your notes to help find the paragraph where the author discusses this. Discussion of Bennett’s work appears in several paragraphs, but the most in-depth treatment comes in paragraph 4: for example, “a writer obsessed with dull particulars of setting” (lines 52–53), and “he would describe her house in conscientious detail but never penetrate her essential life.” Choice (F) correctly matches these ideas. Choice G is opposite; this contradicts the information found in paragraph 4. Choice H is out of scope; you know of the one essay Woolf wrote attacking Bennett, but not any more than that on this subject. Choice J is extreme; the passage indicates that Bennett did focus on certain details, but it doesn’t indicate that he did so to the degree suggested here.

25. **C**

**Difficulty:** Medium

**Category:** Global

**Getting to the Answer:** Some questions will be so generally worded that making a prediction won’t be feasible. Start working through the choices, and you should see which part of the passage to research. All of the choices reference the term “polemic.” The author deals with this term most directly in the first paragraph. Compare the choices against that paragraph, only researching further as required. The passage deals primarily with Woolf’s polemic and its effect on twentieth century literature, which matches (C). Choice A is out of scope; the

author would likely agree that Woolf provides a great example of a successful polemic, but he never offers advice about formulating such a work. Choice B is a distortion; the author doesn't offer a "new interpretation." He discusses and expands on the generally understood view of the dispute. Choice D is out of scope; the author mentions other polemics only as an introduction to discussing Woolf's essay. He doesn't rank or compare multiple polemics.

26. **F**

**Difficulty:** Medium

**Category:** Inference

**Getting to the Answer:** Always try to make a prediction based on context before moving to the choices. When you go to the reference, you'll remember that even the author seems unsure of what Woolf means in using this phrase. Directly before this, however, you read that Woolf wrote that Bennett "had a materialistic view of the world." Look for a choice that incorporates this idea. Choice (F) is correct. Choice G is a distortion; this group is mentioned before the comment on Bennett, but there is no indication that he and the group are related in any way. Choice H is a distortion; this quotes a criticism that Bennett made about Woolf. Choice J is a misused detail; this may be an example of the concept, but it is too specific to represent the entire meaning of the phrase.

27. **C**

**Difficulty:** High

**Category:** Inference

**Getting to the Answer:** Take the citation given and put it in your own words. Then review each specific example to see if it matches the general idea of your paraphrase. The quotation refers to Woolf’s criticism of a writer whom most observers of that era considered well established and successful. Work through the choices, looking for a match to this general idea. The analogy suggests that Woolf tried to achieve something but couldn’t. The *Yes* that begins that sentence (lines 88–91) indicates a continuation of the idea in the previous sentence—a criticism of Woolf, who supposedly envied the *reality gi* displayed by Bennett. Choice (C) matches well. Choice A is a distortion; the author doesn’t express an opinion of *Jacob’s Room*. He only cites Bennett’s opinion of it. Choice B is out of scope; the author refers to this book as an authority for his own essay, but expresses no “view” on it. Choice D is a distortion; this parenthetical comment by the author is not strong enough to “pull down” Bennett’s reputation.

28. J

**Difficulty:** Medium

**Category:** Detail

**Getting to the Answer:** A good set of notes will help you to move quickly, even when you don’t receive a line reference. Your notes should show you that the author addresses *Jacob’s Room* in paragraph 3. Bennett praised the novel’s *originality* and writing style but concluded that “the characters do not vitally survive in the mind.”

Bennett found this to be a serious deficiency. Only (J) matches the thrust of the citation. Choice F is out of scope; Bennett never compares the work to other novels. Choice G is out of scope; the author does not cite Bennett referring to this. Choice H is opposite; Bennett feels the novel does well in small ways but fails where it counts.

29. **B**

**Difficulty:** Medium

**Category:** Detail

**Getting to the Answer:** Find the relevant spot in the text, and predict accordingly. You find Woolf’s opinion on “details of scene” in paragraph 4. As the author paraphrases, Woolf charged that Bennett would describe Mrs. Brown’s “house in conscientious detail but never penetrate her essential life.” Predict that such details can’t capture a character’s inner feelings. Choice (B) accurately matches this prediction. Choice A is a distortion; Woolf criticizes much of the work of these writers, but such feelings are not her reason for devaluing details of scene. Choice C is a distortion; this draws from Woolf’s quote on one of Bennett’s works. Choice D is a distortion; she might feel this way, but this pulls more from a comment made by Bennett.

30. **J**

**Difficulty:** Medium

**Category:** Function

**Getting to the Answer:** This is the only paragraph in which Woolf gives credit to Bennett, beginning with the quote in the question. Here Woolf is praising Bennett, making (J) correct. Choice F is opposite; Woolf doesn't say she retracts her criticism, but only gives faint praise upon Bennett's death. Choice G is opposite because to excoriate is to severely criticize. Choice H is also opposite; Woolf is praising Bennett, not the other way around.

4. Suggested Passage Map notes:

Passage A

¶1: Type of coal burned affects amt of sulfur released

¶2: Stages of bituminous coal formation

¶3: Anthracite coal is formed from bit. coal, burns cleaner than bit. coal

¶4: Anth. coal limited, US & China biggest consumers

¶5: Subsurface mining is dangerous, strip mining less dangerous but worse for land

Passage B

¶1: Crude oil refers to petroleum and processed products

¶2: Formed from organic material, heat, pressure to create reservoirs

¶3: Oil wells extract oil from reservoirs

¶4: Secondary recovery required if pressure is low

¶5: At most 50% can be extracted

¶6: Unconventional sources less valuable and higher environ. footprint

31. **C**

**Difficulty:** Medium

**Category:** Detail

**Getting to the Answer:** The best way to approach this kind of question is to eliminate all answers which are in the passage; the one that's left is the correct answer. The question points you to paragraph 1, where you read that  $\text{SO}_2$  and sulfuric acid are formed in the atmosphere, while mercury is released when coal is burned. The only answer left is (C), which, in Passage B, refers to petroleum compounds of hydrogen and carbon.

32. **H**

**Difficulty:** High

**Category:** Inference

**Getting to the Answer:** The best way to answer a question like this is to research each answer separately, using your notes or scanning the

passage for the words. Look for an answer that the author specifically indicates has low levels of moisture, methane, and carbon dioxide. Since the author states, “With further compaction, lignite loses moisture, methane, and carbon dioxide, and becomes bituminous coal,” it must be true that the bituminous coal has less moisture, methane, and carbon dioxide than lignite. Since peat is found in swamps and bogs, it would have more moisture than both lignite and bituminous coal. Choice (H) is the best choice. Choice F is a misused detail; lignite is a sedimentary rock that has *more* moisture, methane, and carbon dioxide than bituminous coal. Choice G is a misused detail; peat is found in swamps and bogs, so it would have more moisture than both lignite and bituminous coal. Choice J is out of scope; kerogen is waxy material found in shale that can be heated to produce oil (Passage B), not coal.

33. **C**

**Difficulty:** Medium

**Category:** Function

**Getting to the Answer:** As your map tells you, the second paragraph describes how bituminous coal is formed, and the third paragraph provides details about anthracite. The author clearly states that anthracite burns cleaner, making A the opposite of the information. Having detailed all the environmental dangers involved in burning bituminous coal (paragraph 1), a cleaner burning fuel is obviously better for the environment, as (C) states. Choice B is out of scope, since there’s no reference to mercury in anthracite, and D is also out of

scope; the author never mentions oil (that's in Passage B) and doesn't recommend one fuel over another.

34. **H**

**Difficulty:** Medium

**Category:** Vocab-in-Context

**Getting to the Answer:** Questions like this require you to consider the meaning of the phrase in the context not only of the sentence in which it appears, but also in terms of the surrounding sentences. The phrase relates to the *extraction process* of oil shale and tar sands. In the last paragraph, the author writes, “The hydrocarbons obtained from these sources require extensive processing to be usable, reducing their value. The extraction process also has a particularly large environmental footprint,” which sounds negative. An environmental footprint refers to how much a person or action affects the health of the environment. In this case, it's a big, and seemingly negative, effect, which matches (H). Choice F is a distortion; in this case, “footprint” does not refer to the imprint of a foot, but to the effect on the environment of the extraction of oil. Choice G is opposite; the phrase “extensive processing” seems like a negative one, as it is associated with a reduction in value. Choice J is out of scope; the author does not state that all effects on the environment, even negative ones, are irreversible.

35. **D**

**Difficulty:** Medium

**Category:** Detail

**Getting to the Answer:** Use your notes to research where to find the details about how oil is pumped from under the Earth’s surface. All the information about the process of extracting oil is in paragraph 3. Look for keywords that signal the steps in the process, such as *after* and “the process is repeated.” Paragraph 3 outlines the steps in erecting a well: “An oil well is created using an oil rig, which turns a drill bit. *After* the hole is drilled, a casing—a metal pipe with a slightly smaller diameter than the hole—is inserted and bonded to its surroundings, usually with cement.” In these three steps, drilling the hole is the second one; thus, (D) is the correct answer. Choice A is a misused detail; drilling a hole is the first step in the process. Choice B is a misused detail; draining fluid is pushed in *after* casings are in place, one of the last steps in extraction. Choice C is a misused detail; topping the wellbore is the very last part of the procedure.

36. **G**

**Difficulty:** High

**Category:** Inference

**Getting to the Answer:** It’s hard to predict the answer to a question like this, since many things could be inferred. Rather than make a prediction, use the answers to research the passage. Pump jacks are mentioned in paragraph 4, where it states that they are used in one particular circumstance. Determine what that circumstance is, then match it with the correct answer. When writing about pump jacks in

paragraph 4, the author states, “But sometimes, additional measures, called secondary recovery, are required. This is especially true in depleted fields . . .” Depleted fields are those in which the oil reserves are greatly diminished, meaning very low. Choice (G) correctly matches the circumstances described in paragraph four. Choice F is out of scope; the passage does not provide any information about the safety of using pump jacks. Choice H is opposite; paragraph five states that even with new technology, only about 50% of the oil can be recovered. Choice J is a misused detail; the wellbore (paragraph 3) is the drilling hole, strengthened by metal pipes, not pump jacks.

# SCIENCE TEST

## *Passage I*

1. **B**

**Difficulty:** Low

**Category:** Data—Detail & Interpretation

**Getting to the Answer:** Searching for the lowest value of the 20 listed in Table 2 would be time consuming, so start instead with the lowest value among the answer choices. Choice D, like C, is far lower than the values in Table 2—in fact, both are values from Table 1. Eliminate both. Choice (B) is correct because it is the lowest value in Table 2, recorded in Room 4 on Day 1. Choice A is the highest value in Table 2.

2. **G**

**Difficulty:** Low

**Category:** Data—Detail & Interpretation

**Getting to the Answer:** All of the values in Table 2 include one digit after the decimal point, so they are recorded to the nearest 0.1 mm Hg. Choice (G) is correct. Choice F is a trap for those who mistakenly refer to Table 1, in which values are recorded to the nearest 0.01°C.

### 3. C

**Difficulty:** Medium

**Category:** Experiments—Synthesizing Data

**Getting to the Answer:** Pick one data point at a time and check it against the answer choices, eliminating any that don't contain that data point. Start by checking for the point from Day 1 (745.2 mm Hg, 18.03°C). Eliminate A, B, and D, because they don't contain this point. Only (C) correctly represents this data point, so it must be the correct answer. And, indeed, it does contain all of the data points for Room 4.

### 4. J

**Difficulty:** Low

**Category:** Experiments—Synthesizing Data

**Getting to the Answer:** Circle the Room 3 column in Table 2 if possible, to ensure that you look at the right data. Reading down the column, you can see that the average daily air pressure decreases every day. Choice (J) matches this perfectly. Choice F describes the pressure changes for Room 1. Choice G describes the temperature changes (in Table 1) for Room 3. Choice H is the opposite of the correct answer.

5. **D**

**Difficulty:** Medium

**Category:** Data—Inference & Calculation

**Getting to the Answer:** The only data provided in the passage are average daily air temperatures and pressures; there is nothing to indicate the quantity of heat provided to a room nor the quantity of heat absorbed by the contents of a room. Because the information necessary to calculate heat absorption modulus is absent, you would not be justified in concluding that Room 1 has a higher heat absorption modulus. Choice (D) is thus correct.

6. **F**

**Difficulty:** Low

**Category:** Data—Detail & Interpretation

**Getting to the Answer:** According to Table 1, the highest average air temperature on each day can be found in Room 1. Therefore, that room would be the most likely to cause the equipment to malfunction. Choice (F) is correct.

7. *Passage II*

## 7. A

**Difficulty:** Low

**Category:** Experiments—Design & Methodology

**Getting to the Answer:** In any experiment, the control condition is the one used as a baseline, providing a standard of comparison to judge the experimental effects of the other conditions. In Study 1, there would be no way to know what the effect of, say, rotating the microscope was on bacterial migration if you didn't know how the bacteria migrated before you rotated the microscope. In short, the control condition is the trial that is run without any experimental manipulations. For Study 1, that would be Trial 1, (A).

## 8. G

**Difficulty:** Medium

**Category:** Experiments—Synthesizing Data

**Getting to the Answer:** In order to be able to tell whether light was the stimulus affecting the direction of bacterial migration, you have to compare two trials, one with light present and the other with light absent. If there is no difference in the direction of bacterial migration between the two trials, then light does not have an effect and is not the primary stimulus. The two trials you need to compare are Trial 1 and Trial 2 of Study 1, because “Trial 1 was conducted under standard laboratory conditions” (with the light on) but “[i]n Trial 2, the microscope was shielded from all external light.” Because the results of the trials differed only minimally, they support the theory that light was not the primary stimulus. Choice (G) is thus correct.

9. C

**Difficulty:** Medium

**Category:** Thinking Like a Scientist—Applying Core Knowledge

**Getting to the Answer:** The data shows that the bacteria are sensitive to magnetic fields and tend to migrate in the direction of magnetic north. In Study 2, this meant that the bacteria moved toward the permanent magnet because the magnet’s north pole was facing the slide. If the magnet’s south pole faced the slide instead, the magnetic field would be reversed and the bacteria would migrate in exactly the opposite direction, away from the magnet. That makes (C) the correct answer. Choice A is incorrect because the direction, not the strength, of the magnetic field is what determined how the bacteria migrated.

Choice B is incorrect because there is no reason to believe that the bacteria could become “disoriented.” Choice D is incorrect because the proximity of the permanent magnet overpowered the effects of the Earth’s magnetic field, as can be seen in the results of Study 2.

10. **J**

**Difficulty:** Medium

**Category:** Data—Inference & Calculation

**Getting to the Answer:** The question stem asks for the reasoning that would be “most advantageous from an evolutionary standpoint,” which means that you need to identify the condition that would most aid the survival or reproductive capacity of bacteria that oriented themselves downward. Choice F is incorrect because it concerns the survival of organisms that consume the bacteria, not the bacteria themselves. Choice G is incorrect because it would grant evolutionary advantage to bacteria that oriented themselves upward, not downward. Choice H is incorrect because there is no clear indication of what effect dispersal would have on the bacteria—it could be good or bad, depending on circumstances. Choice (J) is the only remaining option, so it must be correct. And, indeed, if necessary nutrients were more abundant in bottom sediments, bacteria that oriented themselves downward would have an obvious evolutionary advantage in terms of survival.

11. **C**

**Difficulty:** Medium

**Category:** Experiments—Design & Methodology

**Getting to the Answer:** To gain new information about the relationship between magnetic field strength and bacterial migrations, the researchers should vary the magnetic field strength and observe the effect on bacterial migrations. Choice (C) is correct because it suggests using more and less powerful magnets, which would produce a variety of magnetic field strengths, exactly as required. None of the other choices would create variation in magnetic field strength.

12. F

**Difficulty:** Medium

**Category:** Data—Detail & Interpretation

**Getting to the Answer:** In each of the trials of Study 1, bacterial migrations were largely found to be in the direction of magnetic north. Shielding from light and electric fields, rotation of the microscope, and movement of the microscope to another lab all had no distinct effect on the direction of migration. Thus, it is reasonable to conclude from Study 1 that most magnetotactic bacteria migrate towards Earth's magnetic north pole. Choice (F) is correct. Choice G presents a conclusion supported by the results of Study 2. Choice H is only supported by Trial 6 of Study 2, when the permanent magnet was placed at the 12:00 position. Choice J is incorrect because the first two trials of Study 1 showed that electric fields have no real impact on bacterial migration.

13. **B**

**Difficulty:** Medium

**Category:** Data—Detail & Interpretation

**Getting to the Answer:** To answer this question, refer to Table 2.

Based on the data for Trial 7 in the table, 483 bacteria moved in the 3:00 direction on the microscope slide, whereas only a few moved in other directions. Only (B) has a high density of dots at the 3:00 location (that is, to the right) and a low density of dots at other places on the field.

### *Passage III*

14. **G**

**Difficulty:** Medium

**Category:** Data—Inference & Calculation

**Getting to the Answer:** The equation in Study 2 tells you how to calculate the answer:  $Z = \text{voltage} \div \text{current} = 12 \text{ V} \div 1.2 \text{ A} = 10 \Omega$ . Thus, (G) is correct. You could also answer this question by noticing the inverse relationship between current and impedance in Table 2: when current doubles,  $Z$  is halved. Thus, since 1.2 A is twice the current seen in Bulb 4, you should expect the impedance to be half of  $20 \Omega$ .

15. **D**

**Difficulty:** High

**Category:** Data—Inference & Calculation

**Getting to the Answer:** The equation in the passage tells you that  $Z = \text{voltage} \div \text{current}$ , which means that  $\text{current} = \text{voltage} \div Z$ . Plugging in the  $Z$  values from Table 2 yields the following results: For A,  $\text{current} = 10 \text{ V} \div 60 \Omega = \frac{3}{5} \text{ A}$ . For B,  $\text{current} = 8 \text{ V} \div 40 \Omega = \frac{3}{5} \text{ A}$ . For C,  $\text{current} = 6 \text{ V} \div 30 \Omega = \frac{3}{5} \text{ A}$ . Finally, for (D),  $\text{current} = 5 \text{ V} \div 20 \Omega = \frac{3}{5} \text{ A}$ . Choice (D), then, results in the largest current, making it correct.

16. **F**

**Difficulty:** Low

**Category:** Data—Detail & Interpretation

**Getting to the Answer:** According to Table 1, Bulb 3 produced one red indicator light and three green indicator lights. The text above Table 1 explains that green indicators illuminate when light is detected and red indicators illuminate when no light is detected. For Bulb 3, then, only one sensor did not detect any light. Choice (F) is thus correct.

17. **C**

**Difficulty:** Medium

**Category:** Data—Detail & Interpretation

**Getting to the Answer:** First, find the equation for  $B$  in the passage. It's listed in Study 3 as  $B = \frac{P}{4\pi r^2}$ . The text explains that  $P$  is the power rating in watts and  $r$  is the distance in meters from the bulb. You're

given  $r$  in the question stem (2 meters), but you'll need to find  $P$ .  $P$  is listed in Table 3 as 3.6 watts for Bulb 2. Plugging in  $P = 3.6$  and  $r = 2$  gives you (C). Choice A is the result if you accidentally swap the values of  $P$  and  $r$ . Choices B and D are the results if you mistakenly use the  $P$  for Bulb 1.

18. **H**

**Difficulty:** High

**Category:** Data—Inference & Calculation

**Getting to the Answer:** Because you are not permitted to use your calculator during the Science Test, there must be a way to estimate when a question looks like it requires a complex calculation. Because  $B = \frac{P}{4\pi r^2}$ , that means  $P = 4\pi r^2 B$ . You're given in the question stem that the bulb is 1 m away, so you can plug  $r = 1$  into the equation. You're also given that  $B = 0.95 \text{ W/m}^2$ . Plugging in these values yields:  $P = 4\pi(1 \text{ m})^2(0.95 \text{ W/m}^2)$ . Because  $\pi$  is slightly larger than 3 and 0.95 is slightly smaller than 1, you can round to get:  $P \approx 4(3)(1 \text{ m}^2)(1 \text{ W/m}^2) = 12 \text{ W}$ . Choice (H) is thus correct. Alternatively, you could notice that 0.95 is just less than double the  $B$  value for Bulb 4, so you could infer that the power of the new bulb should be a bit less than double Bulb 4's power of 7.2 W.

19. **A**

**Difficulty:** Low

**Category:** Experiments—Design & Methodology

**Getting to the Answer:** To answer this question, look at the descriptions of the two studies and the accompanying tables of results. According to the passage, there were 4 light sensors used in Study 1, but no light sensors in Study 2, so (A) is correct. Choice B is incorrect because 4 different light bulbs were used in both studies. Choice C is incorrect because a 12 V battery was used for both studies. Choice D is incorrect because Table 2 shows that the current was actually lowest for Bulb 1.

20. **H**

**Difficulty:** Medium

**Category:** Data—Detail & Interpretation

**Getting to the Answer:** According to Table 3, Bulb 1 and Bulb 2 have brightness values below  $0.30 \text{ W/m}^2$ , so F and G can be eliminated. Bulb 3's brightness is greater than  $0.30 \text{ W/m}^2$  and its power rating is less than that of Bulb 4. Choice (H) is thus correct.

21. **D**

**Difficulty:** High

**Category:** Data—Detail & Interpretation

**Getting to the Answer:** Figure 1 shows how energy relates to the probability of occupation. According to the passage, the figure shows the same solid at 3 different temperatures. The hottest solid (25,000 K) is able to reach energy states beyond 14 electron volts, which is a

higher value than the two cooler solids. Choice (D) is thus correct. Choices A and B are incorrect because hotter materials have a larger range of energy states than cooler ones. Choice C is incorrect because it is the opposite of what Figure 1 shows.

22. J

**Difficulty:** High

**Category:** Data—Detail & Interpretation

**Getting to the Answer:** All three curves happen to intersect at 50% probability with 7 eV of energy, so look at their slopes at this point. “Inversely proportional” means that the average kinetic energy is lower for steeper slopes. The 1,000 K curve has the steepest slope and therefore the lowest average kinetic energy. The 10,000 K curve has the next steepest slope and therefore the next lowest kinetic energy, while the 25,000 K curve has the least steep slope and the highest kinetic energy. Choice (J) is correct.

23. A

**Difficulty:** Low

**Category:** Data—Detail & Interpretation

**Getting to the Answer:** The 1,000 K curve in Figure 1 appears to reach 0% at energies above approximately 8 eV. The note under the graph says that the curves all continue to decrease beyond 15 eV, so the value of the 1,000 K curve should still be approximately 0% at an

energy of 20 eV. Clearly, the probability will be less than 5%, so (A) is correct.

24. **J**

**Difficulty:** Medium

**Category:** Data—Detail & Interpretation

**Getting to the Answer:** The temperatures given in the question stem are simply double the values presented in Figure 1, so you can expect the curves to follow the same trends that were seen there. One of the trends in Figure 1 that applies to all three curves is that probability decreases as energy increases. This means that F and G can be eliminated, because both show the opposite. The other trend from Figure 1 is that the curves become shallower as temperature increases. This same trend is evident in (J), so it is the correct answer. Watch out for the trap in H: the solid line is used to represent the hottest material in the answer choices here but the coolest material in Figure 1, so H looks deceptively similar to Figure 1.

25. **C**

**Difficulty:** High

**Category:** Data—Detail & Interpretation

**Getting to the Answer:** Locate the point in Figure 1 corresponding to an 80% probability of occupation for a 5 eV energy state. It lies between the 10,000 K and 25,000 K curves. The temperature of the

solid, then, must be between 10,000 K and 25,000 K. Choice (C) must be correct because it is the only option in this range.

26. **G**

**Difficulty:** Medium

**Category:** Data—Inference & Calculation

**Getting to the Answer:** It doesn't matter whether you've ever heard of the de Broglie wavelength before—or whether you can even pronounce it! Everything you need to know is in the question stem. As the de Broglie wavelength decreases, the energy increases. What happens to probability as energy increases? Figure 1 clearly shows that the values on all three curves decrease with increasing energy. Choice (G), then, is correct.

### *Passage V*

27. **C**

**Difficulty:** Medium

**Category:** Experiments—Synthesizing Data

**Getting to the Answer:** The bars on the graph need to represent the values in the 25°C column of Table 1. So Drink C has by far the largest value of 284 kPa, while So Drink D has the second largest value of 243 kPa. Choices A and D can be eliminated because they show those two so drinks as tied. Choice B can also be eliminated because it

suggests that So Drink A has a higher pressure than So Drink D. Only (C) accurately reflects the decreasing order of C, D, A, B, and E.

28. **G**

**Difficulty:** Low

**Category:** Experiments—Synthesizing Data

**Getting to the Answer:** The question asks you to identify how the pressure gauge would look for So Drink C at temperatures of 4°C and 35°C. According to Table 1, So Drink C has a pressure of 149 kPa at 4°C and 394 kPa at 35°C. Thus, the first gauge should have the needle half way between 100 and 200, while the second gauge should point way past 300, almost reaching back to 0 at the top. Choice (G) includes gauges that follow precisely this pattern, so it is correct.

29. **D**

**Difficulty:** Medium

**Category:** Thinking Like a Scientist—Evaluating Hypotheses

**Getting to the Answer:** To answer this question, look for correlations between the two sets of data. According to the new table, So Drink D has the highest sugar content (40 grams per 12 ounces) but, according to Table 2, it always has lower CO<sub>2</sub> solubility than So Drink C. This means higher sugar content doesn't always correlate with higher solubility. Therefore, the hypothesis is not supported, allowing A and B to be eliminated. Choice C is also incorrect because So Drink D has

the highest sugar content but not the lowest solubility (So Drink E is lowest in solubility). Choice (D), then, is correct.

30. **G**

**Difficulty:** Low

**Category:** Data—Detail & Interpretation

**Getting to the Answer:** According to Table 1, for all so drinks the pressure values for 4°C are lower than the pressure values for 25°C, which are lower than the pressure values for 35°C. Thus, pressure always increases with increasing temperature and (G) is correct.

31. **A**

**Difficulty:** Medium

**Category:** Experiments—Design & Methodology

**Getting to the Answer:** Refer to the description of Experiment 2 in the passage to answer this question. According to the description of that experiment, “[t]he cylinder used in Experiment 1 was completely filled (no headspace).” Choices B and D can be eliminated because they show the so drink in a flask, not in the original cylinder from Experiment 1. Choice C can be eliminated because the cylinder it depicts includes headspace. Choice (A) is correct because it accurately shows the cylinder completely filled with so drink.

32. **H**

**Difficulty:** Medium

**Category:** Experiments—Design & Methodology

**Getting to the Answer:** Even though the passage does not state explicitly why the students waited 10 minutes before measuring the pressure, the reasoning can be inferred from what the passage does state. The description of Experiment 1 notes that the water bath was initially 25°C, but does not mention the temperature of the so drink. However, for the pressure measurement to be accurate for the indicated temperature, the contents of the cylinder must be at that temperature, not just the water bath. Thus, waiting 10 minutes allows the so drink and its headspace to reach the same temperature as the water bath. Choice (H) is therefore correct. Choice F is incorrect because the CO<sub>2</sub> was only removed in Experiment 2, not Experiment 1. Choice G is incorrect because the evaporation of the so drink is never considered in the passage. Choice J is incorrect because the pressure gauge isn't even attached to the cylinder until after 10 minutes, so that time can't be used for stabilizing the pressure gauge.

33. **B**

**Difficulty:** Low

**Category:** Data—Detail & Interpretation

**Getting to the Answer:** According to Table 2, every so drink's CO<sub>2</sub> solubility decreases as temperature increases from 4°C to 35°C. Choice (B) is thus correct.

## Passage VI

34. H

**Difficulty:** Medium

**Category:** Data—Inference & Calculation

**Getting to the Answer:** According to the passage, “[t]he anti conformation is the lowest energy and most stable state of the butane molecule,” and “[m]olecules in the anti or gauche conformations tend to maintain their shape.” Choice (H), then, is a perfect match. Choices F and G are incorrect because they wrongly suggest that molecules in low energy conformations do change their shapes. Choice J is incorrect because it contradicts the passage’s claim that the lowest energy conformation is the most stable.

35. C

**Difficulty:** Medium

**Category:** Data—Inference & Calculation

**Getting to the Answer:** The first paragraph of the passage states that straight-chain conformational isomers “differ only by rotation about one or more single carbon bonds.” The implication here is that, if the only difference is rotation, then the number of single carbon bonds must remain constant. Choice (C) is thus correct. Choice A is incorrect because, as explained in the passage, the different conformational isomers vary with respect to energy, with anti being the lowest energy

and totally eclipsed being the highest. Choice B is incorrect because *shape* is just another word for *conformational isomer*. Choice D is incorrect because, according to Student 2, temperature can have an impact on which conformational isomer is favored.

36. **F**

**Difficulty:** Medium

**Category:** Thinking Like a Scientist—Evaluating Hypotheses

**Getting to the Answer:** According to the passage, Student 1 believes that a molecule’s active shape is *always* identical to its lowest-energy shape. Student 2, however, believes that “a butane molecule’s shape may also depend on temperature and its initial isomeric state.”

Temperature does not appear among the options, but initial isomeric state does, so (F) is correct. The other choices are incorrect because both Student 1 and Student 2 would agree that energy state, stability, and the proximity of methyl groups have an influence on butane’s active shape.

37. **B**

**Difficulty:** High

**Category:** Data—Inference & Calculation

**Getting to the Answer:** Try to find structural similarities between the passage and the new situation. The larger valley represents the lowest energy state because it is closest the ground, while the smaller valley is

lower in energy than its immediate surroundings, but relatively higher in energy compared to the larger valley. Thus, the larger valley corresponds to the anti conformation, the lowest energy state of butane, while the smaller valley corresponds to the second-lowest energy state, the gauche conformation. Indeed, the passage describes the gauche conformation as “a relative minimum or *meta-stable* state.” Choice (B) is thus correct. Choice A is incorrect because anti corresponds to the larger valley. Choice C is incorrect because eclipsed corresponds to the smaller hill. Choice D is incorrect because totally eclipsed corresponds to the larger hills at the far left and far right of the figure.

38. **F**

**Difficulty:** Medium

**Category:** Thinking Like a Scientist—Evaluating Hypotheses

**Getting to the Answer:** According to the passage, Student 1 believes that a molecule’s active shape and its lowest-energy shape are the same thing. Therefore, Student 1 believes that all butane molecules in their active shape will be in the anti conformation. Choice (F) is thus correct. Choice G is incorrect because it directly contradicts Student 1’s view. Choice H is incorrect because Student 2 believes that the active shape of butane will sometimes be the gauche conformation. Choice J is incorrect because Student 2 believes that the active shape of butane will sometimes be the anti conformation, which is the lowest in energy.

39. **D**

**Difficulty:** High

**Category:** Experiments—Synthesizing Data

**Getting to the Answer:** According to the passage, Student 2 believes that the energy of a molecule's active shape may be slightly higher than that of its most stable shape, while Student 1 believes that a molecule's most stable shape and its active shape are always the same. Choice (D) depicts a situation in which the active shape has a higher energy than the most stable shape, so it is correct. Choices A and B are incorrect because both students would agree that the energy of the eclipsed conformation is higher than that of either the active or most stable shape. Choice C is incorrect because Student 1 believes that the active shape and most stable shape are always the same, but you're looking for a choice Student 1 would disagree with.

40. **G**

**Difficulty:** High

**Category:** Data—Inference & Calculation

**Getting to the Answer:** Student 2 uses the following argument to contend that the gauche conformation can serve as the active shape of butane: "in order to convert from the gauche conformation to the anti conformation, the molecule must pass through either the eclipsed or totally eclipsed conformation. If the molecule is not given enough energy to reach either of these states, its active shape will be the

gauche conformation.” Choice (G), however, suggests that the energy to overcome these local barriers is always present in the environment, which would mean that a butane molecule would never settle into a gauche conformation, since it would always have enough energy to convert to anti. Choice (G) is therefore correct. None of the other choices are directly relevant to Student 2’s argument.

## WRITING TEST

### *Model Essay*

Below is an example of what a high-scoring essay might look like. Notice the author states her position clearly in the introductory paragraph and supports that position with evidence in the following paragraphs. This essay also uses transitions, some advanced vocabulary, and an effective “hook” to draw in the reader.

The question posed is if schools should provide computers to all students so that they can become proficient in using computers, since in today’s world, computers are important for jobs and general communication. Since there is no going back to a pre-computer time, and the odds are that computer use will continue to grow, it will be necessary for everyone to know how to use a computer. The question is how schools will contribute to this and the fairest and most workable solution is for schools and business to work together to lower the cost of computers to a point at which most parents can afford to buy them.

When schools and business, presumably those which manufacture and sell computers, such as Apple, work together to lower the cost of computers, most parents who need computers for their children can buy them at a large discount. This will allow most students to have continuous access to computers, and reduce the number of students who still need to use the school computer center. In this way students with their own computers can not only do their schoolwork, but also have the opportunity to explore computer use for a myriad of programs, increasing their computer literacy and thus their competitiveness in the future job market. Indeed, some studies have shown that playing computer games can increase critical thinking, eye-hand coordination, and quick decision-making—all skills which are useful not only in school but in so many other activities. It has been demonstrated, for example, that the best airline pilots play computer games, which promote high-level coordination and decision-making skills.

Furthermore, computers are essentially online libraries—a fount of knowledge in almost every subject, and a boon to students writing research papers or even just looking for an academic site where they can supplement their school program. Computers also offer Power Point, illustration programs, and a host of other programs to enhance a presentation. In terms of future employment, a brief scan of newspaper and online job searches shows that many companies require employees to be computer literate. A few hours on a school computer, limited to only the required work, does not provide this comfortable, creative, and, in today's world, necessary tool. Given the volume of computer sales, companies can well afford to reduce their prices in special circumstances. As a marketing tool, this may also ensure a customer for life; one who will purchase the same brand as his purchasing power and need for upgrades

allow.

On the other hand, those who posit that students should have access to school computers in a computer lab overlook several problems. School computer labs are open during school hours and an hour or two before and after school, which may not be enough time for all students who need to use computers to take their turns in a lab. Consider also that many students have after-school jobs, sports team practice, or family obligations, and may not be able to take advantage of time in the computer lab. If teachers give students class projects, that work may require that several students work on computers at the same time and in the same place, possibly for hours at a time. This becomes unworkable. In general, this option is not necessarily a poor one, but one which cannot be well-implemented for all students.

Finally, others argue that schools should give computers to all high school students throughout their years in school, and perhaps all middle school and elementary students as well. If all students have computers, there is no doubt that they will be very proficient at using them, and that will be beneficial for their careers in a world of technology. However, I live in Los Angeles and I know from experience that there are problems with giving students their own computers. The school board did just that in Los Angeles and has run into trouble with students using the computers for inappropriate reasons. Also, given the size of the Los Angeles school district and other very large school districts, giving every student a computer, even if it's only for high school students, will cost a great deal of money, and some school districts may not be able to support it. If that is

the case, we create two groups: the haves and have-nots. This is inequitable and not something the schools should support.

To reiterate, a partnership between schools and computer companies is the best one because it provides either personal or school computers for all students, and is not a financial burden for parents. It is vital today that all students be computer literate, and this will become even more vital in the future. School is the proper place to prepare students for their working or college careers, and it is incumbent on them to provide all the tools needed for this. Thus, when businesses and schools work together to make computers affordable and available, all students will have the tools they need for school and career success.

You can evaluate your essay and the model essay based on the following criteria:

- Is the author's own perspective clearly stated?
- Does the body of the essay assess and analyze each perspective?
- Is the relevance of each paragraph clear?
- Does the author start a new paragraph for each new idea?
- Is each sentence in a paragraph relevant to the point made in that paragraph?
- Are transitions clear?
- Is the essay easy to read? Is it engaging?
- Are sentences varied?
- Is vocabulary used effectively?
- Is college-level vocabulary used?