

CHAPTER 5 The Cell in Action

SECTION

1

Cell Energy

BEFORE YOU READ

After you read this section, you should be able to answer these questions:

- How does a plant make food?
- How do plant cells differ from animal cells?
- How do plant and animal cells get energy from food?



California Science Standards

7.1.b, 7.1.d

How Does a Plant Make Its Own Food?

The sun is the major source of energy for Earth. Plants use carbon dioxide, water, and the sun's energy to make food in a process called **photosynthesis**. The food that plants make gives them energy. Animals get the energy stored in plants when they eat them.

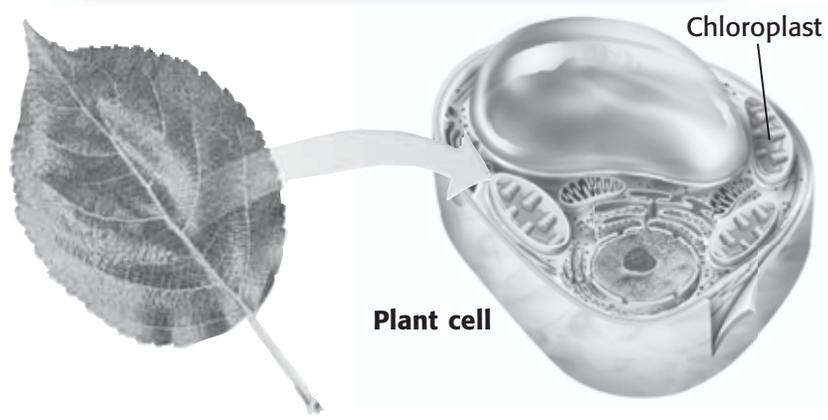
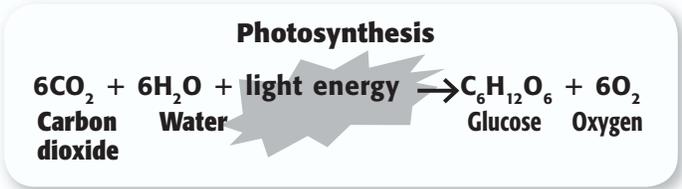
Plant cells have molecules called *pigments* that absorb light energy. Chlorophyll is the main pigment used in photosynthesis. It is found in *chloroplasts*, where photosynthesis takes place. The food plants make is in the form of a simple sugar called *glucose*. Photosynthesis also produces oxygen. ✓

STUDY TIP

Compare As you read this section, make a Venn Diagram to compare cellular respiration and fermentation.

READING CHECK

1. Complete Photosynthesis takes place in _____.



TAKE A LOOK

2. Identify What two things are made during photosynthesis?

SECTION 1 Cell Energy *continued*

CALIFORNIA STANDARDS CHECK

7.1.d Students know that mitochondria **liberate** energy for the work that cells do and that chloroplasts capture sunlight energy for photosynthesis.

Word Help: **liberate** to release; to set free

3. Explain Why do animal cells have mitochondria but no chloroplasts?

How Do Organisms Get Energy from Food?

Animals cannot make their own food as plants can. However, both plant and animal cells must break down food to get energy from it. There are two ways cells get energy: cellular respiration and fermentation.

Cellular respiration uses oxygen to break down food. **Fermentation** does not use oxygen to break down food. Cellular respiration releases more energy from food than fermentation. Most eukaryotes, such as plants and animals, use cellular respiration to free the energy stored in food.

What Happens in Cellular Respiration?

When you hear the word *respiration*, you might think of breathing. However, cellular respiration is different from breathing. Cellular respiration is a chemical process that happens in cells. In eukaryotic cells, such as plant and animal cells, cellular respiration takes place in *mitochondria*.

Recall that to get energy, plants make their food and animals eat food. Most organisms store the energy as glucose. To use this energy, cells must break down glucose. In cellular respiration, glucose is broken down into carbon dioxide and water. Energy is also released. This energy is in the form of a molecule called *ATP* (adenosine triphosphate). The figure below shows how energy is released when a cow eats grass.

TAKE A LOOK

4. Identify What two things are needed for cellular respiration?

5. List What three things are made during cellular respiration?

Cellular respiration

$$\text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2 \rightarrow 6\text{CO}_2 + 6\text{H}_2\text{O} + \text{energy (ATP)}$$

Glucose Oxygen Carbon dioxide Water

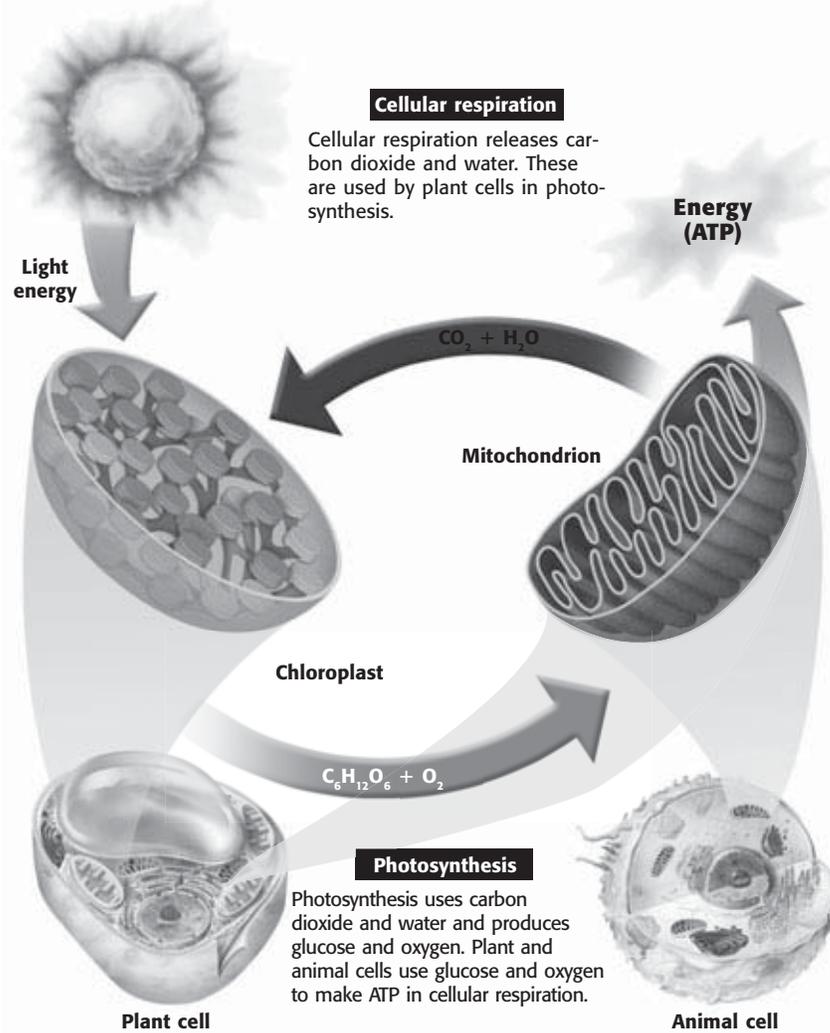
Mitochondrion

Animal cell

The mitochondria in the cells of this cow will use cellular respiration to release energy stored in the grass.

SECTION 1 Cell Energy *continued*

The Connection Between Photosynthesis and Cellular Respiration



Critical Thinking

6. Apply Concepts What would happen if oxygen was not produced during photosynthesis?

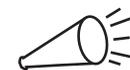
TAKE A LOOK

7. Complete Plant and animal cells use glucose and oxygen to make _____.

How Is Fermentation Different from Cellular Respiration?

In fermentation, cells break down glucose without oxygen. Some bacteria and fungi rely only on fermentation to release energy from food. However, cells in other organisms may use fermentation when there is not enough oxygen for cellular respiration.

When you exercise, your muscles use up oxygen very quickly. When cells don't have enough oxygen, they must use fermentation to get energy. Fermentation creates a byproduct called *lactic acid*. This is what makes your muscles ache as they tire.

 **Say It**

Research Use the school library or the internet to research an organism that uses fermentation. What kind of organism is it? Where is it found? Is this organism useful to humans? Present your findings to the class.

Section 1 Review

7.1.b, 7.1.d 

SECTION VOCABULARY

<p>cellular respiration the process by which cells use oxygen to produce energy from food</p> <p>fermentation the breakdown of food without the use of oxygen</p>	<p>photosynthesis the process by which plants, algae, and some bacteria use sunlight, carbon dioxide, and water to make food.</p> <p><u>Wordwise</u> The root <i>phot-</i> means "light."</p>
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1. **Identify** What kind of cells have chloroplasts?

2. **Explain** How do plant cells make food?

3. **Explain** Why do plant cells need both chloroplasts and mitochondria?

4. **Apply Concepts** How do the processes of photosynthesis and cellular respiration work together?

5. **Compare** What is one difference between cellular respiration and fermentation?

6. **Explain** Do your body cells always use cellular respiration to break down glucose? Explain your answer.
