

## Cell Processes and Energy • Section Summary

# Photosynthesis

## Key Concepts

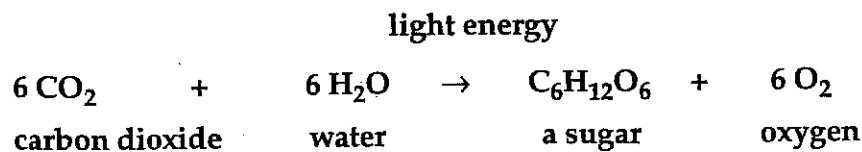
- How does the sun supply living things with the energy they need?
- What happens during the process of photosynthesis?

The sun is the source of energy for most living things. All cells need energy to carry out their functions. The process by which a cell captures the energy in sunlight and uses it to make food is called **photosynthesis**.

Nearly all living things obtain energy either directly or indirectly from the energy of sunlight captured during photosynthesis. Plants, such as grass, use energy from the sun to make their own food through the process of photosynthesis. An organism that makes its own food is called an **autotroph**. An organism that cannot make its own food is called a **heterotroph**. Many heterotrophs obtain food by eating other organisms.

Photosynthesis is a complex process. During photosynthesis, plants and some other organisms use energy from the sun to convert carbon dioxide and water into oxygen and sugars. Photosynthesis takes place in two stages: (1) capturing the sun's energy and (2) producing sugars. In plants, this energy-capturing process occurs mostly in the leaves. The chloroplasts in plant cells give plants their green color. The green color comes from **pigments**, colored chemical compounds that absorb light. The main photosynthetic pigment in chloroplasts is **chlorophyll**. Chlorophyll captures light energy and uses it to power the second stage of photosynthesis to produce sugars. The cell needs two raw materials for this stage: water ( $H_2O$ ) and carbon dioxide ( $CO_2$ ). Plant roots absorb water from the soil, and the water then moves up to the leaves. Carbon dioxide enters the plant through small openings on the undersides of the leaves called **stomata**. Once in the leaves, the water and carbon dioxide move into the chloroplasts.

Inside the chloroplasts, the water and carbon dioxide undergo a complex series of chemical reactions and produce two important products of photosynthesis: sugar and oxygen. Plant cells use sugar for food and to make other compounds, such as cellulose. Plant cells also store sugar for later use. Oxygen exits the leaf through the stomata. Almost all of the oxygen in Earth's atmosphere was produced by living things through photosynthesis. The events of photosynthesis can be summed up by the following chemical equation:

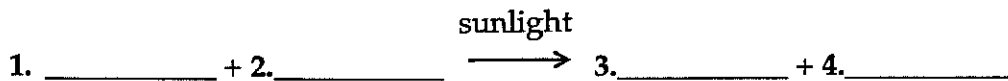


**Cell Processes and Energy** ▪ *Review and Reinforce*

# Photosynthesis

## Understanding Main Ideas

Fill in the blanks in the photosynthesis equation below with the names of the missing compounds. Then answer the questions that follow in the spaces provided.



5. What are the raw materials of photosynthesis?

\_\_\_\_\_

6. What are the products of photosynthesis?

\_\_\_\_\_

7. Why is *sunlight* written above the arrow in the equation, rather than on either side of it?

\_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

8. Where does photosynthesis occur?

\_\_\_\_\_  
 \_\_\_\_\_

## Building Vocabulary

Fill in the blank to complete each statement.

9. The process by which a cell captures the energy in sunlight and uses it to make food is called \_\_\_\_\_.

10. \_\_\_\_\_ are colored chemical compounds that absorb light.

11. The main pigment found in the chloroplasts of plants is \_\_\_\_\_.

12. \_\_\_\_\_ are small openings on the undersides of leaves through which carbon dioxide enters a plant.

13. An organism that makes its own food is a(n) \_\_\_\_\_.

14. A(n) \_\_\_\_\_ is an organism that cannot make its own food.

Cell Processes and Energy

## Cell Processes and Energy • Section Summary

## Respiration

### Key Concepts

- What events occur during respiration?
- What is fermentation?

Cells store and use energy in a way that is similar to the way you deposit and withdraw money from a savings account. When you eat a meal, you add to your body's energy savings account. When your cells need energy, they make a withdrawal by breaking down the carbohydrates in food to release energy.

The process by which cells obtain energy from glucose (a type of sugar) is called **respiration**. **During respiration, cells break down simple food molecules such as sugar and release the energy they contain.** Because living things need a continuous supply of energy, the cells of all living things carry out respiration continuously. The term *respiration* also is used to mean breathing, that is, moving air in and out of your lungs. To avoid confusion, the respiration process that takes place inside cells sometimes is called cellular respiration. The two kinds of respiration are related. Breathing brings oxygen into your lungs, and oxygen is necessary for cellular respiration to occur in most cells.

Like photosynthesis, respiration is a two-stage process. The first stage takes place in the cytoplasm of the organism's cells. There, glucose molecules are broken down into smaller molecules. Oxygen is not involved in this stage of respiration, and only a small amount of energy is released. The second stage of respiration takes place in the mitochondria. There, the small molecules are broken down into even smaller molecules. These chemical reactions require oxygen, and a great deal of energy is released. Two other products of respiration are carbon dioxide and water.

Photosynthesis and respiration can be thought of as opposite processes. Together, these two processes form a cycle that keeps the levels of oxygen and carbon dioxide fairly constant in the atmosphere.

Some cells obtain their energy through **fermentation**, an energy-releasing process that does not require oxygen. **Fermentation provides energy for cells without using oxygen.** One type of fermentation occurs in yeast and some other single-celled organisms. This process is sometimes called alcoholic fermentation because alcohol is one of the products made when these organisms break down sugars. Another type of fermentation takes place at times in your body when your muscles run out of oxygen—for example, when you've run as fast as you could for as long as you could. One product of this type of fermentation is an acid known as lactic acid. When lactic acid builds up, your muscles feel weak and sore.

## Cell Processes and Energy ▪ Review and Reinforce

**Respiration****Understanding Main Ideas**

Fill in the blanks in the table below. Then answer the questions that follow in the spaces provided.

**Respiration**

Raw Materials	Products
1.	3.
2.	4.
	5.

6. Where in the cell does the first stage of respiration take place?

\_\_\_\_\_

7. Where in the cell does the second stage of respiration take place?

\_\_\_\_\_

8. How does fermentation differ from respiration?

\_\_\_\_\_

\_\_\_\_\_

9. Which type of fermentation occurs in yeast?

\_\_\_\_\_

10. Which type of fermentation sometimes occurs in human muscle cells?

\_\_\_\_\_

**Building Vocabulary**

If the statement is true, write true. If it is false, change the underlined word to make it true.

\_\_\_\_\_ 11. The process by which cells "withdraw" energy from glucose is called photosynthesis.

\_\_\_\_\_ 12. Respiration provides energy for cells without using oxygen.