

## SECTION 2-4

## SECTION SUMMARY

## Respiration

**Guide for Reading**

- ◆ What events occur during respiration?
- ◆ How are photosynthesis and respiration related?
- ◆ 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 and break down the glucose in food to release energy.

The process by which cells "withdraw" energy from glucose is called **respiration**. **During respiration, cells break down simple food molecules such as glucose 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.

The overall process of respiration can be summarized in a simple chemical equation. However, respiration is a complex, 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, 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.