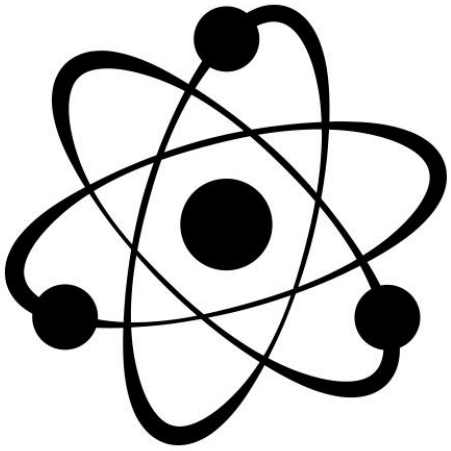


SCIENCE

ACT PRACTICE TEST

64E

SCIENCE TEST

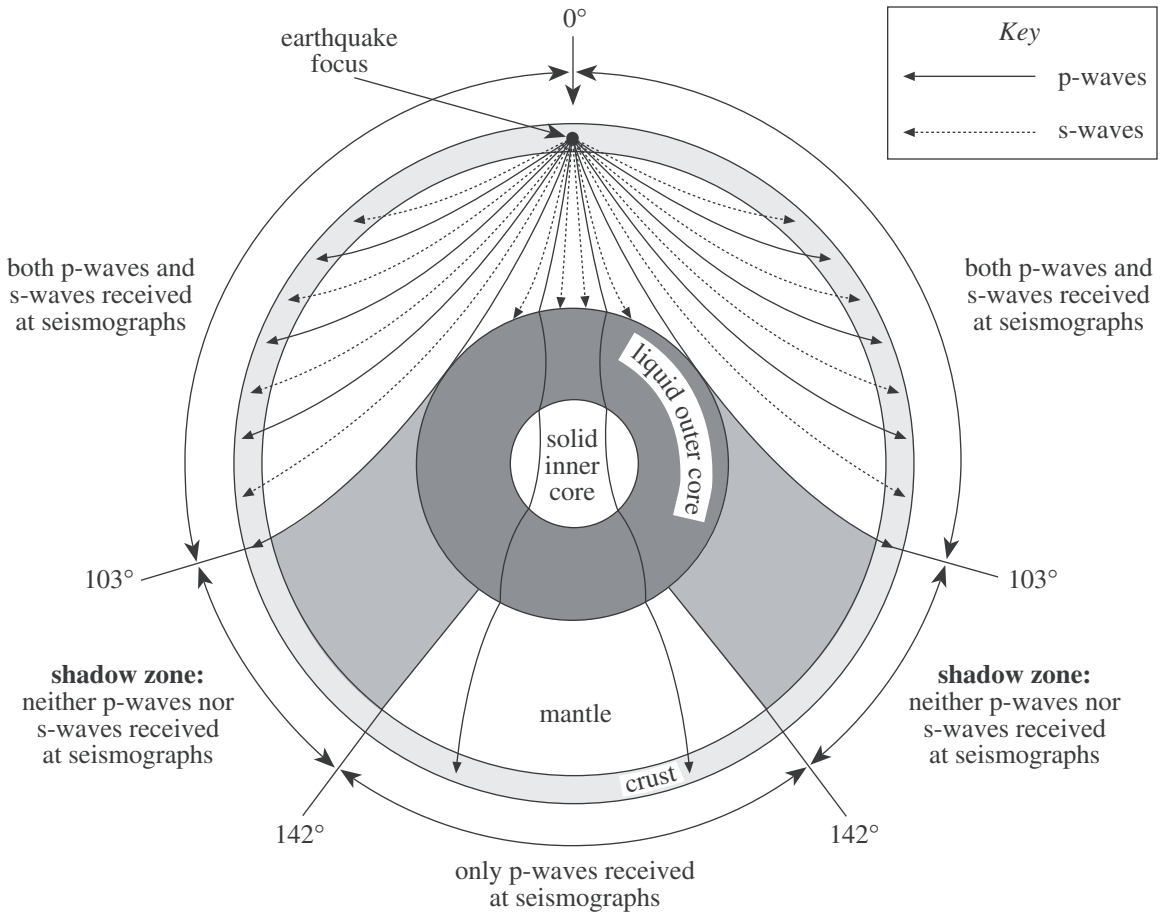
35 Minutes—40 Questions

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

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

Passage I

Earthquakes produce seismic waves that can travel long distances through Earth. Two types of seismic waves are *p-waves* and *s-waves*. P-waves typically travel 6–13 km/sec and s-waves typically travel 3.5–7.5 km/sec. Figure 1 shows how p-waves and s-waves move and are *refracted* (bent) as they travel through different layers of Earth's interior. Figure 2 shows a *seismograph* (an instrument that detects seismic waves) recording of p-waves and s-waves from an earthquake. Figure 3 shows, in general, how long it takes p-waves and s-waves to travel given distances along the surface from an earthquake *focus* (point of origin of seismic waves).



Note: The figure is not to scale.

Figure 1

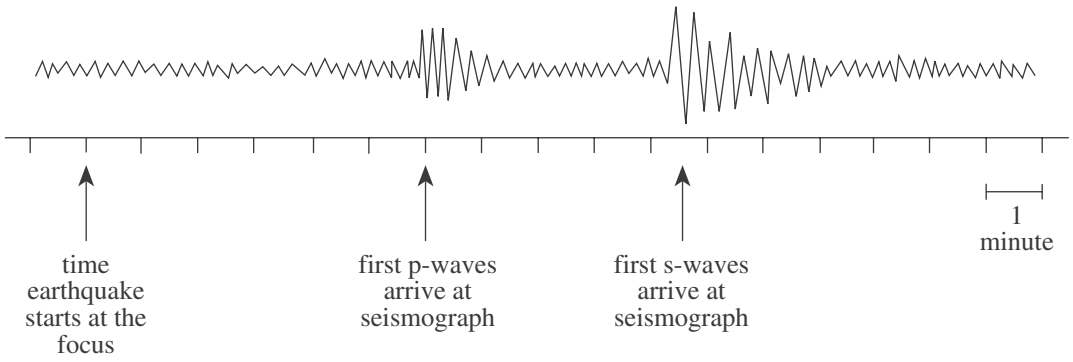


Figure 2

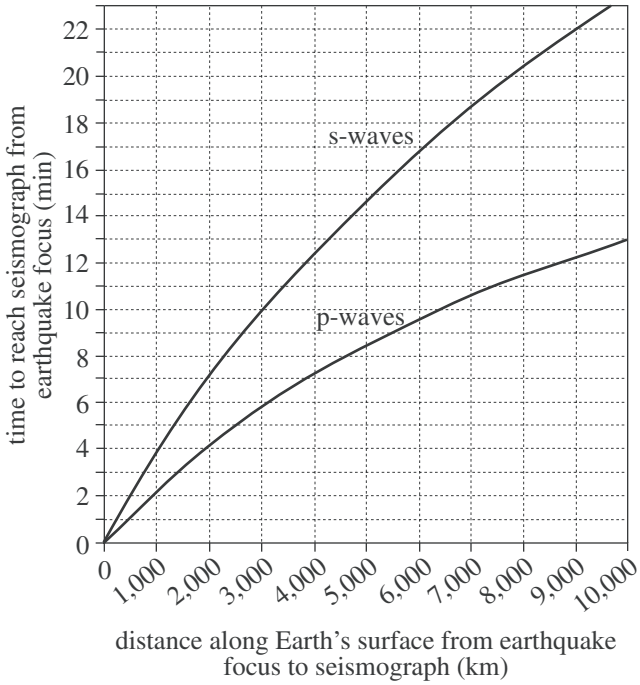


Figure 3

1. Figure 1 shows that a seismograph located at a point 125° around Earth from an earthquake's focus would receive which type(s) of seismic waves, if either, from that earthquake?

A. P-waves only
B. S-waves only
C. Both p-waves and s-waves
D. Neither p-waves nor s-waves

2. According to Figure 1, when p-waves encounter the boundary between the mantle and the core, the p-waves most likely:

F. stop and do not continue into the core.
G. enter the core and are refracted.
H. change to s-waves.
J. change to a third type of seismic wave.

3. Based on Figure 3, for a given seismograph, the time elapsed between the arrival of the first p-waves and the arrival of the first s-waves from an earthquake focus 10,500 km away would most likely be:

A. less than 5 min.
B. between 5 min and 7 min.
C. between 8 min and 10 min.
D. more than 10 min.

4. Based on the information provided, the "time earthquake starts at the focus" in Figure 2 corresponds to which of the following points on Figure 3 ?

F. 0 km, 0 min
G. 2,000 km, 5 min
H. 5,000 km, 12 min
J. 10,000 km, 20 min

5. According to Figure 2, which of the following statements best describes the relative amplitudes of the first p-waves to arrive at the seismograph and the first s-waves to arrive at the seismograph? The amplitude of the first p-waves to arrive at the seismograph is:

A. smaller than the amplitude of the first s-waves to arrive at the seismograph.
B. larger than the amplitude of the first s-waves to arrive at the seismograph.
C. nonzero, and the same as the amplitude of the first s-waves to arrive at the seismograph.
D. zero, as is the amplitude of the first s-waves to arrive at the seismograph.

Passage II

Lake Agassiz existed between 11,700 and 9,500 years ago in North America (see Figure 1). The lake was formed when a large glacier dammed several rivers. Groundwater trapped in lake and glacial sediments provides information about the climate at the time the sediments were deposited. Figure 2 shows a cross section of the sediments (lake clay and glacial till) and bedrock in the area. Figure 3 shows the $\delta^{18}O$ values of groundwater taken from samples of the top 40 m of sediment at 3 sites along the same cross section. $\delta^{18}O$ is calculated from a ratio of 2 oxygen isotopes (^{18}O and ^{16}O) in the groundwater. Smaller $\delta^{18}O$ values indicate cooler average temperatures.

Figure 1

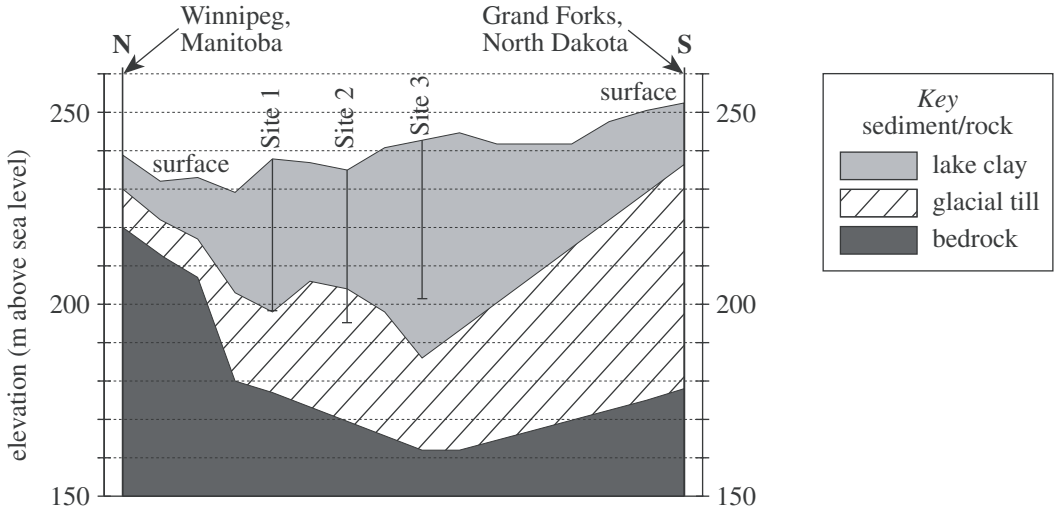
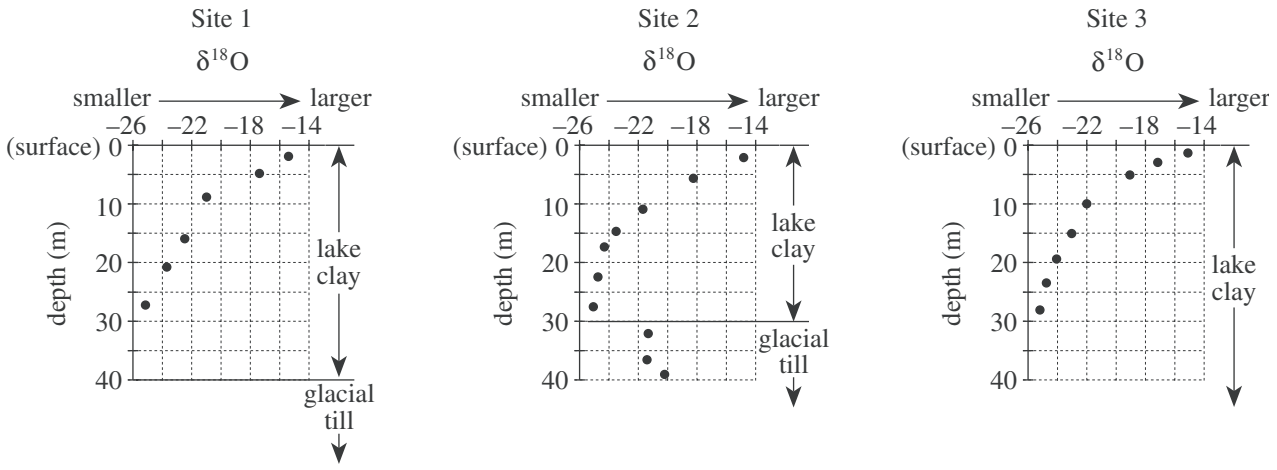


Figure 2



Note: $\delta^{18}O = \left[\left(\frac{^{18}O/^{16}O \text{ of groundwater sample}}{^{18}O/^{16}O \text{ of standard water sample}}\right) - 1\right] \times 1{,}000$

Figure 3

Figures adapted from V. H. Remenda, J. A. Cherry, and T. W. D. Edwards, "Isotopic Composition of Old Ground Water from Lake Agassiz: Implications for Late Pleistocene Climate." ©1994 by the American Association for the Advancement of Science.

6. According to Figure 2, the lake clay deposit is thinnest at which of the following cities or sites?

F. Winnipeg
G. Site 1
H. Site 2
J. Grand Forks

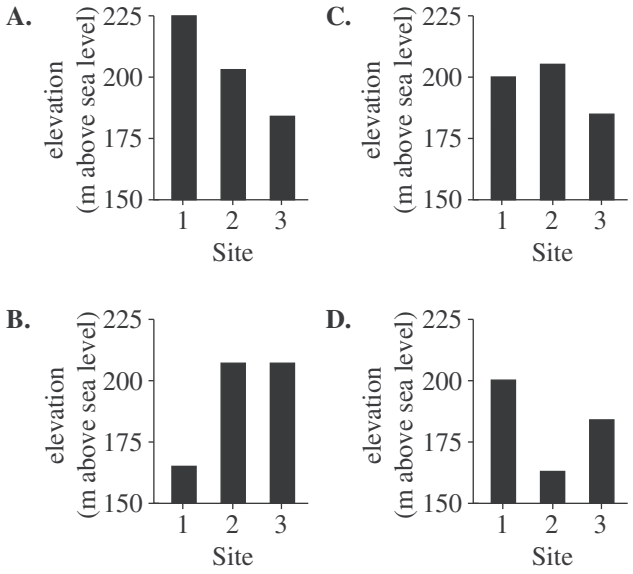
7. According to Figure 3, at Sites 1, 2, and 3, the smallest $\delta^{18}O$ value of the groundwater in the lake clay was recorded at a depth between:

A. 0 m and 10 m.
B. 10 m and 20 m.
C. 20 m and 30 m.
D. 30 m and 40 m.

8. According to Figure 2, as the thickness of the lake clay deposit increases from Grand Forks to Site 3, the thickness of the glacial till beneath it:

F. increases.
G. remains the same.
H. first increases and then decreases.
J. decreases.

9. According to Figure 2, which of the following graphs best represents the *elevations*, in m above sea level, of the top of the glacial till layer at Sites 1, 2, and 3 ?



10. Precipitation that falls at Sites 1, 2, and 3 soaks into the soil until it reaches the groundwater table about 3 m below the surface. Based on Figure 3, and assuming no alteration of the precipitation, the $\delta^{18}O$ value of present-day precipitation in the study area is closest to:

F. –26.
G. –23.
H. –20.
J. –15.

Passage III

Some students tested their hypothesis that the presence of bubbles in cans of various liquids would affect the *roll time* (the time it took a can to roll, without slipping, down an incline between 2 fixed points; see Figure 1).

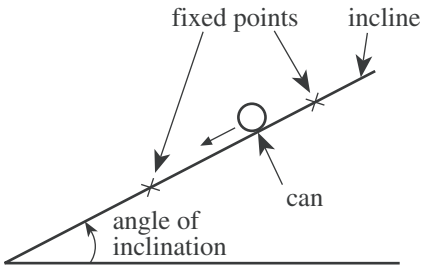


Figure 1

Identical 1.2 L aluminum cans were used in the first two experiments. The angle of inclination of the incline was 2.3° in all three experiments.

Experiment 1

The students added 1 L of a liquid—tap water containing no bubbles—to an empty can, sealed the can, and found its roll time. Next, they added 1 L of the tap water to a second empty can, sealed it, shook it, and immediately found its roll time. They repeated these procedures using soapy water containing many bubbles, and a carbonated beverage that contained no bubbles and that tasted flat, having lost most of its carbonation. The results are shown in Table 1.

Table 1

Trial	Liquid	Roll time: before shaking (sec)	Roll time: after shaking (sec)
1	tap water	1.75	1.75
2	soapy water	1.97	2.15
3	flat-tasting beverage	1.75	1.96

Experiment 2

The students added 1 L of the flat-tasting beverage to an empty can. They sealed the can, shook it, and set it aside. Fifteen minutes later they found the roll time of the can before and immediately after shaking it (Trial 4). Again they set the can aside. Two hours later they found the roll time of the can before and immediately after shaking it (Trial 5). The results are shown in Table 2.

Table 2

Trial	Roll time: before shaking (sec)	Roll time: after shaking (sec)
4	1.86	1.96
5	1.75	1.93

Experiment 3

The students added 1 L of the flat-tasting beverage to an empty 2 L clear plastic bottle and sealed the bottle. When they rolled the bottle down the incline, no bubbles formed. They shook the bottle, causing bubbles to form, and set the bottle aside. Fifteen minutes later, some bubbles were still visible, but after 2 hours, no bubbles could be seen.

11. In Experiment 3, what is the most likely reason the students used the plastic bottle rather than an aluminum can? Compared to an aluminum can, the plastic bottle:

A. rolled more rapidly down the incline.
B. made bubbles in the liquid easier to see.
C. contained a greater quantity of liquid.
D. had thicker walls and was less likely to break.

12. Based on the results of Experiments 1 and 2, in which of the following trials, before shaking, were the average speeds of the cans the same?

F. Trials 1 and 2
G. Trials 2 and 3
H. Trials 2 and 4
J. Trials 3 and 5

13. In Experiment 2, a result of shaking the can of flat-tasting beverage was that the:

- **A.** number of bubbles in the beverage immediately decreased.
- **B.** mass of the can of beverage increased.
- **C.** roll time of the can of beverage decreased.
- **D.** roll time of the can of beverage increased.

14. In Trial 5, is it likely that bubbles were present in large numbers immediately before the can was shaken?

- **F.** Yes; based on the results of Experiment 1, the bubbles produced in Trial 4 probably lasted for less than 15 min.
- **G.** Yes; based on the results of Experiment 1, the bubbles produced in Trial 4 probably lasted for more than 2 hr.
- **H.** No; based on the results of Experiment 3, the bubbles produced in Trial 4 probably lasted for less than 2 hr.
- **J.** No; based on the results of Experiment 3, the bubbles produced in Trial 4 probably lasted for more than 3 hr.

15. Suppose that in Experiment 2, two hours after the completion of Trial 5, the students had measured the roll time of the can of liquid without first shaking the can. Based on the results of Trials 4 and 5, the roll time would most likely have been:

- **A.** less than 1.86 sec.
- **B.** between 1.86 sec and 1.93 sec.
- **C.** between 1.94 sec and 1.96 sec.
- **D.** greater than 1.96 sec.

16. Based on the results of Trials 3–5 and Experiment 3, if the students had added 1 L of the flat-tasting beverage to one of the empty aluminum cans, sealed the can, and shaken it, how long would it most likely have taken for the number of bubbles in the beverage to become too few to affect the roll time?

- **F.** Less than 5 min
- **G.** Between 5 min and 14 min
- **H.** Between 15 min and 2 hr
- **J.** Over 2 hr

Passage IV

The chemical reactions associated with photosynthesis can be summarized with the following chemical equation:

$$6\ CO_2 + 12\ H_2O + \text{energy} \rightarrow C_6H_{12}O_6 + 6\ O_2 + 6\ H_2O$$

Table 1 lists wavelength ranges for visible light and the color frequently associated with each range.

Table 1

Color	Wavelength (nm)
Violet	380–430
Blue	430–500
Green	500–565
Yellow	565–585
Orange	585–630
Red	630–750

Table 1 adapted from Neil A. Campbell, Jane B. Reece, and Lawrence G. Mitchell, *Biology*, 5th ed. ©1999 by Benjamin/Cummings.

Figure 1 shows the relative absorption of light by chlorophyll *a* and chlorophyll *b* versus the wavelength of light from 400 nm to 750 nm.

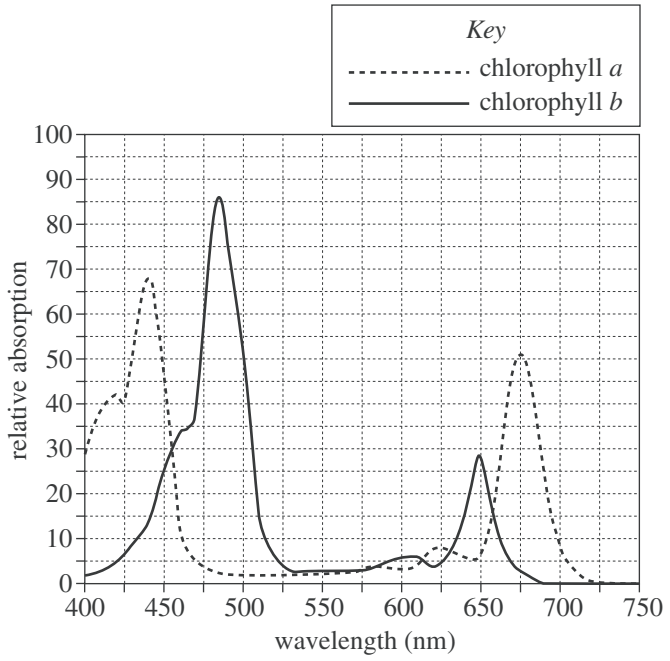


Figure 1

Figure 2 shows the average rate of photosynthesis at various wavelengths as a percent of the average rate of photosynthesis at 670 nm.

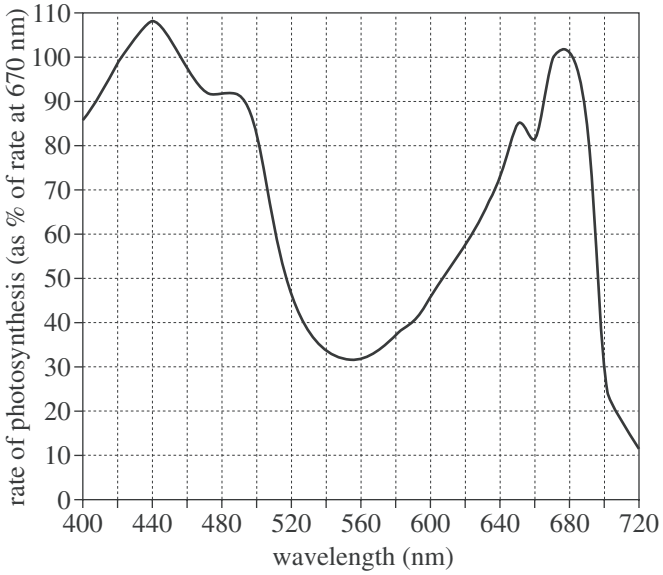


Figure 2

Figures 1 and 2 adapted from Peter H. Raven, Ray F. Evert, and Susan E. Eichhorn, *Biology of Plants*, 4th ed. ©1986 by Worth Publishers, Inc.

17. Based on Table 1 and Figure 1, which color of light is associated with the wavelength of light that results in the greatest absorption by chlorophyll *b* ?

A. Blue
B. Green
C. Yellow
D. Red

18. In eukaryotic organisms, the chemical reactions associated with the chemical equation shown in the passage typically occur within which of the following structures?

F. Chloroplasts
G. Mitochondria
H. Lysosomes
J. Nuclei

19. In Figure 2, at which of the following wavelengths does the rate of photosynthesis exceed the rate of photosynthesis at 670 nm ?

A. 400 nm
B. 430 nm
C. 630 nm
D. 700 nm

20. In the chemical equation shown in the passage, the carbon in CO_2 becomes part of which of the following types of molecules?

F. Fat
G. Sugar
H. Protein
J. Nucleic acid

21. Which of the following conclusions is best supported by Figures 1 and 2 ? The wavelength that results in the highest rate of photosynthesis also results in the:

A. lowest relative absorption by chlorophyll *a*.
B. lowest relative absorption by chlorophyll *b*.
C. highest relative absorption by chlorophyll *a*.
D. highest relative absorption by chlorophyll *b*.

Passage V

Students performed the following experiments to determine the density of common plastics.

Experiment 1

A dry 100 mL graduated cylinder was placed on an electronic balance and *tared* (the balance was reset to 0.000 g). H_2O was added to the graduated cylinder until a certain mass was obtained. Ethanol was added to the graduated cylinder until the volume of liquid was 50.0 mL. The density of the liquid was then calculated. The procedure was repeated with different amounts of ethanol and H_2O (see Table 1).

Table 1

Liquid	Mass of H_2O (g)	Mass of ethanol (g)	Total mass (g)	Density (g/mL)
1	0	39.67	39.67	0.793
2	10.24	32.43	42.67	0.853
3	19.79	25.23	45.02	0.900
4	35.42	12.47	47.89	0.958
5	49.96	0	49.96	0.999

Experiment 2

A known mass of potassium iodide (KI) was dissolved in a known mass of H_2O. A dry 100 mL graduated cylinder was placed on the balance and tared. The solution was added to the graduated cylinder until the volume was 50.0 mL. The density of the liquid was then calculated. The procedure was repeated with different amounts of KI and H_2O (see Table 2).

Table 2

Liquid	Mass of H_2O in solution (g)	Mass of KI in solution (g)	Mass of solution in graduated cylinder (g)	Density (g/mL)
6	97.66	7.36	52.51	1.05
7	95.41	15.52	55.70	1.11
8	94.38	20.68	57.53	1.15
9	92.18	29.08	60.63	1.21
10	87.77	41.31	64.64	1.29

Experiment 3

A solid plastic bead was placed at the bottom of a sample of each of Liquids 1–10 from Experiments 1 and 2. If the bead stayed at the bottom, "S" was recorded in Table 3. If the bead rose, "R" was recorded in Table 3. The procedure was repeated for various plastics.

Table 3

Plastic	Liquid 1	2	3	4	5	6	7	8	9	10
Polybutylene	R	R	R	R	R	R	R	R	R	R
VLDPE	S	R	R	R	R	R	R	R	R	R
LDPE	S	S	S	R	R	R	R	R	R	R
HDPE	S	S	S	S	R	R	R	R	R	R
PA-11	S	S	S	S	S	R	R	R	R	R
PA-6	S	S	S	S	S	S	S	R	R	R
Polycarbonate	S	S	S	S	S	S	S	S	R	R
PVC	S	S	S	S	S	S	S	S	S	S

22. In Experiment 1, the density of ethanol was found to be:

F. less than 0.793 g/mL.
G. 0.793 g/mL.
H. 0.999 g/mL.
J. greater than 0.999 g/mL.

23. Based on the results of Experiments 1–3, the density of PA-11 is most likely:

A. less than 0.793 g/mL.
B. between 0.853 g/mL and 0.958 g/mL.
C. between 0.999 g/mL and 1.05 g/mL.
D. greater than 1.11 g/mL.

24. Suppose that a sixth KI/H_2O solution had been measured in Experiment 2 and the mass of the solution in the graduated cylinder was 67.54 g. The density of this solution would most likely have been closest to which of the following?

F. 1.25 g/mL
G. 1.30 g/mL
H. 1.35 g/mL
J. 1.40 g/mL

25. A plastic bead was tested as in Experiment 3 using Liquids 1–4. Which of the following is NOT a plausible set of results for the plastic?

	Liquid			
	1	2	3	4
A.	R	R	R	R
B.	R	R	S	S
C.	S	S	R	R
D.	S	S	S	S

26. In Experiments 1 and 2, the students tared the graduated cylinder in each trial so they could more easily determine:

F. the mass of the substances added to the graduated cylinder.
G. the density of the graduated cylinder.
H. when the total volume of the added substances was equal to 50.0 mL.
J. when all of the KI was dissolved in the H_2O.

27. A student claimed that polycarbonate is more dense than PA-6. Do the results of Experiments 1–3 support his claim?

A. No, because in Liquid 8, polycarbonate stayed at the bottom and PA-6 rose.
B. Yes, because in Liquid 8, polycarbonate stayed at the bottom and PA-6 rose.
C. No, because in Liquid 8, polycarbonate rose and PA-6 stayed at the bottom.
D. Yes, because in Liquid 8, polycarbonate rose and PA-6 stayed at the bottom.

Passage VI

Bacteria break down sugars by *fermentation*. To study 2 fermentation pathways, researchers performed 2 experiments using broth that contained either the sugar *sucrose* or the sugar *lactose*. One of the fermentation pathways produces CO_2 gas and increases the acidity (lowers the pH) of the solution. The other pathway produces acid but not CO_2.

Experiment 1

Sucrose broth was added to 5 large test tubes. Next, *phenol red* (a pH indicator that is yellow if pH < 7, red if pH ≥ 7) was added to each large test tube. A *Durham tube* (a small test tube) was placed, inverted, in each large test tube to collect CO_2 (see Figure 1).

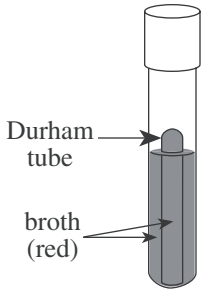


Figure 1

The large test tubes were capped, heated until the solutions were sterile, then cooled. One of 4 bacterial species (Species A–D) was added to each of 4 of the large test tubes. The procedure was repeated using lactose broth instead of sucrose broth. The 10 large test tubes (all containing solutions at a pH of 7) were then incubated at 37°C for 48 hr.

The large test tubes and Durham tubes were examined. If acid was produced, the solution was yellow. If no acid was produced, the solution remained red. If CO_2 was produced, a gas bubble was observed at the top of the Durham tube (see Table 1).

Table 1

Species added	Sucrose broth		Lactose broth	
	acid	CO_2	acid	CO_2
A	–	–	–	–
B	–	–	+	+
C	+	+	–	–
D	+	–	+	–
None	–	–	–	–

Experiment 2

Synergism occurs when 2 bacterial species act together to ferment a sugar by using a pathway that neither species can use alone. To investigate synergism, Experiment 1 was repeated, except that different pairs of bacterial species were added to each large test tube (see Table 2).

Table 2

Species added	Sucrose broth		Lactose broth	
	acid	CO_2	acid	CO_2
A and B	–	–	+	+
A and C	+	+	–	–
B and D	+	+	+	+
C and D	+	+	+	+

28. In Experiment 1, which of the bacterial species fermented lactose?

F. Species B only
G. Species C only
H. Species B and Species D only
J. Species C and Species D only

29. Suppose that in Experiment 2 both Species B and Species C had been added to a large test tube containing sucrose broth and to a large test tube containing lactose broth. Which of the following would most likely depict the results?

	Sucrose broth		Lactose broth	
	acid	CO_2	acid	CO_2
A.	–	–	+	+
B.	+	+	–	–
C.	+	+	+	+
D.	–	–	–	–

30. Suppose a scientist isolates a bacterial species that is 1 of the 4 species used in Experiment 1. She adds the species to sucrose broth and observes that neither acid nor CO_2 is produced. She then adds the species to lactose broth and observes that both acid and CO_2 are produced. Based on the results of Experiment 1, the species is most likely:

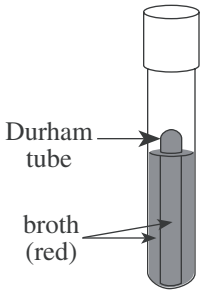
F. Species A.
G. Species B.
H. Species C.
J. Species D.

31. What is the evidence from Experiments 1 and 2 that Species C and Species D acted synergistically in Experiment 2 ?

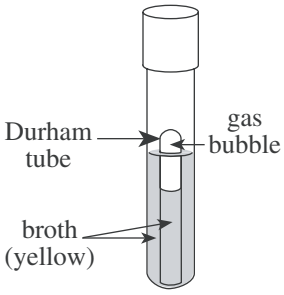
A. No acid was produced when each species was alone in the sucrose broth, but acid was produced when the 2 species were together in the sucrose broth.
B. No acid was produced when each species was alone in the lactose broth, but acid was produced when the 2 species were together in the sucrose broth.
C. No CO_2 was produced when each species was alone in the sucrose broth, but CO_2 was produced when the 2 species were together in the sucrose broth.
D. No CO_2 was produced when each species was alone in the lactose broth, but CO_2 was produced when the 2 species were together in the lactose broth.

32. Which of the following figures best illustrates the results of Experiment 1 for Species D in the sucrose broth?

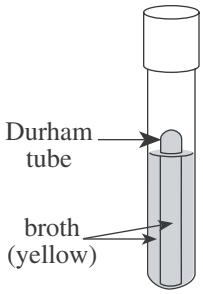
F.



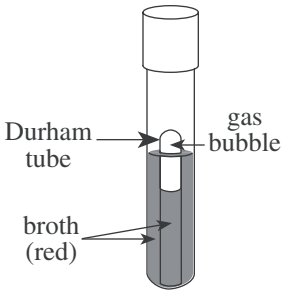
H.



G.



J.

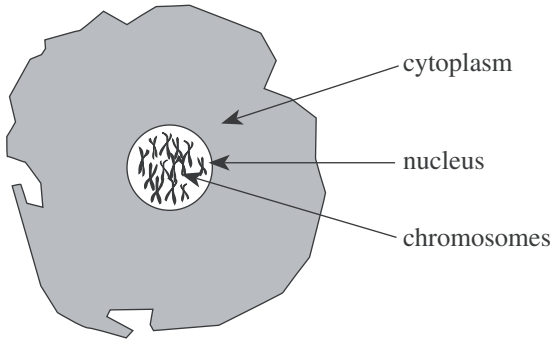


33. Is the hypothesis that Species A and Species C acted synergistically supported by the results of Experiment 2 ?

A. Yes, because both acid and CO_2 were produced from sucrose.
B. Yes, because both acid and CO_2 were produced from lactose.
C. No, because only acid, not CO_2, was produced from both sucrose and lactose.
D. No, because neither acid nor CO_2 was produced from lactose.

Passage VII

In the 1940s, scientists thought all genetic material was contained in structures called *chromosomes* and that chromosomes had been found only in the nucleus of a cell (not in the cytoplasm):



Chromosomes are composed of 2 types of molecules, proteins and deoxyribonucleic acid (DNA). Proteins are composed of subunits called *amino acids*. DNA consists of chains of subunits called *nucleotides.* The parts of chromosomes that are responsible for the transmission of genetic information are called *genes*.

Two scientists in the 1940s debate whether genes are made of proteins or DNA.

Protein Hypothesis

Genes are made only of proteins. Proteins make up 50% or more of a cell's dry weight. Cells contain 20 different amino acids that can be arranged in a virtually infinite number of ways to make different proteins. The number and arrangement of different amino acids within a protein form the codes that contain hereditary information.

In contrast, only 4 different nucleotides make up the DNA found in cells, and they are believed to form chains only in certain ratios. As a result, the number of different combinations that DNA can carry is much smaller than the number that proteins can carry.

DNA Hypothesis

Genes are made only of DNA. DNA is found exclusively in the cell's nucleus, whereas proteins are found throughout the nucleus and cytoplasm. Additionally, the amount of protein in a cell varies from cell type to cell type, even within the same animal.

Though DNA is less abundant than proteins, the amount is consistent from cell type to cell type within the same animal, except for the *gametes* (the reproductive cells). Gametes have half the amount of DNA as other cells in the body. Gametes also have half the typical number of chromosomes. Thus, the amount of DNA in a cell is correlated with the number of chromosomes in the cell. No such correlation is found for proteins.

34. Which of the following statements is most consistent with the DNA Hypothesis? The amount of DNA will generally increase from cell type to cell type as the number of:

- **F.** amino acids in the nucleus increases from cell type to cell type.
- **G.** amino acids in the cytoplasm increases from cell type to cell type.
- **H.** chromosomes in the nucleus increases from cell type to cell type.
- **J.** chromosomes in the cytoplasm increases from cell type to cell type.

35. By referring to the observation that DNA is found exclusively in the nucleus while proteins are found throughout the cell, the scientist supporting the DNA Hypothesis implies that genes are made only of DNA because which of the following are also found only in the nucleus?

- **A.** Amino acids
- **B.** Proteins
- **C.** Gametes
- **D.** Chromosomes

36. According to the passage, a similarity between DNA and proteins is that both types of molecules:

- **F.** are found only in gametes.
- **G.** are abundant in the cytoplasm.
- **H.** contain 20 different amino acids.
- **J.** are composed of smaller subunits.

37. According to the Protein Hypothesis, which of the following observations provides the strongest evidence that genes are NOT composed of DNA ?

- **A.** DNA is composed of only 4 types of nucleotides.
- **B.** DNA is composed of smaller subunits than are proteins.
- **C.** DNA is abundant in both the nucleus and the cytoplasm.
- **D.** The concentration of DNA is generally consistent from cell to cell.

38. *Mitochondria* are organelles located in the cytoplasm that are responsible for energy transformation in a cell. After the 1940s, it was observed that mitochondria contain their own genes. This observation contradicts evidence stated in which hypothesis?

- **F.** The DNA Hypothesis, because if genes are made of DNA, the observation would show that DNA is present outside the nucleus.
- **G.** The DNA Hypothesis, because if genes are made of DNA, the observation would show that DNA is present inside the nucleus.
- **H.** The Protein Hypothesis, because if genes are made of proteins, the observation would show that proteins are present outside the nucleus.
- **J.** The Protein Hypothesis, because if genes are made of proteins, the observation would show that proteins are present inside the nucleus.

39. The scientist who describes the DNA Hypothesis implies that the Protein Hypothesis is *weakened* by which of the following observations?

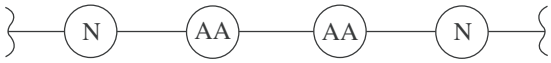
A. For a given organism, the amount of protein in the gametes is half that found in other types of cells.
B. For a given organism, the amount of protein in different types of cells is not the same.
C. Protein molecules are composed of many subunits.
D. Proteins are found only in the nucleus.

40. Which of the following illustrations of a portion of a DNA molecule is consistent with the description in the passage?

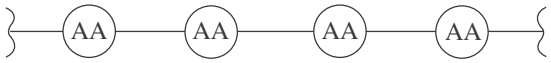
Key
AA - amino acid
N - nucleotide

F.

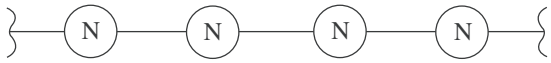
G.



H.



J.



END OF TEST 4

STOP! DO NOT RETURN TO ANY OTHER TEST.

[See Note on page 56.]

Test 3: Reading—Scoring Key

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

Number Correct (Raw Score) for:

Social Studies/Sciences (SS) Subscore Area _____ (20)

Arts/Literature (AL) Subscore Area _____ (20)

Total Number Correct for Reading Test (SS + AL) _____ (40)

* SS = Social Studies/Sciences
AL = Arts/Literature

Test 4: Science—Scoring Key

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

Number Correct (Raw Score) for:

Total Number Correct for Science Test _____ (40)

0964E

TABLE 1

Explanation of Procedures Used to Obtain Scale Scores from Raw Scores

On each of the four multiple-choice tests on which you marked any responses, the total number of correct responses yields a raw score. Use the table below to convert your raw scores to scale scores. For each test, locate and circle your raw score or the range of raw scores that includes it in the table below. Then, read across to either outside column of the table and circle the scale score that corresponds to that raw score. As you determine your scale scores, enter them in the blanks provided on the right. The highest possible scale score for each test is 36. The lowest possible scale score for any test on which you marked any responses is 1.

Next, compute the Composite score by averaging the four scale scores. To do this, add your four scale scores and divide the sum by 4. If the resulting number ends in a fraction, round it off to the nearest whole number. (Round down any fraction less than one-half; round up any fraction that is one-half or more.) Enter this number in the blank. This is your Composite score. The highest possible Composite score is 36. The lowest possible Composite score is 1.

ACT Test 64E	**Your Scale Score**
English	_____
Mathematics	_____
Reading	_____
Science	_____
Sum of scores	_____
Composite score (sum ÷ 4)	_____

NOTE: If you left a test completely blank and marked no items, do not list a scale score for that test. If any test was completely blank, do not calculate a Composite score.

Scale Score	Raw Scores				Scale Score
	Test 1 English	Test 2 Mathematics	Test 3 Reading	Test 4 Science	
36	75	60	40	40	**36**
35	73-74	59	39	39	**35**
34	71-72	58	38	—	**34**
33	70	56-57	37	38	**33**
32	69	55	36	37	**32**
31	67-68	54	35	—	**31**
30	66	52-53	34	36	**30**
29	65	50-51	32-33	35	**29**
28	63-64	48-49	31	33-34	**28**
27	62	45-47	30	32	**27**
26	60-61	42-44	29	30-31	**26**
25	58-59	40-41	27-28	28-29	**25**
24	56-57	37-39	26	26-27	**24**
23	54-55	35-36	24-25	25	**23**
22	52-53	33-34	23	23-24	**22**
21	49-51	31-32	22	21-22	**21**
20	46-48	29-30	20-21	19-20	**20**
19	43-45	26-28	19	18	**19**
18	41-42	24-25	18	16-17	**18**
17	39-40	21-23	16-17	15	**17**
16	36-38	17-20	15	14	**16**
15	33-35	14-16	14	13	**15**
14	30-32	11-13	12-13	12	**14**
13	28-29	9-10	11	11	**13**
12	26-27	7-8	9-10	10	**12**
11	24-25	6	8	9	**11**
10	22-23	5	6-7	7-8	**10**
9	20-21	4	—	6	**9**
8	17-19	3	5	5	**8**
7	14-16	—	4	4	**7**
6	11-13	2	3	3	**6**
5	8-10	—	—	—	**5**
4	6-7	1	2	2	**4**
3	4-5	—	—	1	**3**
2	3	—	1	—	**2**
1	0-2	0	0	0	**1**

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