TJ Admissions Prep / Test #6 Instructions

Date: _____

mm/dd/yyyy

First Name: _____ Last Name: _____

Email: _____ Phone: _____

Instructions for TJ Test Administration

Please do the following:

- Make sure your name is on the test and on each separate sheet of the answer form "bubble" sheets.
- Write on the test as much as you want.
- Mark a "T" on the test beside questions that eat up your time.
- Mark a "?" on the test beside questions you guess on.
- Circle your answer choices (or write answer where indicated) on the test.
- Transfer your answers to the answer form/bubble sheet (don't write notes on the answer form/bubble sheet
- There is no guessing penalty, so answer all questions!

Environment:

- Find a room where you will not be distracted by family members.
- You must sit in a regular chair at a table.
- Turn off any music or TV in the background.
- Get a timer or use your timer on your phone.
- Put your phone on airplane mode so you aren't distracted.
- No eating or drinking during the test. You may take breaks in between sections if you need to eat, drink, etc.
- If you are being proctored via Zoom, take your test in front of your computer. You will receive log in information in the email that say "New Appointment" and you can find the credentials by clicking the link that says "view appointment details".

If you self-proctor, the timing is as follows:

- ACT Math – 28 Questions / 50 Minutes, then 5 minute break
- ACT Reading – 40 Questions / 65 Minutes, then 5 minute break
- ACT Science – 40 Questions / 60 Minutes

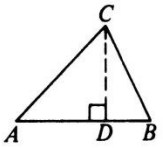
SECTION 1	Time—50 minutes 28 Questions	In this section solve each problem, using any available space on the page for scratchwork. Then decide which is the best of the choices given and fill in the corresponding oval on the answer sheet.

The following information is for your reference in solving some of the problems.

Circle of radius r: Area $= \pi r^2$; Circumference $= 2\pi r$
The number of degrees of arc in a circle is 360.
The measure in degrees of a straight angle is 180.

Definition of symbols:

$=$	is equal to	$\leqq$	is less than or equal to
$\neq$	is unequal to	$\geqq$	is greater than or equal to
$<$	is less than	$\parallel$	is parallel to
$>$	is greater than	$\perp$	is perpendicular to



Triangle: The sum of the measures in degrees of the angles of a triangle is 180.

If $\angle CDA$ is a right angle, then

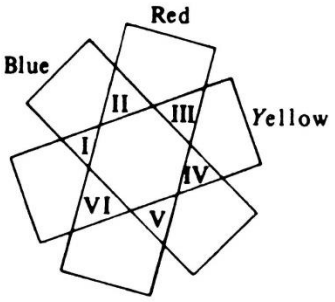
(1) area of $\triangle ABC = \dfrac{AB \times CD}{2}$

(2) $AC^2 = AD^2 + DC^2$

Note: Figures that accompany problems in this test are intended to provide information useful in solving the problems. They are drawn as accurately as possible EXCEPT when it is stated in a specific problem that its figure is not drawn to scale. All figures lie in a plane unless otherwise indicated. All numbers used are real numbers.

1. If $x^2 - 1 = y$ and $x = 3$, then $y^2 =$

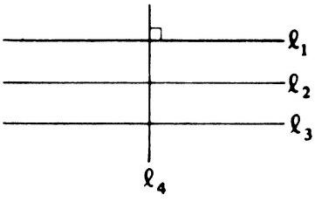
(A) 81 (B) 64 (C) 9 (D) 8 (E) 4



Red + Blue : Purple
Red + Yellow : Orange
Blue + Yellow : Green

2. The figure above shows strips of colored glass that overlap to form other colors as shown by the color chart. Which two labeled triangular regions would be green?

(A) I and III
(B) I and IV
(C) II and V
(D) III and VI
(E) IV and VI



3. In the figure above, if $\ell_1 \parallel \ell_2$, $\ell_2 \parallel \ell_3$, and $\ell_1 \perp \ell_4$, which of the following statements must be true?

I. $\ell_1 \parallel \ell_3$
II. $\ell_2 \perp \ell_4$
III. $\ell_3 \perp \ell_4$

(A) None (B) I only (C) I and II only
(D) II and III only (E) I, II, and III

4. If $100 \leqq k \leqq 400$ and k is a multiple of 5, 6, 7, and 10, then $k =$

(A) 105
(B) 150
(C) 210
(D) 300
(E) 350

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5. In a restaurant where the sales tax on a \$4.00 lunch is \$0.24, what will be the sales tax due on a \$15.00 dinner?

(A) \$0.60
(B) \$0.75
(C) \$0.90
(D) \$1.20
(E) \$1.74

1st Row	0 1 0
2nd Row	0 1 1 0
3rd Row	0 1 2 1 0
4th Row	0 1 3 3 1 0
5th Row	0 1 4 6 4 1 0
6th Row →	

6. The nonzero numbers above form a triangular array. Beginning with the second row, each nonzero number in a row is the sum of the two numbers nearest to it in the row immediately above. If a sixth row is added in this fashion, what will be the sum of all the numbers in the sixth row?

(A) 8 (B) 10 (C) 16 (D) 32 (E) 64

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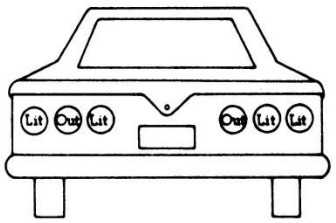
7. If x is a positive integer and $x^2 + x = n$, which of the following could be the value of n?

(A) 14
(B) 15
(C) 18
(D) 23
(E) 30



8. If one more of the lit signals on the rear of the car above were out, what per cent of all the rear signals would then be lit?

(A) 25% (B) $33\frac{1}{3}\%$ (C) 50%

(D) $66\frac{2}{3}\%$ (E) 75%

9. If $111{,}111 + N = 181{,}111$, then $N =$

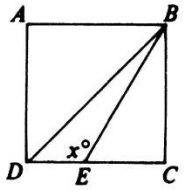
(A) 7×10^3
(B) 7×10^4
(C) 7×10^5
(D) 8×10^4
(E) 9×10^4

10. In the United States in a certain year, food production per person was 15 per cent greater than food consumption per person. If the average daily consumption per person in the United States in that year was 3,000 calories, what was the average daily production (in calories) per person in that year?

(A) 3,200 (B) 3,450 (C) 3,600
(D) 3,850 (E) 4,500

11. 0.06 is the ratio of 6 to

(A) 1,000 (B) 100 (C) 10
(D) $\frac{1}{10}$ (E) $\frac{1}{100}$



12. In the figure above, $ABCD$ is a square. If $BE = 2EC$, then $x =$

(A) 100 (B) 110 (C) 120
(D) 150 (E) 160

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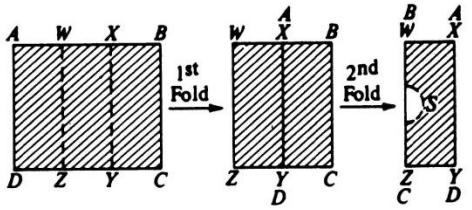
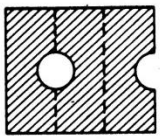
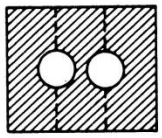


13. In the figure above, a rectangular piece of paper $ABCD$ is folded along dotted line WZ so that A is on top of X and D is on top of Y and then folded along XY so that B is on top of W and C is on top of Z. A small semicircle S with diameter on BC is cut out of the folded paper. If the paper is unfolded, which of the following could be the result?

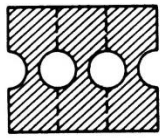
(A)



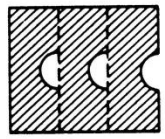
(B)



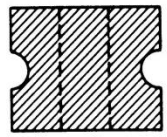
(C)



(D)



(E)



14. If $5x - 3y = 8$ and $x = \frac{7y}{5}$, then $y =$

(A) $\frac{5}{4}$

(B) $\frac{8}{5}$

(C) 2

(D) $\frac{8}{3}$

(E) 4

15. Amy is twice as old as Bill. Five years ago she was 3 times as old as Bill was then. How old is Bill now?

(A) 20
(B) 15
(C) 10
(D) 5
(E) It cannot be determined from the information given.

16. $(3x^2 - 4x + 7) - (2x + 1)(x - 5) =$

(A) $x^2 + 5x + 12$
(B) $x^2 - 5x + 12$
(C) $x^2 - 5x + 2$
(D) $5x^2 - 13x + 2$
(E) $5x^2 + 13x + 12$

17. In $\triangle ABC$, the ratio of the length of side AB to the perimeter is 1 to 3. What is the ratio of the length of side BC to the perimeter?

(A) $\frac{1}{4}$

(B) $\frac{1}{3}$

(C) $\frac{5}{12}$

(D) $\frac{1}{2}$

(E) It cannot be determined from the information given.

18. $\frac{(N-2)(N-4)(N-6)(N-8)-1}{2}$ is an integer if N is equal to

(A) 1 only
(B) 2 only
(C) 9 only
(D) any odd integer
(E) any even integer

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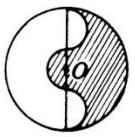

19. Three equal semicircles are drawn on a diameter of the circle with center O as shown above. If the area of circle O is 9π, then the area of the shaded region is

(A) $\frac{7\pi}{2}$ (B) 4π (C) $\frac{9\pi}{2}$ (D) 5π (E) $\frac{11\pi}{2}$

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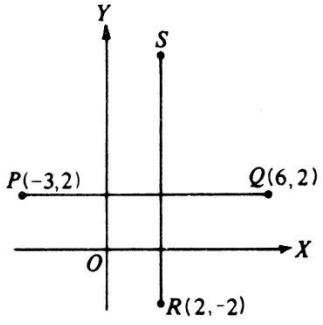
20. If each angle of quadrilateral $ABCD$ measures less than 180° and if 3 of its angles each measure x°, which of the following must be true?

(A) $x > 60$
(B) $x = 60$
(C) $x < 60$
(D) $ABCD$ is a parallelogram but not a square.
(E) $ABCD$ is a square.

21. The set P consists of all numbers which are the sum of 3 consecutive prime numbers. For example, the number 109 is in P, since $31 + 37 + 41 = 109$. The least prime number in P is

(A) 13
(B) 17
(C) 19
(D) 23
(E) 31



22. The coordinates of points P, Q, and R are shown in the figure above. If $PQ = RS$ and $PQ \perp RS$, what are the coordinates of S ?

(A) (2, 6) (B) (2, 7) (C) (2, 8)
(D) (2, 9) (E) (7, 2)

23. How many minutes will it take a rocket to travel 4,000 miles if its average rate is 100 miles every t seconds?

(A) $\frac{2t}{3}$

(B) $\frac{3t}{2}$

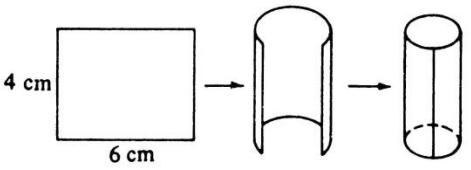
(C) $\frac{2}{3t}$

(D) $40t$

(E) $2{,}400t$

24. If the average of x, y, and 80 is 6 more than the average of y, z, and 80, what is the value of $x - z$?

(A) 2
(B) 3
(C) 6
(D) 18
(E) It cannot be determined from the information given.



25. The figure above shows how a rectangular piece of paper is rolled to form a cylindrical tube. If it is assumed that the 4-centimeter sides of the rectangle meet with no overlap, what is the area, in square centimeters, of the circular base region enclosed?

(A) 16π

(B) 9π

(C) 4π

(D) $\frac{9}{\pi}$

(E) $\frac{4}{\pi}$

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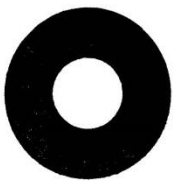
26. The difference between $6\frac{2}{3}$ hours and $7\frac{3}{5}$ hours is how many minutes?

27. There are fewer than 40 students enrolled in a certain class. If, at a certain time, $\frac{2}{9}$ of the students are absent from school and $\frac{1}{4}$ of those in school have gone to the library, what is the total class enrollment?

28. 

In the figure above, what is the greatest number of nonoverlapping regions into which the shaded region can be divided with exactly two straight lines?

End of Section 1 - Math

Section 2

READING TEST

65 Minutes—40 Questions

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

Passage I

PROSE FICTION: This passage is adapted from the short story "American History" by Judith Ortiz-Cofer (©1992 by Judith Ortiz-Cofer). The story appeared in the anthology *Iguana Dreams: New Latino Fiction.*

There was only one source of beauty and light for me my ninth grade year. The only thing I had anticipated at the start of the semester. That was seeing Eugene. In August, Eugene and his family had moved into the only house on the block that had a yard and trees. I could see his place from my bedroom window in El Building. In fact, if I sat on the fire escape I was literally suspended above Eugene's backyard. It was my favorite spot to read my library books in the summer. Until that August the house had been occupied by an old couple. Over the years I had become part of their family, without their knowing it, of course. I had a view of their kitchen and their backyard, and though I could not hear what they said, I knew when they were arguing, when one of them was sick, and many other things. I knew all this by watching them at mealtimes. I could see their kitchen table, the sink, and the stove. During good times, he sat at the table and read his newspapers while she fixed the meals. If they argued, he would leave and the old woman would sit and stare at nothing for a long time. When one of them was sick, the other would come and get things from the kitchen and carry them out on a tray. The old man had died in June. The house had stood empty for weeks. I had had to resist the temptation to climb down into the yard and water the flowers the old lady had taken such good care of.

By the time Eugene's family moved in, the yard was a tangled mass of weeds. The father had spent several days mowing, and when he finished, from where I sat, I didn't see the red, yellow, and purple clusters that meant flowers to me. I didn't see this family sit down at the kitchen table together. It was just the mother, a red-headed tall woman who wore a white uniform; the father was gone before I got up in the morning and was never there at dinner time. I only saw him on weekends when they sometimes sat on lawn-chairs under the oak tree, each hidden behind a section of the newspaper; and there was Eugene. He was tall and blond, and he wore glasses. I liked him right away because he sat at the kitchen table and read books for hours. That summer, before we had even spoken one word to each other, I kept him company on my fire escape.

Once school started I looked for him in all my classes, but P. S. 13 was a huge place and it took me days and many discreet questions to discover Eugene. After much maneuvering I managed "to run into him" in the hallway where his locker was—on the other side of the building from mine—and in study hall at the library where he first seemed to notice me, but did not speak; and finally, on the way home after school one day when I decided to approach him directly, though my stomach was doing somersaults.

I was ready for rejection, snobbery, the worst. But when I came up to him and blurted out: "You're Eugene. Right?" he smiled, pushed his glasses up on his nose, and nodded. I saw then that he was blushing deeply. Eugene liked me, but he was shy. I did most of the talking that day. He nodded and smiled a lot. In the weeks that followed, we walked home together. He would linger at the corner of El Building for a few minutes then walk down to his house.

I did not tell Eugene that I could see inside his kitchen from my bedroom. I felt dishonest, but I liked my secret sharing of his evenings, especially now that I knew what he was reading since we chose our books together at the school library.

I also knew my mother was unhappy in Paterson, New Jersey, but my father had a good job at the blue-jeans factory in Passaic and soon, he kept assuring us, we would be moving to our own house there. I had learned to listen to my parents' dreams, which were spoken in Spanish, as fairy tales, like the stories about life in Puerto Rico before I was born. I had been to the island once as a little girl. We had not been back there since then, though my parents talked constantly about buying a house on the beach someday, retiring on the island—that was a common topic among the residents of El Building. As for me, I was going to go to college and become a teacher.

But after meeting Eugene I began to think of the present more than of the future. What I wanted now was to enter that house I had watched for so many years. I wanted to see the other rooms where the old people had lived, and where the boy spent his time. Most of all, I wanted to sit at the kitchen table with Eugene like two adults, like the old man and his wife had done, maybe drink some coffee and talk about books.

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1. The main theme of this passage concerns the:
   - **A.** difficulty of first starting and then maintaining a friendship.
   - **B.** process of making a new friend and how the friendship changes the narrator.
   - **C.** problems the narrator has dealing with the loss of her former neighbors.
   - **D.** differences in the lives led by two pairs of adults who at different times lived in the same house.

2. Which of the following questions is NOT answered by information in the passage?
   - **F.** Has the narrator ever walked around inside Eugene's house?
   - **G.** What hobby or interest do Eugene and the narrator share?
   - **H.** What makes Eugene's house different from other houses on the block?
   - **J.** What careers other than teaching has the narrator considered pursuing?

3. The narrator draws which of the following comparisons between the old couple and Eugene's parents?
   - **A.** The old couple were more socially outgoing and had many more friends than Eugene's parents.
   - **B.** Eugene's parents are just as interested in tending the lawn and flowers as the old couple were.
   - **C.** Eugene's parents are less nurturing of each other and spend less time together than the old couple did.
   - **D.** Just like the old man and old woman, both of Eugene's parents appear to have jobs outside the home.

4. In terms of developing the narrative, the last two paragraphs (lines 67–87) primarily serve to:
   - **F.** provide background details about the narrator and her family in order to highlight the narrator's unique and shifting perspective.
   - **G.** describe the narrator's family in order to establish a contrast between her parents and Eugene's parents.
   - **H.** portray the narrator's family in order to show how her friendship with Eugene affected the various members of her family.
   - **J.** depict the hopes and dreams of the narrator's parents in order to show how her parents' aspirations changed over time.

5. It can most reasonably be inferred from the passage that when the narrator says, "I didn't see the red, yellow, and purple clusters that meant flowers to me" (lines 30–31), she is most nearly indicating that:
   - **A.** from her current position, she couldn't see the old woman's flowers, which were still growing near the house.
   - **B.** the flowers grown by the old woman had died because the narrator had stopped watering them.
   - **C.** the flowers grown by the old woman had been cut down when Eugene's father mowed the lawn.
   - **D.** the weeds that had grown up in the old couple's lawn had intertwined with the flowers, making the flowers hard to see.

6. According to the narrator, which of the following statements was true about Eugene at the moment when she first talked to him?
   - **F.** Due to the size of the school, he had not even noticed the narrator until she started talking to him.
   - **G.** He had searched unsuccessfully for the narrator's locker several different times and had been too shy to ask someone where it was.
   - **H.** He had first noticed the narrator in study hall but had been uninterested in her until she introduced herself.
   - **J.** He had apparently taken notice of the narrator at school and had come to like her but felt nervous about introducing himself.

7. When the narrator says, "I began to think of the present more than of the future" (lines 80–81), she most likely means that meeting Eugene led her to:
   - **A.** shift some of her attention away from her career plans and onto the developing friendship.
   - **B.** think more about her own work interests than about the career her parents thought she should pursue.
   - **C.** put off her plans of returning to Puerto Rico for a visit in favor of continuing to prepare for college.
   - **D.** want to spend more time with him instead of helping her parents plan a vacation to Puerto Rico.

8. The narrator most nearly portrays her parents' dreams as:
   - **F.** close to being realized because of her father's good job.
   - **G.** somewhat uncommon among the other residents of the family's building.
   - **H.** ones she has heard about many times but that seem far off and remote to her.
   - **J.** ones she shares with her parents and longs to fulfill.

9. The narrator claims that she felt close to the old couple because she had:
   - **A.** listened in on so many of their conversations over the years.
   - **B.** helped take care of the old woman's flowers after the woman's husband had died.
   - **C.** been able to watch them as they moved through their entire house.
   - **D.** regularly observed them during their mealtimes.

10. Which of the following best describes the narrator's feelings about secretly observing Eugene at his home?
    - **F.** Joy tinged with suspicion
    - **G.** Enjoyment mixed with guilt
    - **H.** Happiness overwhelmed by a sense of betrayal
    - **J.** Pleasure lessened by having actually met him

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Passage II

SOCIAL SCIENCE: This passage is adapted from volume 2 of Blanche Wiesen Cook's biography *Eleanor Roosevelt* (©1999 by Blanche Wiesen Cook).

Eleanor Roosevelt [ER] is the most controversial First Lady in United States history. Her journey to greatness, her voyage out beyond the confines of good wife and devoted mother, involved determination and amazing courage. It also involved one of history's most unique partnerships. Franklin Delano Roosevelt [FDR] admired his wife, appreciated her strengths, and depended on her integrity.

However, ER and FDR had different priorities, occasionally competing goals, and often disagreed. In the White House they ran two distinct and separate courts.

By 1933 [her first year as First Lady], ER was an accomplished woman who had achieved several of her life's goals. With her partners, ER was a businesswoman who co-owned the Val-Kill crafts factory, a political leader who edited and copublished the *Women's Democratic News,* and an educator who co-owned and taught at a New York school for girls.

As First Lady, Eleanor Roosevelt did things that had never been done before. She upset race traditions, championed a New Deal for women, and on certain issues actually ran a parallel administration. On housing and the creation of model communities, for example, ER made decisions and engineered policy.

At the center of a network of influential women who ran the Women's Committee of the Democratic Party led by Molly Dewson, ER worked closely with the women who had dominated the nation's social reform struggles for decades. With FDR's election, the goals of the great progressive pioneers, Jane Addams, Florence Kelley, and Lillian Wald, were at last at the forefront of the country's agenda. ER's mentors since 1903, they had battled on the margins of national politics since the 1880s for public health, universal education, community centers, sanitation programs, and government responsibility for the welfare of the nation's poor and neglected people.

Now their views were brought directly into the White House. ER lobbied for them personally with her new administrative allies, in countless auditoriums, as a radio broadcaster, and in monthly, weekly, and, by 1936, daily columns. Called "Eleanor Everywhere," she was interested in everyone.

Every life was sacred and worthy, to be improved by education, employment, health care, and affordable housing. Her goal was simple, a life of dignity and decency for all. She was uninterested in complex theories, and demanded action for betterment. She feared violent revolution, but was not afraid of socialism—and she courted radicals.

As fascism and communism triumphed in Europe and Asia, ER and FDR were certain that there was a middle way, what ER called an American "revolution without bloodshed." Her abiding conviction, however, was that nothing good would happen to promote the people's interest unless the people themselves organized to demand government responses. A people's movement required active citizen participation, and ER's self-appointed task was to agitate and inspire community action, encourage united democratic movements for change.

Between 1933 and 1938, while the Depression raged and the New Deal unfolded, ER worked with the popular front. She called for alliances of activists to fight poverty and racism at home, and to oppose isolationism internationally.

Active with the women's peace movement, ER spoke regularly at meetings of the Women's International League for Peace and Freedom, and the Conference on the Cause and Cure of War. She departed, however, from pacifist and isolationist positions and encouraged military preparedness, collective security, and ever-widening alliances.

Between 1933 and 1938 ER published countless articles and six books. She wrote in part for herself, to clear her mind and focus her thoughts. But she also wrote to disagree with her husband. From that time to this, no other First Lady has actually rushed for her pen to jab her husband's public decisions. But ER did so routinely, including in her 1938 essay *This Troubled World,* which was a point-by-point rejection of FDR's major international decisions.

To contemplate ER's life of example and responsibility is to forestall gloom. She understood, above all, that politics is not an isolated individualist adventure. She sought alliances, created community, worked with movements for justice and peace. Against great odds, and under terrific pressure, she refused to withdraw from controversy. She brought her network of agitators and activists into the White House, and never considered a political setback a permanent defeat. She enjoyed the game, and weathered the abuse.

11. As she is revealed in the passage, ER is best described as:

A. socially controversial but quietly cooperative.
B. politically courageous and socially concerned.
C. morally strong and deeply traditional.
D. personally driven but calmly moderate.

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12. The author presents ER's accomplishments as exceptional because ER:

- **F.** brought politically unpopular views to the forefront of the nation's politics.
- **G.** was the first public figure to introduce political roles for women.
- **H.** was a political pioneer struggling alone for social reform.
- **J.** replaced community action with more powerful White House networks.

13. According to the passage, ER believed that social reform should include all of the following EXCEPT:

- **A.** promoting community action.
- **B.** developing universal education.
- **C.** supporting affordable housing.
- **D.** establishing involved theories.

14. Based on the passage, ER's approach to social reform can best be characterized as:

- **F.** passionate and theoretical.
- **G.** patient and flexible.
- **H.** simplistic and isolationist.
- **J.** progressive and determined.

15. It can reasonably be inferred from the passage that at the time ER began working for social reform, the United States was:

- **A.** deeply committed to reforms in education and health care.
- **B.** experiencing a time of national prosperity that contributed to ER's ideals concerning the public welfare.
- **C.** concentrating on affairs at home due to isolationist policies and the spread of democracy overseas.
- **D.** unsupportive of the idea that the government was responsible for the welfare of its poor and neglected.

16. According to the last paragraph, which of the following statements would the author most likely make with regard to ER's vision and ideals?

- **F.** ER considered politics a game and played only when she knew she could win.
- **G.** ER worked with agitators and remained dedicated to the pursuit of justice and peace in victory and defeat.
- **H.** ER placed herself in the position of president, making decisions that determined White House policy.
- **J.** ER saw herself as the country's role model and personally responsible for bringing about change.

17. In terms of the passage as a whole, one of the main functions of the third paragraph (lines 13–19) is to suggest that:

- **A.** ER's successes in various professional pursuits helped prepare her to take action in the political world.
- **B.** ER had avoided the political spotlight in her personal pursuits.
- **C.** ER had competing and conflicting interests during her first year as first lady.
- **D.** while ER had many personal accomplishments, little could have prepared her for life as the first lady.

18. According to the passage, the primary principle underlying ER's goals was that:

- **F.** every person deserved a dignified and decent life.
- **G.** as first lady, she could talk about things that had never been discussed before.
- **H.** through radio and columns, she could show she was interested in every person.
- **J.** she must lead a bloodless American revolution.

19. The passage states that ER believed the relationship between a people and their government should be:

- **A.** begun and carried out as if it were an isolated, individualist adventure.
- **B.** formed and modeled by the White House.
- **C.** based on organized, widespread citizen participation.
- **D.** controlled through radio broadcasts and formal channels.

20. In the context of the passage, the author's statement that ER "enjoyed the game, and weathered the abuse" (line 93) most nearly means that ER:

- **F.** enjoyed her individualist adventure in politics even if criticized.
- **G.** preferred to be a team player rather than take the lead.
- **H.** embraced the political life and accepted criticism as part of her work.
- **J.** understood political games and so did not take politics or criticism very seriously.

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Passage III

HUMANITIES: This passage is adapted from the essay "The Interior Life" by Annie Dillard, which appeared in her book *An American Childhood* (©1987 by Annie Dillard).

The interior life is often stupid. Its egoism blinds it and deafens it; its imagination spins out ignorant tales, fascinated. It fancies that the western wind blows on the Self, and leaves fall at the feet of the Self for a reason, and people are watching. A mind risks real ignorance for the sometimes paltry prize of an imagination enriched. The trick of reason is to get the imagination to seize the actual world—if only from time to time.

When I was five, I would not go to bed willingly because something came into my room. My sister Amy, two years old, was asleep in the other bed. What did she know? She was innocent of evil. There was no messiness in her, no roughness for things to cling to, only a charming and charmed innocence that seemed then to protect her, an innocence I needed but couldn't muster. Since Amy was asleep, furthermore, and since when I needed someone most I was afraid to stir enough to wake her, she was useless.

I lay alone and was almost asleep when the thing entered the room by flattening itself against the open door and sliding in. It was a transparent, luminous oblong. I could see the door whiten at its touch; I could see the blue wall turn pale where it raced over it, and see the maple headboard of Amy's bed glow. It was a swift spirit; it was an awareness. It made noise. It had two joined parts, a head and a tail. It found the door, wall, and headboard; and it swiped them, charging them with its luminous glance. After its fleet, searching passage, things looked the same, but weren't.

I dared not blink or breathe. If it found another awareness, it would destroy it.

Every night before it got to me it gave up. It hit my wall's corner and couldn't get past. It shrank completely into itself and vanished. I heard the rising roar it made when it died or left. I still couldn't breathe. I knew that it could return again alive that same night.

Sometimes it came back, sometimes it didn't. Most often, restless, it came back. The light stripe slipped in the door, ran searching over Amy's wall, stopped, stretched lunatic at the first corner, raced wailing toward my wall, and vanished into the second corner with a cry. So I wouldn't go to bed.

It was a passing car whose windshield reflected the corner streetlight outside. I figured it out one night.

Figuring it out was as memorable as the oblong itself. Figuring it out was a long and forced ascent to the very rim of being, to the membrane of skin that both separates and connects the inner life and the outer world. I climbed deliberately from the depths like a diver who releases the monster in his arms and hauls himself hand over hand up an anchor chain till he meets the ocean's sparkling membrane and bursts through it; he sights the sunlit, becalmed hull of his boat, which had bulked so ominously from below.

I recognized the noise it made when it left. That is, the noise it made called to mind, at last, my daytime sensations when a car passed—the sight and noise together. A car came roaring down hushed Edgerton Avenue in front of our house, stopped, and passed on shrieking as its engine shifted up the gears. What, precisely, came into the bedroom? A reflection from the car's oblong windshield. Why did it travel in two parts? The window sash split the light and cast a shadow.

Night after night I labored up the same long chain of reasoning, as night after night the thing burst into the room where I lay awake.

There was a world outside my window and contiguous to it. Why did I have to keep learning this same thing over and over? For I had learned it a summer ago, when men with jackhammers broke up Edgerton Avenue. I had watched them from the yard. When I lay to nap, I listened. One restless afternoon I connected the new noise in my bedroom with the jackhammer men I had been seeing outside. I understood abruptly that these worlds met, the outside and the inside. "Outside," then, was conceivably just beyond my windows.

The world did not have me in mind. It was a coincidental collection of things and people, of items, and I myself was one such item—a child walking up the sidewalk, whom anyone could see or ignore. The things in the world did not necessarily cause my overwhelming feelings; the feelings were inside me, beneath my skin, behind my ribs, within my skull. They were even, to some extent, under my control.

I could be connected to the outer world by reason, if I chose, or I could yield to what amounted to a narrative fiction, to a show in light projected on the room's blue walls.

21. Which of the following statements best describes the structure of this passage?

- **A.** It begins and ends with a series of assertions that surround a story used by the narrator to support and elaborate on those assertions.
- **B.** It contains a highly detailed anecdote that the narrator uses to show how the claims she makes in the first paragraph are wrong.
- **C.** It compares and contrasts the narrator's perspective on an incident in her life with the perspectives of several other people, such as her parents.
- **D.** It consists mainly of a story about a recent event in the narrator's life that she feels taught her an interesting but ultimately insignificant lesson.

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22. In terms of mood, which of the following best describes lines 9–44?

F. A steadily increasing feeling of tension
G. A consistently high level of tension
H. A growing feeling of tension that is finally broken
J. A feeling of tension frequently undermined by the narrator's use of irony and humor

23. The narrator develops the third paragraph (lines 19–29) mainly through:

A. detached philosophical musings on the nature of the object she sees.
B. a detailed description of what she did to try to keep the object out of her room.
C. sensory details vividly depicting the object and its movements.
D. imaginative speculation on what might be causing the object to appear.

24. The narrator indicates that one reason she did not wake her sister Amy when "something" came into their room was because:

F. Amy had previously asked the narrator to stop waking her up during the night.
G. the narrator knew she could muster her own charmed innocence.
H. Amy had already figured out what the thing was before going to sleep.
J. the narrator was afraid of alerting the thing to her own presence.

25. It can reasonably be inferred from the passage that the narrator regards her initial discovery of the truth about the object entering her bedroom as:

A. deflating, because the object turned out to be so ordinary.
B. disappointing, because she felt she should have solved the mystery many years ago.
C. satisfying, because she could at last ignore the object and go to sleep.
D. significant, because solving the mystery led to important insights.

26. It can most reasonably be inferred that for the narrator, the image of the diver bursting through "the ocean's sparkling membrane" (line 52) symbolizes her:

F. fear of monsters and of the object in her bedroom.
G. crossing of the boundary separating her inner and outer lives.
H. struggle to maintain the separation between her inner and outer worlds.
J. bitterness at entering reality and leaving behind her comforting memories.

27. As it is used in line 87, the phrase "a show in light" most nearly refers to:

A. a fictional story the narrator has read.
B. a movie the narrator saw at a theater.
C. the work of reason in linking a person to the outer world.
D. a fantasy created by the mind.

28. The narrator uses the images in lines 3–5 primarily to depict the interior life's tendency to engage in:

F. deceptive self-absorption.
G. vital self-examination.
H. useful analysis of nature.
J. fierce debates with itself.

29. Which of the following statements best paraphrases lines 5–8?

A. The imagination lacks value and should be ignored in favor of paying attention to the actual world.
B. Reason can enhance the imagination but at the expense of experience in the actual world.
C. Rather than become isolated, the imagination should connect to the actual world at least occasionally.
D. Reason, not the imagination, is the best way to appreciate and enrich the actual world.

30. By her statements in lines 77–80, the narrator is most nearly asserting that:

F. in her world, adults are generally considered more important than children.
G. she, like everyone and everything else, was a small part of a larger world.
H. it still mattered greatly whether people saw or ignored her.
J. she was less valuable than other people in her world.

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Passage IV

NATURAL SCIENCE: This passage is adapted from "Publish and Punish: Science's Snowball Effect" by Jon Van (©1997 by The Chicago Tribune Company).

It's a scientific finding so fundamental that it certainly will make the history books and maybe snag a Nobel Prize if it pans out, but the notion that cosmic snowballs are constantly pelting Earth is something Louis Frank just as soon would have ducked.

Frank is the University of Iowa physicist whose research led him to declare more than a decade ago that Earth is being bombarded by hundreds of house-sized comets day after day that rain water on our planet and are the reason we have oceans. That weather report caused the widely respected scientist to acquire a certain reputation among his colleagues as a bit unstable, an otherwise estimable fellow whose hard work may have pushed him over the edge.

Frank and his associate, John Sigwarth, probably went a way toward salvaging their reputations when they presented new evidence that leaves little doubt Earth is indeed being bombarded by *something* in a manner consistent with Frank's small-comet theory. Rather than gloating or anticipating glory, Frank seemed relieved that part of a long ordeal was ending. "I knew we'd be in for it when we first put forth the small-comet theory," Frank conceded, "but I was naive about just how bad it would be. We were outvoted by about 10,000 to 1 by our colleagues. I thought it would have been more like 1,000 to 1."

To the non-scientist this may seem a bit strange. After all, the point of science is to discover information and insights about how nature works. Shouldn't every scientist be eager to overturn existing ideas and replace them with his or her own? In theory, that is the case, but in practice, scientists are almost as loath to embrace radically new ideas as the rest of us.

"Being a scientist puts you into a constant schizophrenic existence," contends Richard Zare, chairman of the National Science Board. "You have to believe and yet question beliefs at the same time. If you are a complete cynic and believe nothing, you do nothing and get nowhere, but if you believe too much, you fool yourself."

It was in the early 1980s when the small-comet theory started to haunt Frank and Sigwarth, who was Frank's graduate student studying charged particles called plasmas, which erupt from the sun and cause the aurora borealis (northern lights). As they analyzed photos of the electrical phenomena that accompany sunspots, they noted dark specks appearing in several images from NASA's Dynamics Explorer 1 satellite. They assumed these were caused by static in the transmission.

After a while their curiosity about the dark spots grew into a preoccupation, then bordered on obsession. Try as they did, the scientists couldn't find any plausible explanation of the pattern of dark spots that appeared on their images. The notion that the equipment was picking up small amounts of water entering Earth's upper atmosphere kept presenting itself as the most likely answer.

Based on their images, the Iowa scientists estimated 20 comets an hour—each about 30 feet or so across and carrying 100 tons of water—were bombarding the Earth. At that rate, they would produce water vapor that would add about an inch of water to the planet every 10,000 years, Frank concluded. That may not seem like much, but when talking about a planet billions of years old, it adds up.

Such intimate interaction between Earth and space suggests a fundamentally different picture of human evolution—which depends on water—than is commonly presented by scientists. Frank had great difficulty getting his ideas into a physics journal 11 years ago and was almost hooted from the room when he presented his theory at scientific meetings. Despite the derision, colleagues continued to respect Frank's mainstream work on electrically charged particles in space and the imaging cameras he designed that were taken aboard recent NASA spacecraft to explore Earth's polar regions.

Unbeknown to most, in addition to gathering information on the northern lights, Frank and Sigwarth designed the equipment to be able to snatch better views of any small comets the spacecraft might happen upon. It was those images from the latest flights that caused even harsh critics of the small-comet theory to concede that some water-bearing objects appear to be entering Earth's atmosphere with regularity.

To be sure, it has not been proved that they are comets, let alone that they have anything to do with the oceans. But Frank's evidence opens the matter up to study. Had he been a researcher of lesser standing, his theory probably would have died long ago.

31. Which of the following conclusions about new theories in science can reasonably be drawn from the passage?

- **A.** Important new theories will eventually be accepted, no matter how controversial they are or who proposes them.
- **B.** Important but unusual new theories have a better chance at acceptance when they are proposed by well-respected scientists.
- **C.** Research on new, nontraditional theories is widely respected within the scientific community.
- **D.** Scientists welcome the opportunity to overturn existing ideas in favor of useful new theories.

32. Which of the following best describes how Frank's colleagues perceived him after he first presented the small-comet theory?

- **F.** Their doubts about the theory led them to also question his work on particles in space.
- **G.** They felt his theory had ruined his reputation as a widely respected scientist.
- **H.** He acquired a reputation among them as someone who had worked hard to develop his theory.
- **J.** They still respected his traditional research but felt he was overly committed to an improbable theory.

33. The passage indicates that at the time Frank and Sigwarth presented new evidence supporting the small-comet theory, Frank most nearly felt:

- **A.** relieved but bitter about how he had been treated.
- **B.** grateful that ridicule of his work would end.
- **C.** proud that he had been proved right.
- **D.** satisfied and filled with anticipation of glory.

34. The author uses the fourth paragraph (lines 27–33) primarily to:

- **F.** continue his earlier criticisms of scientists.
- **G.** reveal the role science serves in society.
- **H.** present then undermine common perceptions of scientists.
- **J.** explain the difference between theoretical and practical scientific research.

35. According to the passage, the research that led to the development of the small-comet theory began with a project originally intended to study:

- **A.** the electrical activity accompanying sunspots.
- **B.** water entering Earth's upper atmosphere.
- **C.** static in satellite transmissions.
- **D.** specks in satellite images.

36. The main function of lines 64–66 in terms of the eighth paragraph (lines 59–66) as a whole is to:

- **F.** give a sense of proportion to the numbers provided earlier in the paragraph.
- **G.** point out the limitations of the evidence provided by the Iowa scientists.
- **H.** supplement the paragraph's description of the comets with additional details about their size and capacity.
- **J.** provide readers with a sense of how old the planet really is.

37. It can reasonably be inferred from the passage that within the scientific community the year the passage was published, the small-comet theory was:

- **A.** tremendously unpopular and condemned for its incompleteness.
- **B.** widely accepted and seen as conclusive.
- **C.** regarded as tentative but deemed worthy of consideration.
- **D.** seen as correct by most scientists but was highly criticized by some.

38. The author italicizes the word *something* in line 18 most likely to emphasize the:

- **F.** great skepticism with which critics regard Frank and Sigwarth's new evidence.
- **G.** remaining uncertainty about what exactly is bombarding Earth.
- **H.** lack of doubt among scientists about the small-comet theory's practical value.
- **J.** concern among scientists about the usefulness of Frank and Sigwarth's methods of collecting evidence.

39. When Richard Zare says that scientists lead a "constant schizophrenic existence" (lines 34–35), he most nearly means that they:

- **A.** often suffer psychologically from the demands of their work.
- **B.** tend to be either complete cynics or people who believe too much.
- **C.** are often guilty of either doing nothing or of fooling themselves.
- **D.** have to maintain a balance between accepting and challenging ideas.

40. It can reasonably be inferred that Frank and Sigwarth conducted the study of the dark specks they found with a:

- **F.** detached, scientific mindset.
- **G.** casual interest that developed into a mild curiosity.
- **H.** steadily increasing level of involvement.
- **J.** great intensity that began when they discovered the specks.

End of Section 2 - Reading

SCIENCE TEST

60 Minutes—40 Questions

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

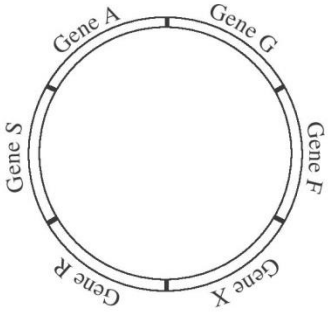
You are NOT permitted to use a calculator on this test.

Passage I

Many bacteria contain *plasmids* (small, circular DNA molecules). Plasmids can be transferred from 1 bacterium to another. For this to occur, the plasmid *replicates* (produces a linear copy of itself). The relative position of the genes is the same on the original plasmid and on the linear copy, except that the 2 ends of the linear copy do not immediately connect.

While replication is occurring, 1 end of the linear copy leaves the donor bacterium and enters the recipient bacterium. Thus, the order in which the genes are replicated is the same as the order in which they are transferred. Unless this process is interrupted, the entire plasmid is transferred, and its 2 ends connect in the recipient bacterium.

Four students studied the way in which 6 genes (F, X, R, S, A, and G) on a specific plasmid were donated by a type of bacterium (see the figure). The students determined that the entire plasmid is transferred in 90 min and that the rate of transfer is constant. They also determined that the genes are evenly spaced around the plasmid, so 1 gene is transferred every 15 min. They disagreed, however, about the order in which the genes are replicated and thus transferred. Four models are presented.



Student 1

Replication always begins between Gene F and Gene X. Gene X is replicated first and Gene F is replicated last.

Student 2

Replication always begins between Gene F and Gene X. However, the direction of replication varies. If Gene F is replicated first, Gene X is replicated last. Conversely, if Gene X is replicated first, Gene F is replicated last.

Student 3

Replication can begin between any 2 genes. Replication then proceeds around the plasmid in a clockwise direction (with respect to the figure). Thus, if Gene S is replicated first, Gene A is replicated second, and Gene R is replicated last.

Student 4

Replication can begin between any 2 genes. Likewise, replication can proceed in either direction. So the order of replication varies.

1. Based on the information presented, if the transfer of the linear copy was interrupted 50 min after transfer began, how many complete genes would have been transferred to the recipient bacterium?

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

2. Based on the model presented by Student 3, if all 6 genes are replicated and the first gene replicated is Gene G, the third gene replicated would be:

F. Gene F.
G. Gene A.
H. Gene S.
J. Gene X.

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3. Which students believe that any of the 6 genes on the plasmid can be the first gene transferred to a recipient bacterium?

   A. Students 2 and 3
   B. Students 2 and 4
   C. Students 3 and 4
   D. Students 2, 3, and 4

4. Suppose that the model presented by Student 1 is correct and that the transfer of genes between 2 bacteria was interrupted after 45 min. Based on the information provided, which of the following genes would NOT have been transferred from the donor bacterium to the recipient bacterium?

   F. Gene G
   G. Gene X
   H. Gene R
   J. Gene S

5. Suppose that Student 2's model is correct and that the transfer of genes between 2 bacteria was interrupted after 30 min. Under these conditions, which of the following genes would definitely NOT be transferred from the donor bacterium to the recipient bacterium?

   A. Gene A
   B. Gene R
   C. Gene G
   D. Gene X

6. Suppose that all 6 genes are transferred from a donor bacterium to a recipient bacterium. Under this condition, which student(s) would argue that Gene A could be the last gene transferred?

   F. Student 2 only
   G. Student 4 only
   H. Students 2 and 4 only
   J. Students 3 and 4 only

7. Suppose that the transfer of genes between 2 bacteria was interrupted, that the last gene transferred was Gene A, and that no incomplete copies of a gene were transferred. Based on this information, Student 1 would say that transfer was most likely interrupted how many minutes after the transfer began?

   A. 15
   B. 30
   C. 45
   D. 60

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Passage II

Color images of the surface of Io, one of Jupiter's moons, show plumes of gas that resemble Earth's geysers and active volcanoes that emit flows of molten material. The materials ejected from Io's volcanoes and plumes rapidly solidify at Io's cold surface temperatures. Scientists believe that these materials may be one of several *allotropes* (forms) of sulfur (S), or a sulfur compound. The following studies were performed to determine the composition of these materials.

Study 1

In a laboratory, scientists measured the *reflectances* (the fraction of light striking a surface that is reflected by that surface) of 4 allotropes of S (red, white, orange, and brown) and of a sulfur compound (sulfur dioxide [SO_2]). Reflectances were measured at visible-light wavelengths between 0.35 µm (micrometers) and 0.60 µm. Figure 1 shows the data for the various S allotropes and for SO_2.

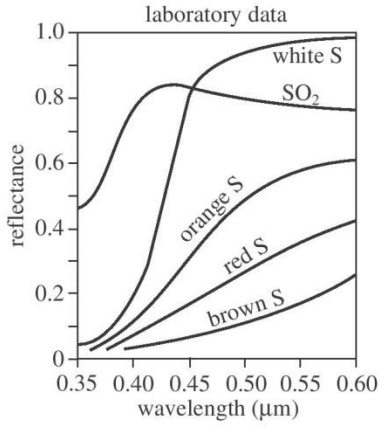

Figure 1

Io's *whole-disk reflectance* (the reflectance of Io's entire visible surface measured all at once) was measured at 2 different times. Figure 2 shows these data along with reflectance data calculated using a computer model. This model shows what combination of materials from Figure 1 would produce the closest match to the measured reflectance data. According to the model, the overall composition of Io's surface is 15% SO_2, 50% orange S, 20% red S, and 15% white S.

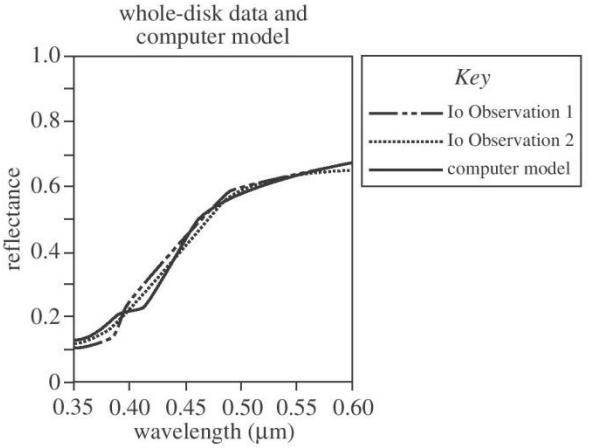

Figure 2

Study 2

At 2 different times, reflectances were measured of the crater floors of 2 volcanoes on Io: Pele and Surt. Figure 3 shows the reflectance data.

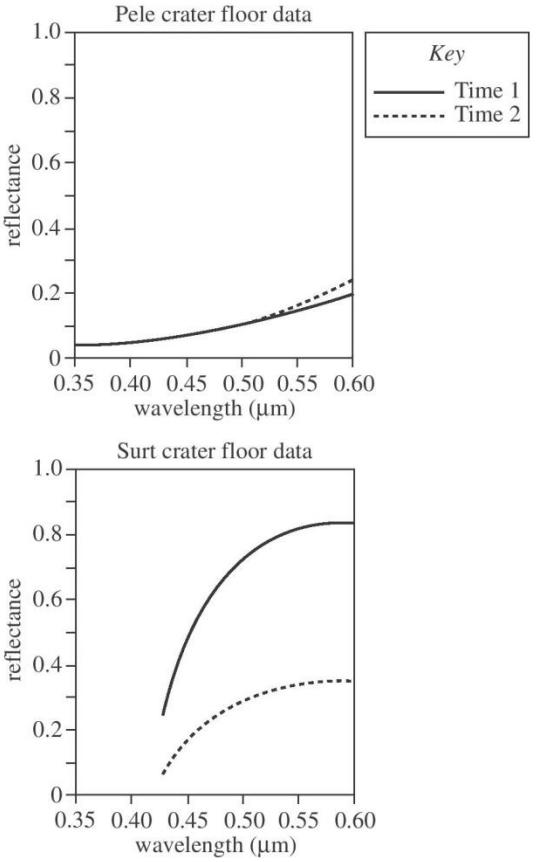

Figure 3

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Study 3

Reflectance data were taken from several large plumes and several small plumes on Io. The averaged data are in Figure 4.

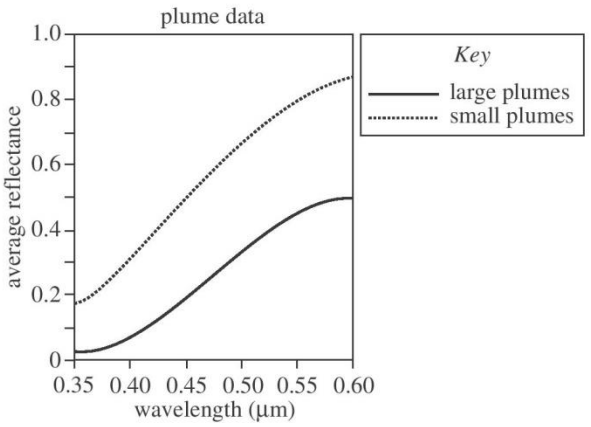

Figure 4

Figures 1, 3, and 4 adapted from Alfred McEwen and Laurence Soderblom, "Two Classes of Volcanic Plumes on Io." ©1983 by Academic Press, Inc.

Figure 2 adapted from Julianne Moses and Douglas Nash, "Phase Transformations and the Spectral Reflectance of Solid Sulfur: Can Metastable Sulfur Allotropes Exist on Io?" ©1991 by Academic Press, Inc.

8. At the wavelengths used in Study 1, as the wavelength of the light increases, the reflectances of the S allotropes and of SO_2 do which of the following?

	S allotropes	SO_2
F.	Increase only	Increase only
G.	Increase only	Increase, then decrease
H.	Decrease only	Decrease only
J.	Decrease only	Increase, then decrease

9. According to Study 3, compared with the corresponding average reflectance for small plumes, large plumes on Io have an average reflectance at a given wavelength that is:

A. always higher.
B. always the same.
C. always lower.
D. sometimes higher and sometimes lower.

10. According to Study 1, the reflectance of white S at a wavelength of 0.40 μm is closest to which of the following?

F. 0.0
G. 0.1
H. 0.2
J. 0.3

11. According to Study 1 and Study 2, the crater floor of the volcano Pele has reflectances most similar to which of the following S allotropes?

A. White S
B. Orange S
C. Red S
D. Brown S

12. If the averaged reflectances for large plumes and for small plumes had been measured at a wavelength of 0.61 μm in Study 3, those reflectances would have been closest to which of the following?

	Large plumes	Small plumes
F.	0.2	0.5
G.	0.5	0.2
H.	0.5	0.9
J.	0.9	0.5

13. According to Study 1, white S has a reflectance of 0.98 at a wavelength of 0.60 μm. This means that white S reflects:

A. 2% of the 0.60 μm wavelength light that strikes its surface.
B. 98% of the 0.60 μm wavelength light that strikes its surface.
C. 2% of all the visible light that strikes its surface.
D. 98% of all the visible light that strikes its surface.

Passage III

An electrical circuit contained a 12-volt (V) battery, a *resistor* (a device that resists the flow of electricity), a *capacitor* (a device that stores electrical charge and electrical energy), a *voltmeter* (an instrument for measuring voltage), and a switch, as shown in Figure 1.

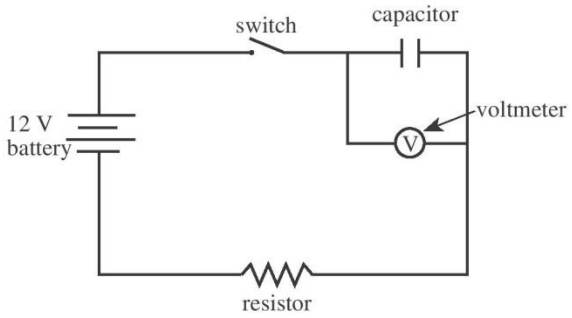

Figure 1

Some students studied the behavior of the circuit.

Experiment 1

The students used a 1×10^7 ohm (Ω) resistor and a capacitor with a *capacitance* of 1×10^{-6} farad (F). (Capacitance is a measure of the maximum amount of electrical charge and electrical energy a capacitor can store.) The capacitor was initially uncharged. At time zero, the students simultaneously closed the switch and started a stopwatch. At time zero and at 12 sec intervals thereafter, they recorded the voltage across the capacitor. Their results are shown in Table 1.

Table 1

Time (sec)	Voltage across capacitor (V)
0	0.0
12	8.4
24	10.9
36	11.7
48	11.9
60	12.0

Experiment 2

Using the 1×10^7 Ω resistor and several different capacitors, the students determined the length of time from when the switch was closed until the voltage across the capacitor reached 6 V. Their results are shown in Table 2.

Table 2

Capacitance ($\times 10^{-6}$ F)	Time to reach 6 V across capacitor (sec)
1.2	8.3
0.6	4.2
0.3	2.1
0.1	0.7

Experiment 3

The students conducted the same procedure described in Experiment 2, except that they used a constant capacitance of 1×10^{-6} F and several different resistors. Their results are shown in Table 3.

Table 3

Resistance ($\times 10^7$ Ω)	Time to reach 6 V across capacitor (sec)
0.75	5.2
0.50	3.5
0.25	1.7

14. In Experiment 1, the *time constant* of the circuit was the time required for the voltage across the capacitor to reach approximately 7.6 V. The time constant of the circuit used in Experiment 1 was:

F. less than 12 sec.
G. between 12 sec and 24 sec.
H. between 24 sec and 36 sec.
J. greater than 36 sec.

15. If, in Experiment 2, a 1.5×10^{-6} F capacitor had been used, the time required for the voltage across the capacitor to reach 6 V would have been closest to:

A. 4.2 sec.
B. 7.0 sec.
C. 10.5 sec.
D. 15.0 sec.

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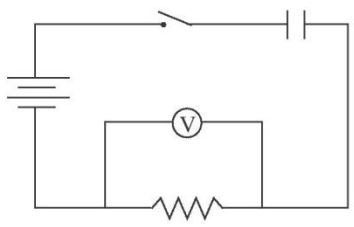
16. The main purpose of Experiment 3 was to determine how varying the:

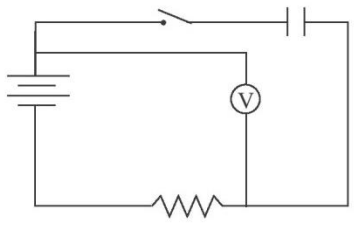
- **F.** battery's voltage affected the resistor's resistance at a given time.
- **G.** capacitor's capacitance affected the time required for the voltage across the capacitor to reach a set value.
- **H.** capacitor's capacitance affected the voltage across the battery at a given time.
- **J.** resistor's resistance affected the time required for the voltage across the capacitor to reach a set value.

17. Based on Figure 1, to measure the voltage across the resistor only, which of the following circuits should one use?

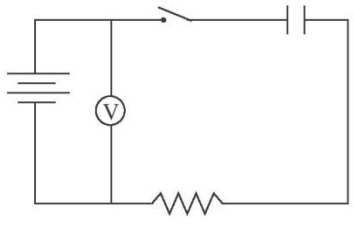
A.



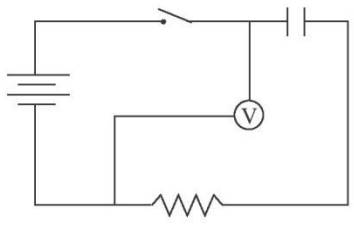
B.



C.



D.



18. Consider a circuit like that shown in Figure 1. Based on Experiments 2 and 3, the voltage across the capacitor will reach a given value in the shortest amount of time if the circuit contains which of the following capacitances and resistances, respectively?

- **F.** 0.1×10^{-6} F, 0.3×10^{7} Ω
- **G.** 0.1×10^{-6} F, 1.0×10^{7} Ω
- **H.** 1.2×10^{-6} F, 0.3×10^{7} Ω
- **J.** 1.2×10^{-6} F, 1.0×10^{7} Ω

19. Consider the following hypothesis: In a circuit arranged as in Figure 1 containing a battery, a capacitor, and a constant resistance, as capacitance increases, the time required to reach a given voltage across the capacitor increases. Do the experiments support this hypothesis?

- **A.** Yes; in Experiment 1, as capacitance increased, the time required to reach a given voltage increased.
- **B.** Yes; in Experiment 2, as capacitance increased, the time required to reach a given voltage increased.
- **C.** No; in Experiment 1, as capacitance increased, the time required to reach a given voltage decreased.
- **D.** No; in Experiment 2, as capacitance increased, the time required to reach a given voltage decreased.

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Passage IV

A *bomb calorimeter* is used to determine the amount of heat released when a substance is burned in oxygen (Figure 1). The heat, measured in kilojoules (kJ), is calculated from the change in temperature of the water in the bomb calorimeter. Table 1 shows the amounts of heat released when different foods were burned in a bomb calorimeter. Table 2 shows the amounts of heat released when different amounts of sucrose (table sugar) were burned. Table 3 shows the amounts of heat released when various chemical compounds were burned.

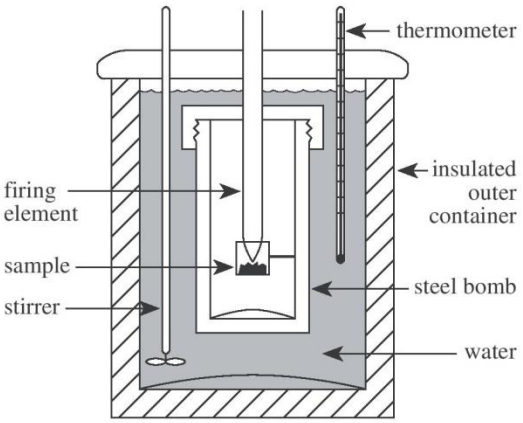

Figure 1

Figure 1 adapted from Antony C. Wilbraham, Dennis D. Staley, and Michael S. Matta, *Chemistry*. ©1995 by Addison-Wesley Publishing Company, Inc.

Table 1

Food	Mass (g)	Change in water temperature (°C)	Heat released (kJ)
Bread	1.0	8.3	10.0
Cheese	1.0	14.1	17.0
Egg	1.0	5.6	6.7
Potato	1.0	2.7	3.2

Table 2

Amount of sucrose (g)	Heat released (kJ)
0.1	1.6
0.5	8.0
1.0	16.0
2.0	32.1
4.0	64.0

Table 3

Chemical compound	Molecular formula	Mass (g)	Heat released (kJ)
Methanol	CH_3OH	0.5	11.4
Ethanol	C_2H_5OH	0.5	14.9
Benzene	C_6H_6	0.5	21.0
Octane	C_8H_{18}	0.5	23.9

20. According to Tables 1 and 2, as the mass of successive sucrose samples increased, the change in the water temperature produced when the sample was burned most likely:

F. increased only.
G. decreased only.
H. increased, then decreased.
J. remained the same.

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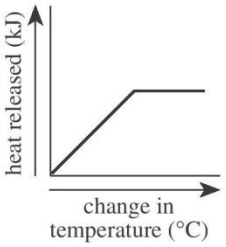
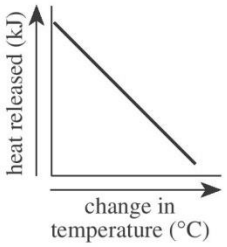
21. Which of the following graphs best illustrates the relationship between the heat released by the foods listed in Table 1 and the change in water temperature?

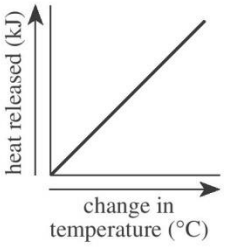
A.



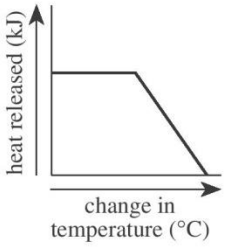
C.



B.



D.



22. Based on the data in Table 2, one can conclude that when the mass of sucrose is decreased by one-half, the amount of heat released when it is burned in a bomb calorimeter will:

F. increase by one-half.
G. decrease by one-half.
H. increase by one-fourth.
J. decrease by one-fourth.

23. Which of the following lists the foods from Tables 1 and 2 in increasing order of the amount of heat released per gram of food?

A. Potato, egg, bread, sucrose, cheese
B. Sucrose, cheese, bread, egg, potato
C. Bread, cheese, egg, potato, sucrose
D. Sucrose, potato, egg, bread, cheese

24. Based on the information in Tables 1 and 2, the heat released from the burning of 5.0 g of potato in a bomb calorimeter would be closest to which of the following?

F. 5 kJ
G. 10 kJ
H. 15 kJ
J. 20 kJ

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Passage V

Density is defined as the mass of a substance divided by its volume:

$$\text{density} = \frac{\text{mass}}{\text{volume}}$$

Table 1 lists the phases and the densities, in grams per cubic centimeter (g/cm^3), of various pure substances at 25°C and 1 atmosphere (atm) of pressure.

Table 1

Substance	Phase	Density (g/cm^3)
Arsenic	solid	5.73
Glucose	solid	1.56
Iron	solid	7.86
Lead	solid	11.34
Zinc	solid	7.14
Ethanol	liquid	0.79
Ethyl ether	liquid	0.71
Glycerol	liquid	1.26
Mercury	liquid	13.59
Freon-12	gas	0.00495
Krypton	gas	0.00343
Methane	gas	0.00065

Figure 1 shows how the density of liquid water changes with temperature.

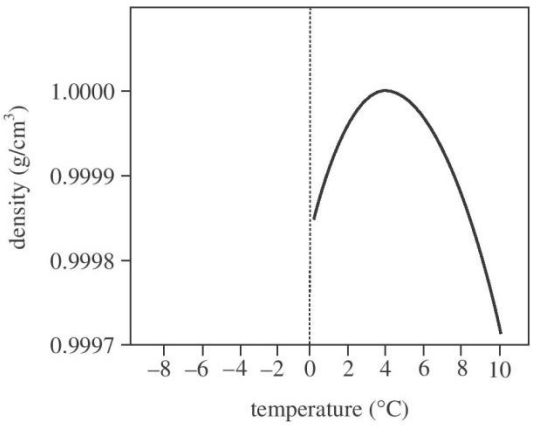

Figure 1

Figure 2 shows how the density of solid water changes with temperature.

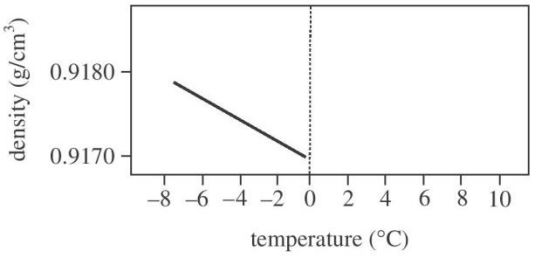

Figure 2

Figures adapted from John C. Kotz and Keith F. Purcell, *Chemistry & Chemical Reactivity*. ©1987 by CBS College Publishing.

25. According to Figure 1, as the temperature of liquid water decreases from 10°C to 0°C, the density:

- **A.** increases only.
- **B.** decreases only.
- **C.** decreases, then increases.
- **D.** increases, then decreases.

26. A student claimed that "If the masses of 1 cm^3 of any solid and 1 cm^3 of any liquid are compared, the mass of the solid will be greater." Do the data in Table 1 support his claim?

- **F.** No; lead has a higher density than any of the liquids listed.
- **G.** No; mercury has a higher density than any of the solids listed.
- **H.** Yes; lead has a higher density than any of the liquids listed.
- **J.** Yes; mercury has a higher density than any of the solids listed.

27. Which of the following hypotheses about the relationship between the temperature and the density of a solid is best supported by the data in Figure 2 ? As the temperature of a solid increases, the density of the solid:

- **A.** increases only.
- **B.** decreases only.
- **C.** increases, then decreases.
- **D.** decreases, then increases.

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28. Equal amounts of ethyl ether, mercury, and water (density = 0.9971 g/cm^3) at 25°C are poured into a single beaker. Three distinct layers of liquid form in the beaker. Based on the data in Table 1, which of the following diagrams represents the order, from top to bottom, of the liquids in the beaker?

F.

Ethyl ether
Water
Mercury

G.

Ethyl ether
Mercury
Water

H.

Mercury
Water
Ethyl ether

J.

Water
Ethyl ether
Mercury

29. According to Figure 1, 100 g of water at 4°C would exactly fill a container having which of the following volumes?

A. 1 cm^3
B. 10 cm^3
C. 100 cm^3
D. 1,000 cm^3

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Passage VI

The clearing of rain forests results in *forest fragmentation* (the breakup of large forest tracts into small patches). Researchers predicted that fragmentation would result in a decrease in animal populations and *aboveground tree biomass* (AGTB) in the resulting fragments. They did 4 studies to test this prediction.

Study 1

The researchers monitored the AGTB of twenty-five 100 m × 100 m forest plots near areas that had recently been cleared of vegetation. The distance from the center of each plot to the nearest clearing was measured. Figure 1 shows the average change per plot in AGTB in metric tons per year (t/yr) over 17 yr.

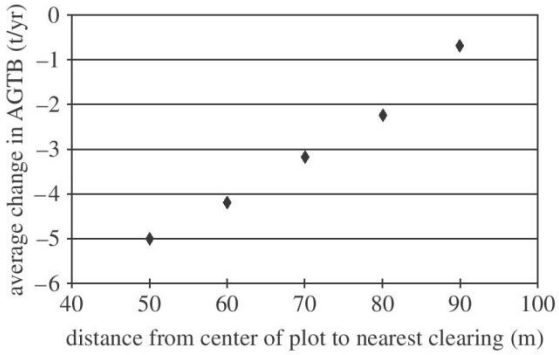

Figure 1

Study 2

Twenty-five 100 m × 100 m forest plots were monitored as in Study 1. The center of each of these plots was at least 500 m from the nearest clearing. The average change in AGTB over 17 yr for these 25 plots was 0 t/yr.

Study 3

Researchers monitored sixteen 100 m × 100 m forest plots near areas that had recently been cleared of vegetation. Each plot was bordered on 1 side by a clearing. Figure 2 shows the average cumulative percent change in AGTB at these plots following fragmentation. (Note: Year 0 represents results prior to fragmentation.)

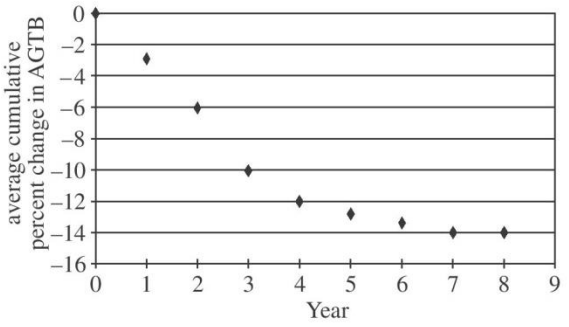

Figure 2

Study 4

Researchers trapped and released birds in 10 forest fragments adjacent to areas that had recently been cleared of vegetation. Three types of birds were monitored: insectivores, frugivores (fruit eaters), and hummingbirds. Figure 3 shows the number of captures per 1,000 hours (hr) of trapping. (Note: Year 0 represents results prior to fragmentation.)

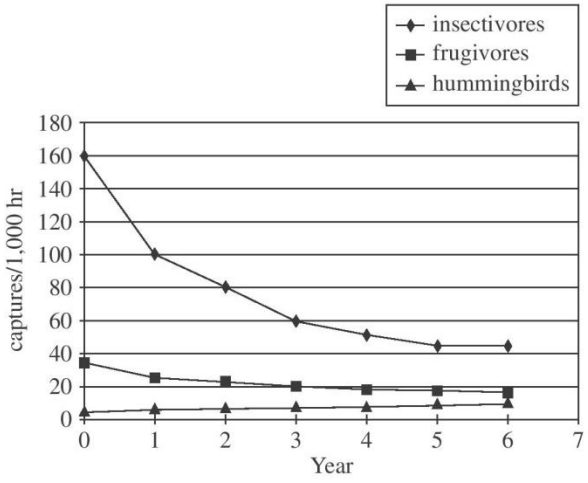

Figure 3

Figures adapted from William F. Laurance et al., "Biomass Collapse in Amazonian Forest Fragments." ©1998 by the American Association for the Advancement of Science.

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30. In Study 4, as time increased from Year 0 to Year 6, the captures/1,000 hr of frugivores:

F. decreased only.
G. increased only.
H. decreased, then increased.
J. increased, then decreased.

31. Based on the results of Study 4, how did fragmentation most likely affect the population sizes of insectivores and hummingbirds in the fragments studied?

A. Fragmentation increased the population sizes of both insectivores and hummingbirds.
B. Fragmentation decreased the population sizes of both insectivores and hummingbirds.
C. Fragmentation increased the population size of insectivores and decreased the population size of hummingbirds.
D. Fragmentation decreased the population size of insectivores and increased the population size of hummingbirds.

32. Based on the results of Study 1, if the distance from the center of a 100 m × 100 m plot were 75 m from the nearest clearing, the expected average change in AGTB at the plot over 17 yr would be closest to which of the following values?

F. –1.1 t/yr
G. –2.6 t/yr
H. +1.1 t/yr
J. +2.6 t/yr

33. After examining the results of Study 2, a student concluded that the AGTB at each of the 25 plots remained constant. Which of the following alternative explanations is also consistent with the results?

A. The AGTB at all 25 plots increased.
B. The AGTB at all 25 plots decreased.
C. The AGTB at some of the plots increased and the AGTB at some of the plots decreased.
D. The AGTB at plots bounded by forest increased and the AGTB at plots bounded by clearings remained constant.

34. Which of the following sets of results from the studies is *least* consistent with the prediction proposed by the researchers?

F. The results of Study 1 for AGTB
G. The results of Study 3 for AGTB
H. The results of Study 4 for frugivores
J. The results of Study 4 for hummingbirds

35. In Study 4, the researchers trapped birds for 10,000 hr per year. Thus, how many insectivores were trapped in Year 2 ?

A. 80
B. 100
C. 800
D. 1,000

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Passage VII

Glaciers deposit *till* (a poorly sorted sediment). If glaciers repeatedly advance over an area and then melt back, thick till deposits may form. Figure 1 shows a vertical core taken through layers of till, non-glacial sediments, and bedrock at a site in Canada. The *resistivity* (an electrical property of a material) and CO_2 measurements taken along the core are also shown. Resistivity is related to a sediment's particle sizes, compaction, and mineral composition. Table 1 shows the average percent sand, silt, and clay contents and descriptions of the various till layers.

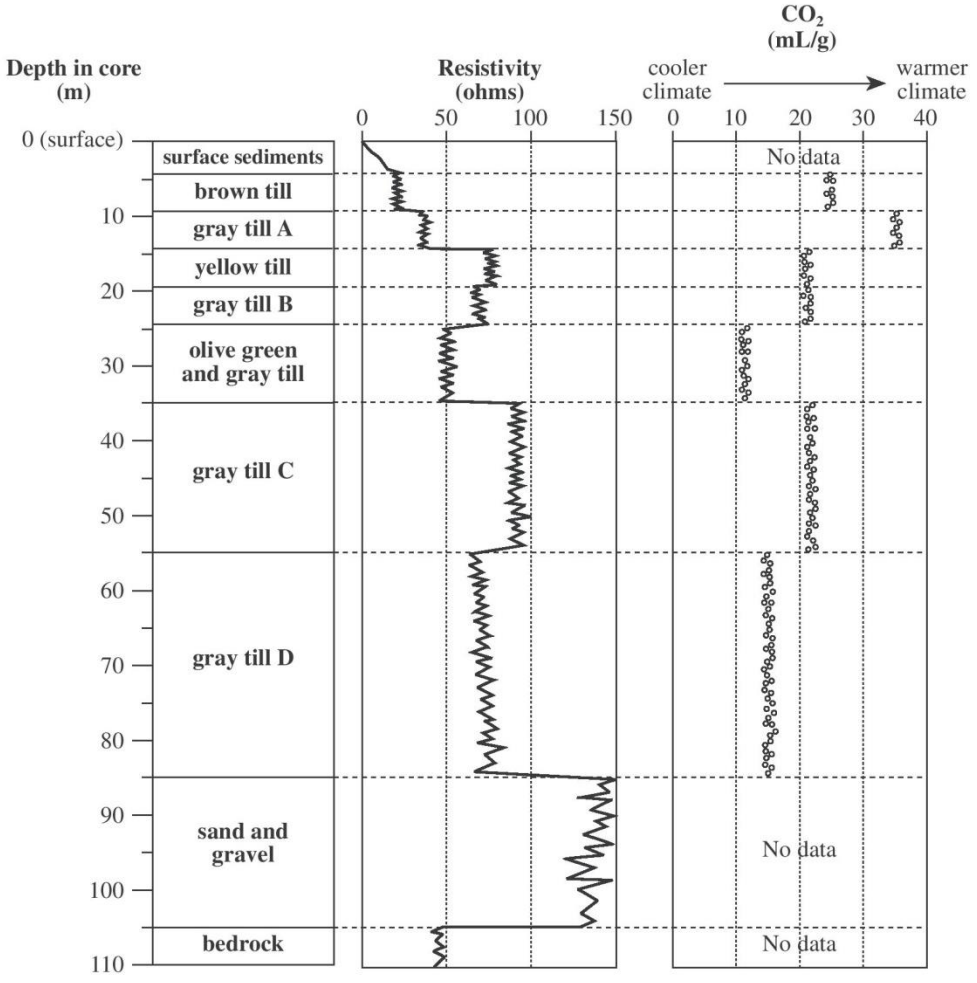

Figure 1

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Table 1				
Depth of till layer (m)	Description of till	Average percent by volume of: larger particle → smaller particle		
		sand	silt	clay
4–9	brown (oxidized*)	54.1	31.7	14.2
9–14	gray A	44.8	36.6	18.6
14–19	yellow (oxidized)	43.5	31.7	24.8
19–24	gray B	37.4	34.3	28.3
24–35	olive green and gray	25.5	34.3	40.2
35–55	gray C	31.7	33.6	34.7
55–85	gray D	37.5	31.7	30.8
*Oxidized sediments have at some time been exposed to the air. Sediments that have been *deprived* of oxygen will be gray or green.				

Figure 1 and Table 1 adapted from E. A. Christiansen, "Pleistocene Stratigraphy of the Saskatoon Area, Saskatchewan, Canada: An Update." ©1992 by the Geological Association of Canada.

36. A sample of gray till was recovered from another core taken from a nearby area. The table below shows the results of an analysis of the sample.

Percent by volume of:			Resistivity (ohms)	CO_2 content (mL/g)
sand	silt	clay		
31.5	33.7	34.8	85	22

Based on these data and the data provided in Figure 1 and Table 1, the sample of gray till corresponds most closely with which till from Figure 1 ?

F. Gray till A
G. Gray till B
H. Gray till C
J. Gray till D

37. According to Figure 1, the *oldest* glacial advance in this area deposited which of the following till layers?

A. Gray till A
B. Yellow till
C. Olive green and gray till
D. Gray till D

38. According to Figure 1, which of the following statements best describes how the resistivity of the sand and gravel layer compares to the resistivity of the till layers? The resistivity measured in the sand and gravel layer is:

F. lower than the resistivities measured in any of the till layers.
G. higher than the resistivities measured in any of the till layers.
H. the same as the resistivities measured in the surface sediments.
J. lower than the resistivities measured in the bedrock.

39. The average resistivity of the bedrock in the core is most similar to the average resistivity of which of the following till layers?

A. Yellow till
B. Gray till B
C. Olive green and gray till
D. Gray till C

40. The sediments being deposited at the present time at the site where the core was taken have a much higher CO_2 content than any of the tills. Given this information and the information in Figure 1, the CO_2 content of sediments recently deposited at the site would most likely be in which of the following ranges?

F. Less than 10 mL/g
G. Between 10 mL/g and 25 mL/g
H. Between 25 mL/g and 35 mL/g
J. Greater than 35 mL/g

End of Section 3 - Science

COMPLETE MARK ● EXAMPLES OF INCOMPLETE MARKS

You must use a No. 2 pencil and marks must be complete. Do not use a mechanical pencil. It is very important that you fill in the entire circle darkly and completely. If you change your response, erase as completely as possible. Incomplete marks or erasures may affect your score.

First Name: _____ Last Name: _____

SECTION 1

Math

1	Ⓐ	Ⓑ	Ⓒ	Ⓓ	Ⓔ
2	Ⓐ	Ⓑ	Ⓒ	Ⓓ	Ⓔ
3	Ⓐ	Ⓑ	Ⓒ	Ⓓ	Ⓔ
4	Ⓐ	Ⓑ	Ⓒ	Ⓓ	Ⓔ
5	Ⓐ	Ⓑ	Ⓒ	Ⓓ	Ⓔ
6	Ⓐ	Ⓑ	Ⓒ	Ⓓ	Ⓔ
7	Ⓐ	Ⓑ	Ⓒ	Ⓓ	Ⓔ
8	Ⓐ	Ⓑ	Ⓒ	Ⓓ	Ⓔ
9	Ⓐ	Ⓑ	Ⓒ	Ⓓ	Ⓔ
10	Ⓐ	Ⓑ	Ⓒ	Ⓓ	Ⓔ
11	Ⓐ	Ⓑ	Ⓒ	Ⓓ	Ⓔ
12	Ⓐ	Ⓑ	Ⓒ	Ⓓ	Ⓔ
13	Ⓐ	Ⓑ	Ⓒ	Ⓓ	Ⓔ
14	Ⓐ	Ⓑ	Ⓒ	Ⓓ	Ⓔ
15	Ⓐ	Ⓑ	Ⓒ	Ⓓ	Ⓔ
16	Ⓐ	Ⓑ	Ⓒ	Ⓓ	Ⓔ
17	Ⓐ	Ⓑ	Ⓒ	Ⓓ	Ⓔ
18	Ⓐ	Ⓑ	Ⓒ	Ⓓ	Ⓔ
19	Ⓐ	Ⓑ	Ⓒ	Ⓓ	Ⓔ
20	Ⓐ	Ⓑ	Ⓒ	Ⓓ	Ⓔ
21	Ⓐ	Ⓑ	Ⓒ	Ⓓ	Ⓔ
22	Ⓐ	Ⓑ	Ⓒ	Ⓓ	Ⓔ
23	Ⓐ	Ⓑ	Ⓒ	Ⓓ	Ⓔ
24	Ⓐ	Ⓑ	Ⓒ	Ⓓ	Ⓔ
25	Ⓐ	Ⓑ	Ⓒ	Ⓓ	Ⓔ

Student-Produced Responses:

26 _____

27 _____

28 _____

COMPLETE MARK ● EXAMPLES OF INCOMPLETE MARKS

You must use a No. 2 pencil and marks must be complete. Do not use a mechanical pencil. *It is very important that you fill in the entire circle darkly and completely. If you change your response, erase as completely as possible. Incomplete marks or erasures may affect your score.*

First Name: _____ Last Name: _____

SECTION 2

Reading

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

COMPLETE MARK ● EXAMPLES OF INCOMPLETE MARKS

You must use a No. 2 pencil and marks must be complete. Do not use a mechanical pencil. *It is very important that you fill in the entire circle darkly and completely. If you change your response, erase as completely as possible. Incomplete marks or erasures may affect your score.*

First Name: _____ Last Name: _____

SECTION 3

Science

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

ANSWER KEY – TJ Test #6

Section #1 Math

1-	B
2-	B
3-	E
4-	C
5-	C
6-	D
7-	E
8-	C
9-	B
10-	B
11-	B
12-	C
13-	A
14-	C
15-	C
16-	A
17-	E
18-	D
19-	B
20-	A
21-	D
22-	B
23-	A
24-	D
25-	D
26-	56
27-	36
28-	5

Section #2 Reading

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

Section #3 Science

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