Bio.12-Q1W6- Qs. Bank-Cyto- Cell Energy -

Multiple Choice
Identify the choice that best completes the statement or answers the question.

____ 1. Which of the following is NOT part of a molecule of ATP?
a. Ribose sugar
b. Adenosine
c. Deoxyribose sugar
d. Phosphate group

____ 2. ATP stores energy for use in several cellular functions. Which of the following does NOT require the breakdown of ATP?
a. Bioluminescence
b. Enzyme production
c. Flagella movement
d. Diffusion

____ 3. Which of the following is a product of photosynthesis?
a. ATP
b. Glucose
c. Water
d. Carbon dioxide

____ 4. Chlorophyll is the primary pigment in plant chloroplasts. It absorbs all wavelengths of light, EXCEPT —
a. green.
b. red.
c. yellow.
d. All of the above

____ 5. Where is the electron transport chain located in the light-dependent reactions?
a. Nucleus
b. Mitochondria
c. Thylakoid membrane
d. Cytoplasm

____ 6. Where do the light-independent reactions of photosynthesis take place?
a. Stroma
b. Thylakoid membrane
c. Mitochondria
d. Cell wall

____ 7. Which of the following is a reactant in photolysis?
a. Electron
b. Oxygen
c. Proton
d. Water

____ 8. The Calvin cycle produces a molecule that is able to reenter the cycle as a reactant. Which of the following molecules is used as a reactant in the beginning of the Calvin cycle and is then produced at the end?
a. ATP
b. Ribulose biphosphate
c. Phosphoglyceric acid
d. Carbon dioxide

____ 9. Which of the following processes is anaerobic?
a. Glycolysis
b. Citric acid cycle
c. Electron transport chain
d. All of the above

____ 10. In the absence of oxygen, yeast cells undergo fermentation to produce —
a. lactic acid.
b. oxygen.
c. glucose.
d. ethyl alcohol.

____ 11. The main energy-trapping molecule in plants is _____.
a. chloroplast
b. chlorophyll
c. stroma
d. carotenoids

____ 12. Energy from sunlight is trapped by chlorophyll located in the _____.
a. citric acid cycle
b. mitochondria
c. electron transport chain
d. thylakoid membranes

____ 13. Chlorophyll traps _____ from sunlight.
a. oxygen
b. energy
c. hydrogen
d. glucose

____ 14. A green pigment that traps energy from sunlight is _____.
a. carotenoid
c. chlorophyll

b. ATP
d. thylakoid membranes

____ 15. Which sugar is a part of adenosine diphosphate?
a. adenine
c. glucose
b. ribose
d. glycogen

____ 16. Energy is released from ATP when the bond is broken between _____.
a. two phosphate groups
c. ribose and a phosphate group
b. adenine and ribose
d. adenine and a phosphate group

____ 17. Organisms need a way of storing energy because _____.
a. a cell can't always immediately use all the energy it gets
b. an organism often has times when no energy is used
c. a cell can release only stored energy
d. a cell cannot create energy and must get it from elsewhere in the organism

____ 18. In order to move molecules in your kidneys, your body needs _____.
a. energy
c. cold
b. sunlight
d. heat

____ 19. In the complete process of photosynthesis, the _____.
a. Calvin cycle yields CO_2
b. light reactions release oxygen
c. Calvin cycle breaks down H_2O
d. light reactions produce $NADP^+$ from $NADPH + H^+$

____ 20. In glycolysis, _____ molecules of ATP are used in the first step, and _____ molecules of ATP are produced in the second step.
a. four, two
c. two, two
b. two, four
d. four, four

____ 21. In respiration, the final electron acceptor in the electron transport chain is _____.
a. oxygen
c. hydrogen ions
b. ATP
d. H_2O

____ 22. Kidneys use energy to move molecules and ions in order to keep the blood chemically balanced. This process is an example of cells using energy to _____.
a. carry on chemosynthesis
c. control body temperature
b. transmit impulses
d. maintain homeostasis

____ 23. Which of the following equations best represents photosynthesis?
a. $C + O_2 + H_2O \rightarrow CO_2 + HOH$
c. $6C + 6H_2O \rightarrow C_6H_{12}O_6$
b. $6CO_2 + 6H_2O \rightarrow C_6H_{12}O_6 + 6O_2$
d. $C_6H_{12}O_6 \rightarrow 6CO_2 + 6H_2O$

____ 24. Leaves appear green because the green portion of the light that strikes them is _____.
a. changed to heat
c. destroyed
b. absorbed
d. reflected

____ 25. Cells store energy when _____.
a. the third phosphate group breaks off from an ATP molecule
b. they break down sucrose to glucose and fructose
c. a third phosphate group is bonded to an ATP molecule
d. ions are released into the bloodstream

____ 26. The energy in glucose <u>cannot</u> be released by _____.
a. glycolysis
c. respiration
b. burning
d. photosynthesis

____ 27. Which of the following is <u>not</u> a part of adenosine diphosphate?
a. glucose
c. ribose
b. adenine
d. two phosphate groups

____ 28. Which of the diagrams in Figure 9-2 best show how energy is produced in a cell?

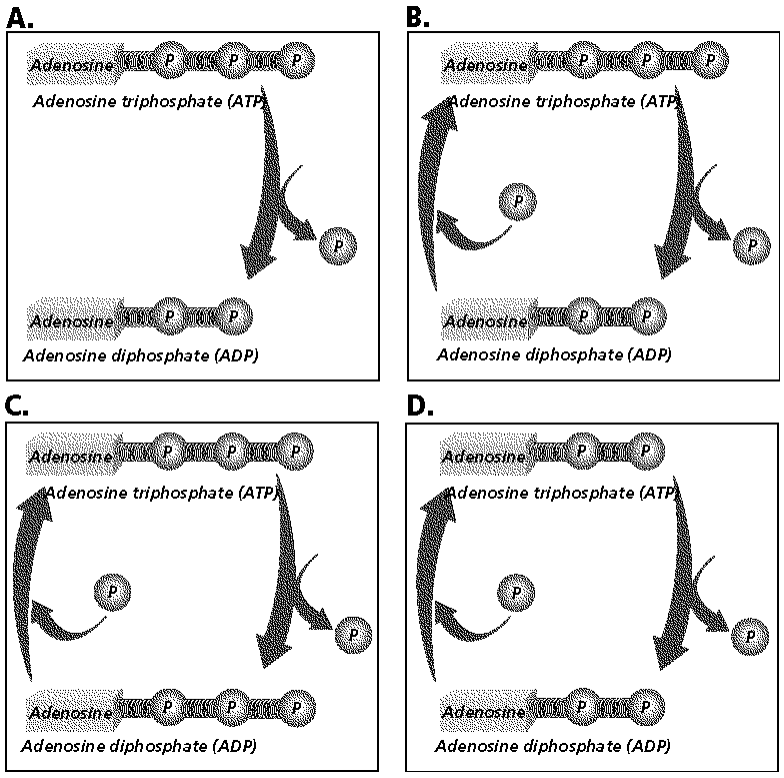

Figure 9-2

a. A
b. B
c. C
d. D

____ 29. Which of the processes shown in Figure 9-3 do not use a cell's energy?

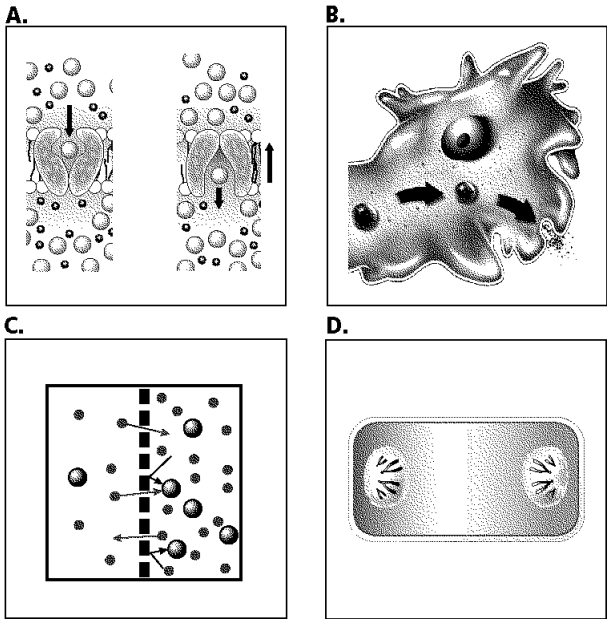

Figure 9-3

a. A
b. B
c. C
d. D

____ 30. What is the main purpose of the cycle shown in Figure 9-4?

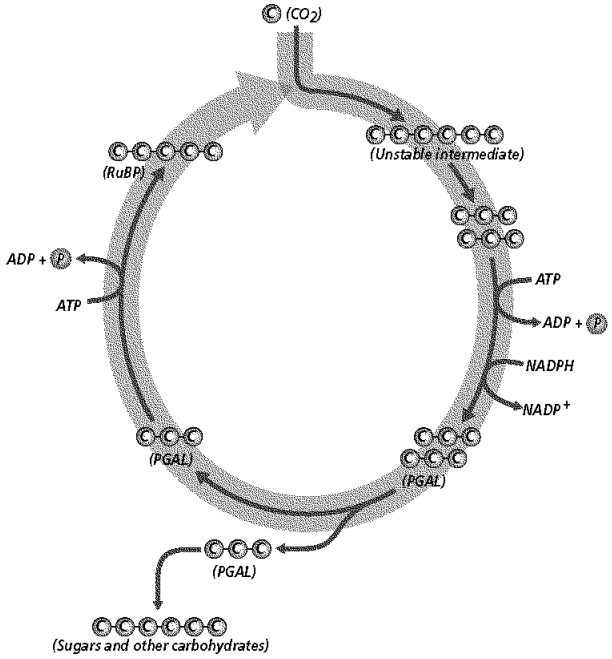

Figure 9-4

a. sugar production
b. destruction of CO_2
c. production of ADP
d. production of $NADP^-$

____ 31. In which types of organisms does the process shown in Figure 9-5 take place?

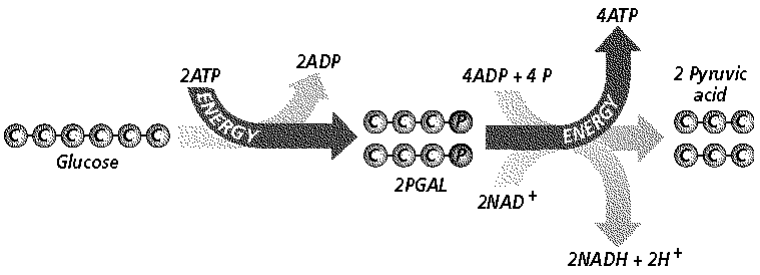

Figure 9-5

a. plants only
b. animals only
c. neither plants nor animals
d. both plants and animals

Completion

Complete each statement.

32. A series of reactions in aerobic respiration that begins and ends with the same 6-carbon compound is the _____.

33. In photosynthesis, the series of reactions that synthesize simple sugars from carbon dioxide and hydrogen is known as the _____.

34. The anaerobic process of splitting glucose to form pyruvic acid is called _____.
35. The splitting of water during photosynthesis is _____.
36. The passing of electrons along a series of molecules, releasing energy as they go, is known as a(n) _____.
37. The process by which autotrophs use energy from sunlight to build carbohydrates is called _____.
38. The reactions in photosynthesis in which energy from the sun is converted to chemical energy are called _____.

Short Answer

39. Compare and contrast the terms *photosynthesis* and *cellular respiration*.
40. Compare and contrast the terms *aerobic process* and *anaerobic process*.
41. What do you think would happen to a plant's energy-trapping ability if suddenly the only pigment it contained was chlorophyll? What is your reasoning?
42. How is ATP obtained from aerobic processes?
43. Predict what would happen if all the ATP production in living things suddenly ceased.
44. How is energy stored in ATP?
45. How does the storage of energy in ATP molecules benefit a cell?
46. If you run or ride a bicycle as fast as you can, your muscles may begin to feel weak and have a burning sensation. Explain what is occurring that accounts for this muscle fatigue.
47. Explain what is meant by carbon fixation. During which stage of photosynthesis does this process take place?
48. Both the wine industry and the bread industry use the process of alcoholic fermentation. In what ways is the use of the process by these industries similar? In what way do the uses differ?
49. Maintaining body temperature, transmitting nerve impulses, movement of cilia, and bioluminescence are various activities of organisms. What requirement do these activities have in common? Why is ATP important in each activity?
50. In an experiment to determine whether green plants take in CO_2, a biologist filled a large beaker with aquarium water to which she added bromothymol blue. She exhaled CO_2 into the solution of bromothymol blue to turn it yellow. Then she placed a sprig of *Elodea* into two test tubes. She left the third test tube without *Elodea* to serve as a control. She added the yellow bromothymol solution to all three test tubes and placed a stopper in each. Next, she placed all the test tubes in sunlight. After several hours in sunlight, the bromothymol solution in the test tubes with the *Elodea* turned blue. The bromothymol solution in the control remained yellow. What conclusion can be drawn from the observations? Explain.

Molecular Yield of ATP per Glucose Molecule		
Reaction	**ATP Produced**	**ATP Used**
Glycolysis	4	2
Production of Acetyl-CoA		2

Citric acid cycle	2	
Electron transport chain	34	

Table 9-1

51. Refer to Table 9-1. The combination of glycolysis and fermentation yields a net gain of two ATP molecules. How many molecules of ATP does fermentation yield? Explain.

52. What is the total net gain in ATP molecules per glucose molecule? Refer to Table 9-1.

53. Referring to Table 9-1, what is the net production of ATP molecules by <u>each</u> of the four reactions?

In 1803, Thomas Engelmann of Germany used a combination of filamentous alga and aerobic bacteria to study the effect of various colors of the visible light spectrum on the rate of photosynthesis. He passed white light through a prism in order to separate the light into the different colors of the spectrum; then he exposed different segments of the alga to the various colors. He observed in which areas of the spectrum the greatest number of bacteria appeared.

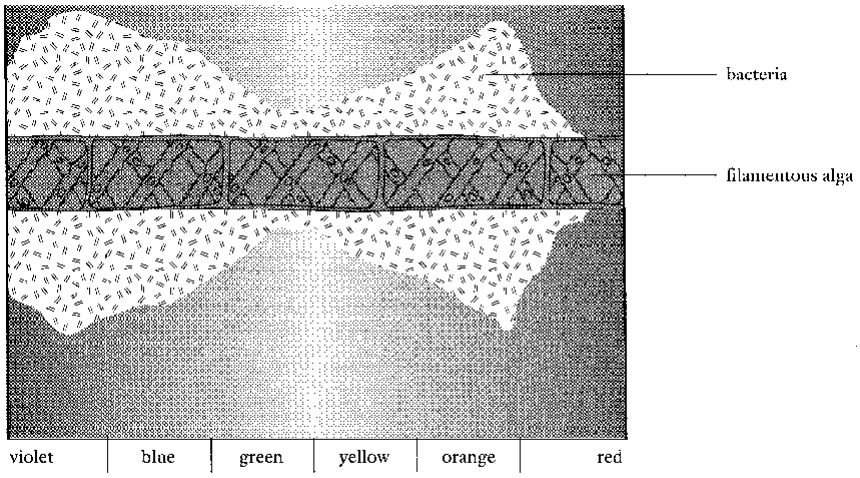

Figure 9-1

54. Did Engelmann's observations verify his hypothesis? Explain. Refer to Figure 9-1.

55. Describe one control Engelmann might have used. Refer to Figure 9-1.

56. What was the independent variable in this experiment? You may refer to Figure 9-1.

57. Based on Figure 9-1, what would Engelmann's conclusion be?

58. Why did Engelmann select aerobic rather than anaerobic bacteria? See Figure 9-1.

59. Referring to Figure 9-1, how was the observation about the amount of oxygen present related to Engelmann's purpose?

60. Was determining where there was more oxygen the purpose of Engelmann's experiment? If not, state the purpose. You may refer to Figure 9-1.

Bio.12-Q1W6- Qs. Bank-Cyto- Cell Energy -
Answer Section

MULTIPLE CHOICE

1. ANS: C
   ATP, or adenosine triphosphate, is composed of adenosine, ribose, and a phosphate group.

   PTS: 1
2. ANS: D
   The energy stored in ATP is used for molecular synthesis, maintenance of homeostasis, cell movement, and bioluminescence. Diffusion does not require energy.

   PTS: 1
3. ANS: B
   Photosynthesis uses carbon dioxide, water, and energy to form glucose and oxygen.

   PTS: 1
4. ANS: A
   Chlorophyll absorbs most wavelengths of light, except green light, which it reflects. This gives leaves their green color.

   PTS: 1
5. ANS: C
   Energized electrons are transported by a series of proteins that are embedded in the thylakoid membrane.

   PTS: 1
6. ANS: A
   The light-independent reactions take place in the stroma of the chloroplast and produce carbohydrates using the products of the light-dependent reactions.

   PTS: 1
7. ANS: D
   Photolysis is the splitting of two molecules of water to produce oxygen and electrons.

   PTS: 1
8. ANS: B
   Ribulose biphosphate combines with carbon dioxide to start the Calvin cycle. It is then reformed at the end of the cycle and released to restart the cycle.

   PTS: 1
9. ANS: A
   Glycolysis takes place in the cytoplasm of cells and can occur in the absence of oxygen.

   PTS: 1
10. ANS: D
    Under anaerobic conditions, fermentation follows glycolysis. Yeast cells perform alcoholic fermentation to produce ethyl alcohol and carbon dioxide.

PTS: 1

11. ANS: B PTS: 1 DIF: B OBJ: 9-3
NAT: C1 | C5 | G1

12. ANS: D PTS: 1 DIF: B OBJ: 9-3
NAT: C1 | C5 | G1

13. ANS: B PTS: 1 DIF: B OBJ: 9-3
NAT: C1 | C5 | G1

14. ANS: C PTS: 1 DIF: B OBJ: 9-3
NAT: C1 | C5 | G1

15. ANS: C PTS: 1 DIF: B OBJ: 9-2
NAT: C1 | C5

16. ANS: A PTS: 1 DIF: B OBJ: 9-2
NAT: C1 | C5

17. ANS: A PTS: 1 DIF: B OBJ: 9-1
NAT: C1 | C5

18. ANS: A PTS: 1 DIF: B OBJ: 9-1
NAT: C1 | C5

19. ANS: B PTS: 1 DIF: B OBJ: 9-4
NAT: C1 | C5 | G1

20. ANS: B PTS: 1 DIF: B OBJ: 9-7
NAT: C1 | C5

21. ANS: A PTS: 1 DIF: B OBJ: 9-7
NAT: C1 | C5

22. ANS: D PTS: 1 DIF: B OBJ: 9-1
NAT: C1 | C5

23. ANS: B PTS: 1 DIF: B OBJ: 9-3
NAT: C1 | C5 | G1

24. ANS: D PTS: 1 DIF: B OBJ: 9-3
NAT: C1 | C5 | G1

25. ANS: C PTS: 1 DIF: B OBJ: 9-2
NAT: C1 | C5

26. ANS: D PTS: 1 DIF: B OBJ: 9-2
NAT: C1 | C5

27. ANS: A PTS: 1 DIF: B OBJ: 9-2
NAT: C1 | C5

28. ANS: B PTS: 1 DIF: B OBJ: 9-2
NAT: C1 | C5

29. ANS: C PTS: 1 DIF: A OBJ: 9-1
NAT: C1 | C5

30. ANS: A PTS: 1 DIF: A OBJ: 9-5
NAT: C1 | C5 | G1

31. ANS: D PTS: 1 DIF: A OBJ: 9-7
NAT: C1 | C5

COMPLETION

32. ANS: citric acid cycle

PTS: 1 DIF: B OBJ: 9-7 NAT: C1 | C5

33. ANS: Calvin cycle

PTS: 1 DIF: B OBJ: 9-5 NAT: C1 | C5 | G1

34. ANS: glycolysis

PTS: 1 DIF: B OBJ: 9-6 NAT: C1 | C5 | G1

35. ANS: photolysis

PTS: 1 DIF: B OBJ: 9-4 NAT: C1 | C5 | G1

36. ANS: electron transport chain

PTS: 1 DIF: B OBJ: 9-4 NAT: C1 | C5 | G1

37. ANS: photosynthesis

PTS: 1 DIF: B OBJ: 9-3 NAT: C1 | C5 | G1

38. ANS: light reactions

PTS: 1 DIF: B OBJ: 9-4 NAT: C1 | C5 | G1

SHORT ANSWER

39. ANS:
Both are complex groups of reactions that involve energy, require enzymes, occur in specific organelles, and involve movement of electrons. In photosynthesis, energy is stored when CO_2 and H_2O combine to form sugar or starch and release oxygen as a waste. In (aerobic) respiration, energy is released when sugar is broken down in the presence of oxygen; CO_2 and H_2O are given off as wastes.

PTS: 1 DIF: B OBJ: 9-7 NAT: C1 | C5

40. ANS:
Aerobic processes require oxygen; anaerobic processes do not.

PTS: 1 DIF: B OBJ: 9-6 NAT: C1 | C5 | G1

41. ANS:
The plant's energy-trapping ability would decrease because the other pigments transfer energy from colors of light that chlorophyll does not absorb well.

PTS: 1 DIF: A OBJ: 9-3 NAT: C1 | C5 | G1

42. ANS:
Answers may include: Aerobic respiration in the mitochondria begins with the production of pyruvic acid from glycolysis. The citric acid cycle and electron transport chain produce additional ATP molecules as the carbohydrate is broken down into water and carbon dioxide.

PTS: 1 DIF: A OBJ: 9-7 NAT: C1 | C5

43. ANS:
Answers may include: Everything would die. All living things require a constant supply of ATP for their cell activities.

PTS: 1 DIF: A OBJ: 9-1 NAT: C1 | C5

44. ANS:
Energy is stored in the phosphate bonds of ATP as ATP is synthesized from other materials.

PTS: 1 DIF: A OBJ: 9-2 NAT: C1 | C5

45. ANS:
ATP stores energy for maintaining life processes. These life processes result in work being done whenever molecules, atoms, or ions are rearranged.

PTS: 1 DIF: A OBJ: 9-2 NAT: C1 | C5

46. ANS:
The rate at which oxygen is supplied to the muscles limits the aerobic respiration that can occur. As a result, anaerobic lactic acid fermentation, changing pyruvic acid to lactic acid occurs. The buildup of lactic acid causes muscle fatigue.

PTS: 1 DIF: B OBJ: 9-6 NAT: C1 | C5 | G1

47. ANS:
Carbon fixation occurs during the Calvin cycle, when an enzyme adds the carbon atom from atmospheric carbon dioxide to a 5-carbon molecule.

PTS: 1 DIF: B OBJ: 9-5 NAT: C1 | C5 | G1

48. ANS:
Both use yeast to produce alcohol and carbon dioxide. In the wine industry, the alcohol remains in the wine; the bread industry uses the carbon dioxide to make the bread dough rise.

PTS: 1 DIF: B OBJ: 9-6 NAT: C1 | C5 | G1

49. ANS:
They require energy. The energy available for each activity is released by the breakdown of ATP to ADP and inorganic phosphate.

PTS: 1 DIF: B OBJ: 9-1 NAT: C1 | C5

50. ANS:
Because the bromothymol in the control was still yellow, the CO_2 did not leak out of the test tubes. Therefore, in the other two test tubes, the *Elodea* must have taken in the CO_2.

PTS: 1 DIF: A OBJ: 9-3 NAT: C1 | C5 | G1

51. ANS:
Fermentation yields no molecules of ATP. Because glycolysis yields a net gain of two ATP molecules, and glycolysis combined with fermentation also yields two molecules of ATP, fermentation must produce zero molecules of ATP.

PTS: 1 DIF: A OBJ: 9-6 NAT: C1 | C5 | G1

52. ANS:
36 molecules

PTS: 1 DIF: A OBJ: 9-7 NAT: C1 | C5

53. ANS:
Glycolysis, 2; acetyl-CoA production, a loss of 2; citric acid cycle, 2; electron transport chain, 34

PTS: 1 DIF: A OBJ: 9-7 NAT: C1 | C5

54. ANS:
Yes, his hypothesis was that various colors of light affect the rate of photosynthesis differently, and he observed that they do.

PTS: 1 DIF: A OBJ: 9-3 NAT: C1 | C5 | G1

55. ANS:
Answers will vary. He could have exposed one test tube to white light and left another in complete darkness.

PTS: 1 DIF: A OBJ: 9-3 NAT: C1 | C5 | G1

56. ANS:
the different colors of light

PTS: 1 DIF: A OBJ: 9-3 NAT: C1 | C5 | G1

57. ANS:
He would conclude that violet light and red light are the most effective colors of the spectrum in bringing about photosynthesis.

PTS: 1 DIF: A OBJ: 9-3 NAT: C1 | C5 | G1

58. ANS:
He was using bacteria to determine oxygen content, and anaerobic bacteria do not require oxygen for their life activities.

PTS: 1 DIF: A OBJ: 9-6 NAT: C1 | C5 | G1

59. ANS:
Because oxygen is a product of photosynthesis, he reasoned that more oxygen indicated a greater rate of photosynthesis.

PTS: 1 DIF: A OBJ: 9-3 NAT: C1 | C5 | G1

60. ANS:
No; the purpose was to determine whether different colors of light affected the production of oxygen and therefore the rate of photosynthesis.

PTS: 1 DIF: A OBJ: 9-3 NAT: C1 | C5 | G1