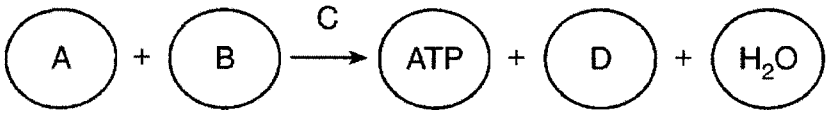
Respiration and Photosynthesis
Practice

1. The temporary storage of energy in ATP molecules is part of which process?
   1) cell division
   2) cellular respiration
   3) protein synthesis
   4) DNA replication

2. A student prepared a test tube containing yeast, glucose, and water. After 24 hours, the test tube was analyzed for the presence of several substances.

   What substance would the student expect to find if respiration occurred in the test tube?
   1) a hormone
   2) starch
   3) nitrogen
   4) carbon dioxide

3. A biological process that occurs in both plants and animals is shown below.

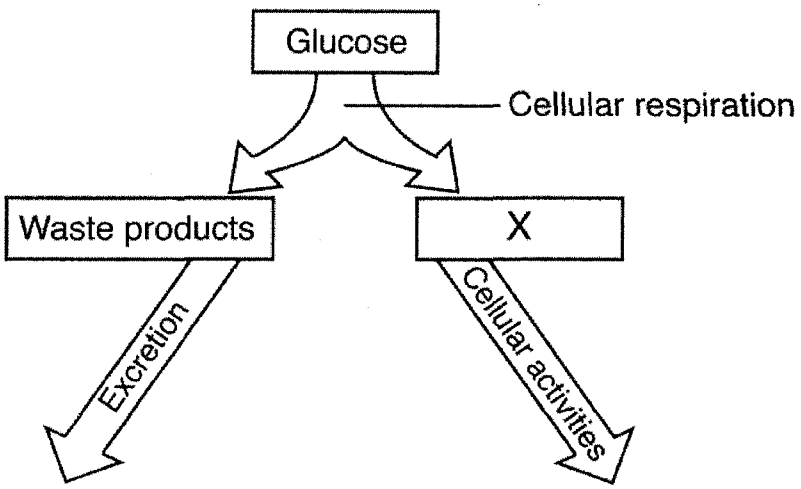


Which row in the chart below identifies the lettered substances in this process?

Row	A	B	C	D
(1)	O_2	CO_2	glucose	enzymes
(2)	glucose	O_2	enzymes	CO_2
(3)	enzymes	O_2	CO_2	glucose
(4)	glucose	CO_2	enzymes	O_2

1) 1 2) 2 3) 3 4) 4

4. The diagram below represents a biochemical process.

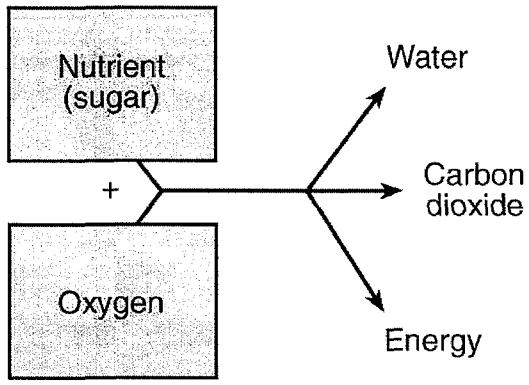


Which molecule is represented by *X*?

1) DNA 2) starch 3) protein 4) ATP

5. All life depends on the availability of usable energy. This energy is released when
   1) organisms convert solar energy into the chemical energy found in food molecules
   2) respiration occurs in the cells of producers and high-energy molecules enter the atmosphere
   3) cells carry out the process of respiration
   4) animal cells synthesize starch and carbon dioxide

6. Base your answer to the following question on the diagram below. The diagram illustrates a process by which energy is released in organisms.



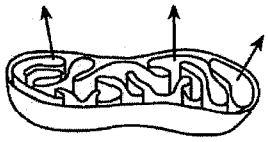
The energy released in this process was originally present in

1) sunlight and then transferred to sugar
2) sunlight and then transferred to oxygen
3) the oxygen and then transferred to sugar
4) the sugar and then transferred to oxygen

Respiration and Photosynthesis

7. Carbon dioxide containing carbon-14 is introduced into a balanced aquarium ecosystem. After several weeks, carbon-14 will most likely be present in
   1) the plants, only
   2) the animals, only
   3) both the plants and animals
   4) neither the plants nor animals

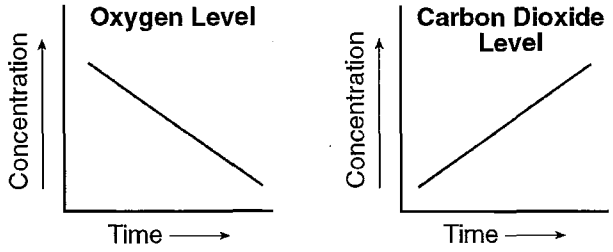
8. The diagram below represents a structure involved in cellular respiration.



Mitochondrion

The release of which substance is represented by the arrows?
   1) glucose
   2) oxygen
   3) carbon dioxide
   4) DNA

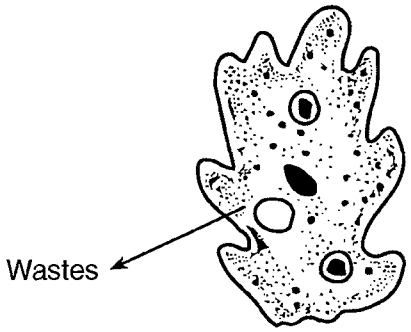
9. The graphs below show the changes in the relative concentrations of two gases in the air surrounding a group of mice.



Which process in the mice most likely accounts for the changes shown?
   1) active transport
   2) evaporation
   3) respiration
   4) photosynthesis

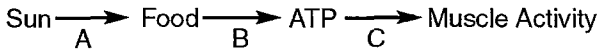
10. Which two organ systems provide materials required for the human body to produce ATP?
   1) reproductive and excretory
   2) digestive and respiratory
   3) respiratory and immune
   4) digestive and reproductive

11. A single-celled organism is represented in the diagram below. An activity is indicated by the arrow.



If this activity requires the use of energy, which substance would be the source of this energy?
   1) DNA
   2) ATP
   3) a hormone
   4) an antibody

12. The flow of energy through an ecosystem involves many energy transfers. The diagram below summarizes the transfer of energy that eventually powers muscle activity.



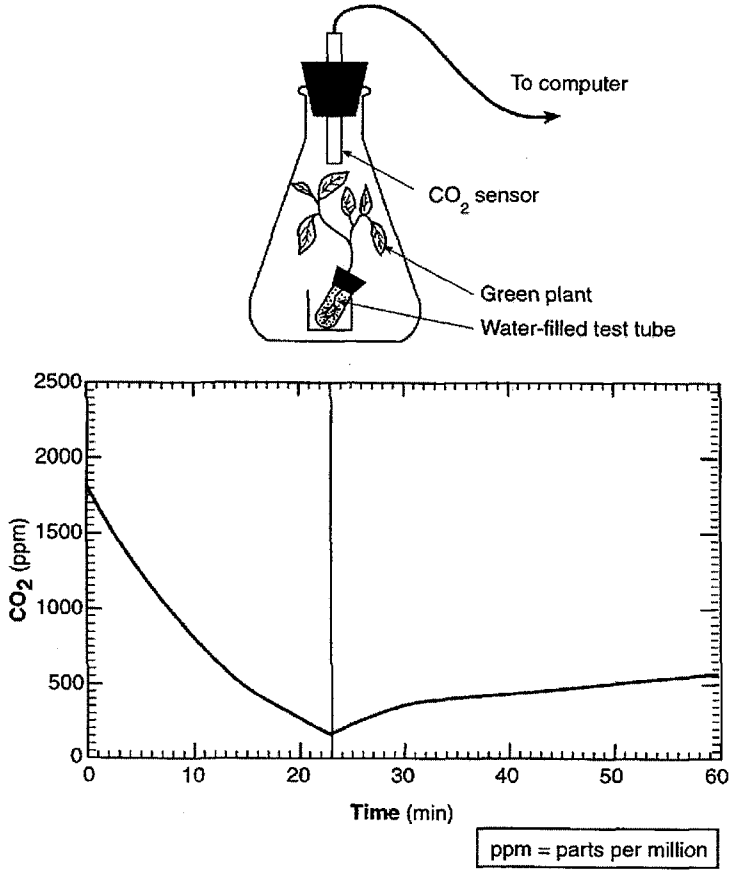
The process of cellular respiration is represented by
   1) arrow *A*, only
   2) arrow *B*, only
   3) arrow *C*, only
   4) arrows *A*, *B*, and *C*

Respiration and Photosynthesis

13. Base your answer to the following question on the information below and on your knowledge of biology.

A small green plant was placed in a flask as shown below. A sensor that measures the CO_2 content of the air in the flask was inserted, and then the flask was sealed with a rubber stopper. The other end of the sensor was connected to a computer to monitor and record CO_2 levels in the flask over a period of time.

For part of the time the flask was placed in bright light and for part of the time it was placed in total darkness. The graph below shows data that were recorded by the sensor over a period of time.

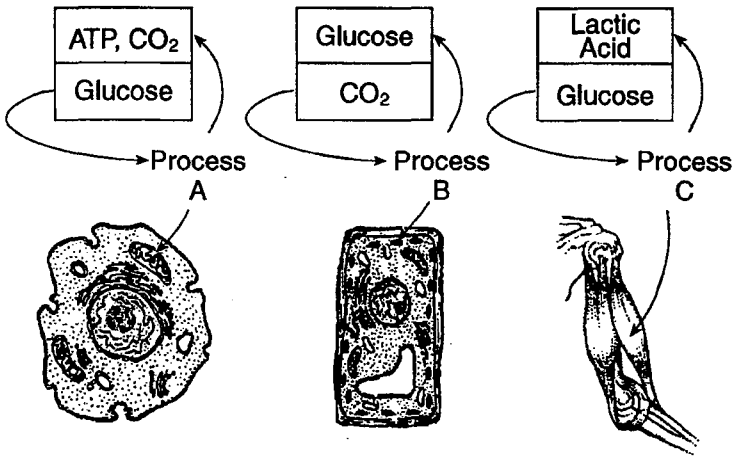


Which process most likely caused the change in CO_2 level in the flask over the last 37 minutes?

1) photosynthesis 2) respiration 3) active transport 4) circulation

Respiration and Photosynthesis

14. Base your answer to the following question on the diagrams below and on your knowledge of biology. The arrow below each lettered process indicates where the process takes place.



Process *A* is known as

1) photosynthesis 2) fermentation 3) dehydration synthesis 4) aerobic respiration

Base your answers to questions **15** and **16** on the equations shown below.

Equations

(*A*) glucose + 2 ATP $\xrightarrow{Y}$ 2 pyruvic acid + 4 ATP

(*B*) 2 pyruvic acid + oxygen $\xrightarrow{Y}$ carbon dioxide + water + 34 ATP

15. What is the combined net gain of ATP molecules at the completion of reactions *A* and *B*?

1) 36 2) 2 3) 34 4) 4

16. In animals, the reaction in equation *B* occurs in the

1) lysosomes 2) chloroplasts 3) mitochondria 4) ribosomes

17. Base your answer to the following question on the two stages of a metabolic process shown below.

Stage 1

$X + 2\ ATP \rightarrow 2$ pyruvic acid $+ 4\ ATP$

Stage 2

2 pyruvic acid + oxygen $\rightarrow$
carbon dioxide + water + 34 ATP

Which raw material, represented by letter *X*, is needed for the stage 1 reaction to occur?

1) chlorophyll
2) nitrogen
3) PGAL
4) $C_6H_{12}O_6$

18. Base your answer to the following question on the biochemical reactions below and on your knowledge of biology.

glucose + [A] $\xrightarrow{[B]}$ 4 ATP + 2 pyruvic acid

2 pyruvic acid + [C] $\xrightarrow{[B]}$ carbon dioxide + water + 34 ATP

Letter *B* represents

1) 4 ADP
2) enzymes
3) 2 PGAL
4) starch

Base your answers to questions **19** and **20** on the two processes represented below and on your knowledge of biology.

Processes

(A) glucose + oxygen $\xrightarrow{X}$ water + carbon dioxide + energy

(B) glucose $\xrightarrow{X}$ alcohol + carbon dioxide + energy

19. In both processes, the **X** represents

1) catalysts
2) hydrogen acceptors
3) monosaccharides
4) hormones

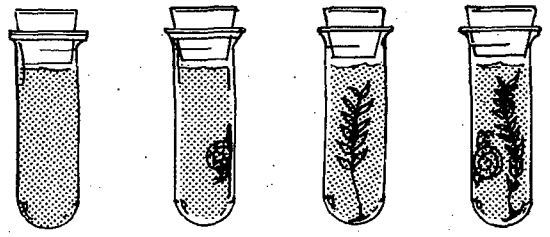
20. Before the glucose in each process can be changed into the final products, it must first be converted to

1) pyruvic acid
2) lactic acid
3) glycogen
4) lipids

Respiration and Photosynthesis

21. Base your answer to the following question on the information and diagrams below and on your knowledge of biology.

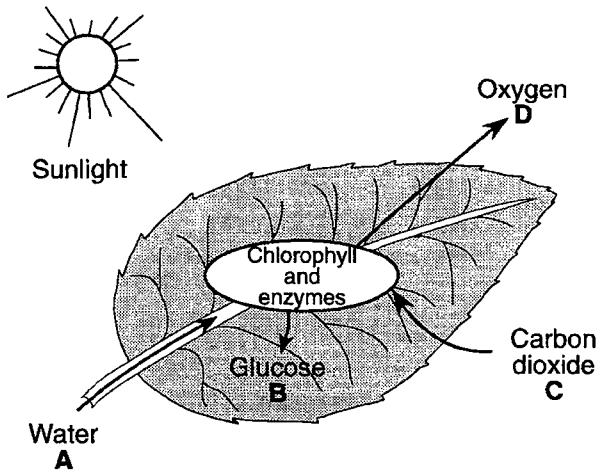
In an investigation of the cycling of environmental gases, a student placed water and bromthymol blue in each of four test tubes as shown in the diagrams below. No additional items were placed in tube 1, a snail was placed in tube 2, an aquatic plant (elodea) was placed in tube 3, and both a snail and an elodea were placed in tube 4. The tubes were then stoppered and placed in bright light for 24 hours.



The most probable explanation for a color change in tube 2 is that

1) water was released by the snail
2) oxygen was removed from the water
3) carbon dioxide was added to the water
4) the snail's body temperature increased

22. Base your answer to the following question on the diagram below and on your knowledge of biology. The diagram represents some processes occurring in the leaf of a plant.

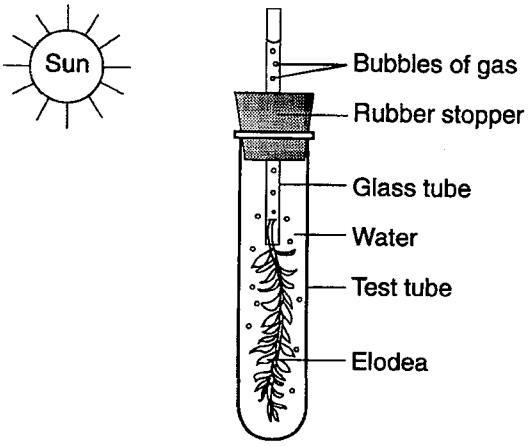


Which letters indicate substances needed by the leaf to carry out the process of aerobic cellular respiration?

1) *A* and *C*
2) *B* and *C*
3) *C* and *D*
4) *B* and *D*

Respiration and Photosynthesis

23. Base your answer to the question on the diagram below and on your knowledge of biology. The diagram shows an investigation performed over a period of 12 hours.



The gas released in this investigation can be used in cellular respiration to form an energy-storing compound known as

1) H_2O
2) CO_2
3) adenosine triphosphate
4) deoxyribonucleic acid

24. In what way are photosynthesis and cellular respiration similar?

1) They both occur in chloroplasts.
2) They both require sunlight.
3) They both involve organic and inorganic molecules.
4) They both require oxygen and carbon dioxide. inorganic produce

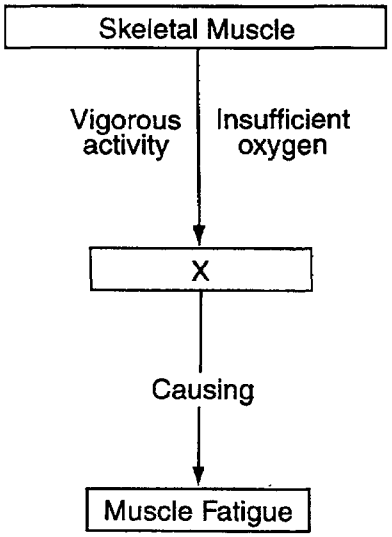
25. One type of anaerobic respiration results in the production of

1) water and oxygen
2) pyruvic acid and glycerol
3) nitrogen gas and ammonia
4) alcohol and carbon dioxide

26. Bacteria that can survive without oxygen are described as

1) aerobic
2) anaerobic
3) heterotrophic
4) saprophytic

27. The diagram below shows a sequence of events that often occurs in human muscle cells.



The substance represented by letter *X* is most likely

1) hemoglobin
2) glycogen
3) ethyl alcohol
4) lactic acid

Base your answers to questions **28** and **29** on the chemical reactions below. Select the chemical reaction, from the list below, that is most closely associated with that statement.

Chemical Reactions:

(1) 2 pyruvic acid $\rightarrow$ 2 ethyl alcohol + $2CO_2$

(2) 2 pyruvic acid $\rightarrow$ 2 lactic acid

(3) 2 pyruvic acid + $6O_2 \rightarrow$ $6H_2O + 6CO_2 + 34$ ATP

28. This reaction occurs in humans when muscle cells do not receive an adequate supply of oxygen.

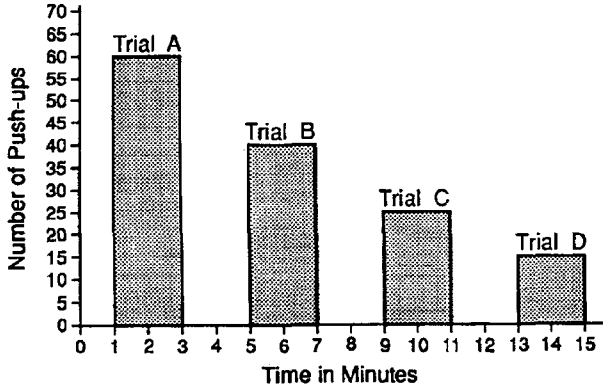
1) 1
2) 2
3) 3
4) 4

29. This reaction is used in the brewing industry.

1) 1
2) 2
3) 3
4) 4

Respiration and Photosynthesis

30. The graph below shows the number of push-ups a student completed in each of four 2-minute trials (*A-D*) during a 15-minute exercise period.



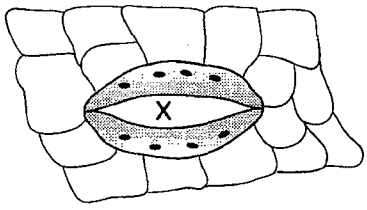
The concentration of lactic acid in the student's muscle tissue was most likely greatest during trial

1) *A*
2) *B*
3) *C*
4) *D*

31. The exchange of oxygen and carbon dioxide between internal leaf cells and the external environment will occur most efficiently if

1) the surfaces of these cells are dry and the stomates are closed
2) these cells are dry and the stomates are open
3) the surfaces of these cells are moist and the stomates are open
4) these cells are moist and the stomates are closed

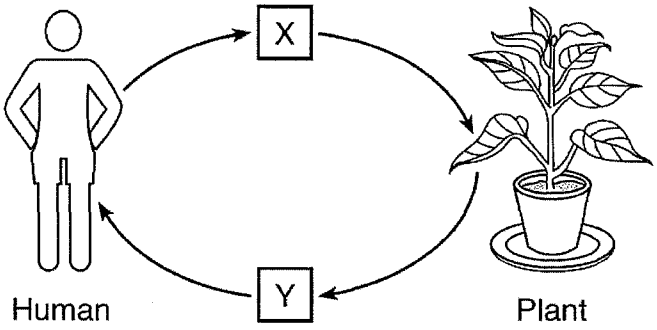
32. The diagram below shows a microscopic view of the lower epidermis of a maple leaf.



The area indicated by letter *X* is known as

1) a stomate
2) a lenticel
3) xylem tissue
4) phloem tissue

33. The diagram below represents a cycling of materials.



Which row in the chart below shows the substances represented by *X* and *Y*?

Row	X	Y
(1)	oxygen	carbon dioxide
(2)	glucose	oxygen
(3)	carbon dioxide	oxygen
(4)	amino acids	carbon dioxide

1) 1
2) 2
3) 3
4) 4

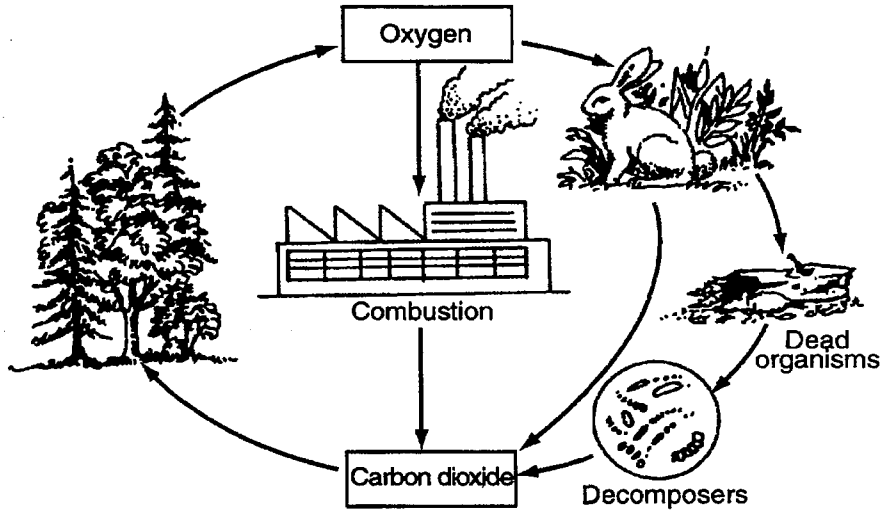
34. Carbon dioxide makes up less than 1 percent of Earth's atmosphere, and oxygen makes up about 20 percent. These percentages are maintained most directly by

1) respiration and photosynthesis
2) the ozone shield
3) synthesis and digestion
4) energy recycling in ecosystems

Respiration and Photosynthesis

35. Millions of acres of tropical rain forest are being destroyed each year. Which change would most likely occur over time if the burning and clearing of these forests were stopped?
    1) an increase in the amount of atmospheric pollution produced
    2) a decrease in the source of new medicines
    3) an increase in the amount of oxygen released into the atmosphere
    4) a decrease in the number of species

36. The diagram below shows some pathways in the cycling of materials in the environment.

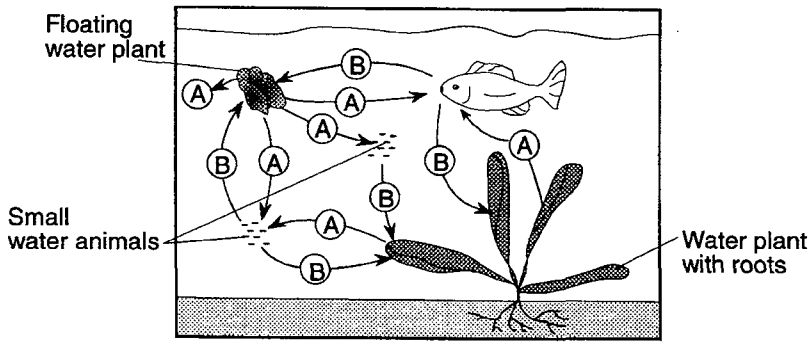


Which two processes are involved in the cycling shown in the diagram?

1) succession and transpiration
2) photosynthesis and cellular respiration
3) artificial selection and deamination
4) enzymatic hydrolysis and regeneration

Respiration and Photosynthesis

37. The diagram below shows an example of interdependence among aquatic organisms. During the day, the organisms either use or give off substance *A* or *B*, as shown by the arrows.



Which substances are represented by *A* and *B*?

1) *A* represents oxygen and *B* represents carbon dioxide.
2) *A* represents oxygen and *B* represents carbohydrates.
3) *A* represents nitrogen and *B* represents carbon dioxide.
4) *A* represents carbon dioxide and *B* represents oxygen.

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38. Which element is *not* recycled throughout an ecosystem by the processes of photosynthesis and respiration?

1) carbon
2) hydrogen
3) nitrogen
4) oxygen

39. Describe the cycling of carbon in an ecosystem. In your answer be sure to:

- identify the inorganic carbon compound that is obtained by plants from the environment
- identify the process plants use to form more complex organic molecules from this carbon compound
- describe how herbivores use these complex organic molecules
- identify the process herbivores use to return carbon to the environment

40. Base your answer to the following question on the information below and on your knowledge of biology.

Carbon, like many other elements, is maintained in ecosystems through a natural cycle. Human activities have been disrupting the carbon cycle.

Identify *one* process involved in recycling carbon dioxide within ecosystems.

41. A marathon runner frequently experiences muscle cramps while running. If he stops running and rests, the cramps eventually go away. The cramping in the muscles most likely results from
    1) lack of adequate oxygen supply to the muscle
    2) the runner running too slowly
    3) the runner warming up before running
    4) increased glucose production in the muscle

Respiration and Photosynthesis

42. Base your answer to the following question on —the information below and on your knowledge of biology.

The Control of Transpiration

Plants normally lose water from openings (stomates) in their leaves. The water loss typically occurs during daylight hours when plants are exposed to the Sun. This water loss, known as transpiration, is both beneficial and harmful to plants.

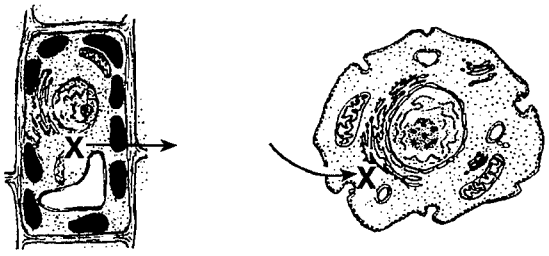
Scientists believe wind and high temperatures increase the rate of transpiration, but the size of each stomate opening can be regulated. Reducing the size of the openings during drought conditions may help reduce the dehydration and wilting that would otherwise occur.

A leaf may lose more than its own weight in water each day. Transpiration also lowers the internal temperature of the leaf as water evaporates. On hot days, temperatures in the leaves may be from 3° to 15°C cooler than the outside air. With stomates open, vital gases may be exchanged between the leaf tissues and the outside environment.

Researchers have also found many plants that use another response when leaf temperatures rise. Special molecules known as heat shock proteins are produced by plant cells and help to hold enzymes in their functional shapes.

Identify *two* of the "vital gases" that are exchanged between leaf tissues and the outside environment.

Base your answers to questions **43** and **44** on the two different cells shown below. Only cell *A* produces substance *X*. Both cells *A* and *B* use substance *X*.

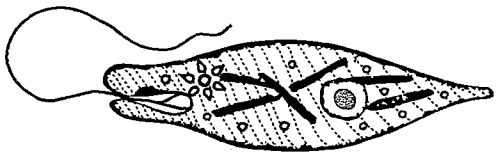


Cell A Cell B

43. Identify the type of organelle found in both cell *A* and cell *B* that uses substance *X*.

44. Identify the type of organelle in cell *A* that produces substance *X*.

45. Base your answer to the following question on the information and the diagram below which represents a single-celled organism known as *Euglena.*



This organism is able to carry out both photosynthesis and cellular respiration. Choose *one* of these processes and write the name of the process you chose below.

Using words or chemical symbols, summarize the reaction involved in the process you chose.