

SECTION 1 **Photosynthesis**



BEFORE YOU READ

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

- How do plants make food?
- How do plants get energy from food?
- How do plants exchange gases with the environment?

STUDY TIP

Outline As you read, outline the steps of photosynthesis. Use the questions in the section titles to help you make your outline.

What Is Photosynthesis?

Many organisms, including humans, have to eat to get energy. Plants, however, are able to make their own food. Plants make their food by a process called **photosynthesis**. During photosynthesis, plants use carbon dioxide, water, and energy from sunlight to make sugars.

How Do Plants Use Sunlight for Photosynthesis?

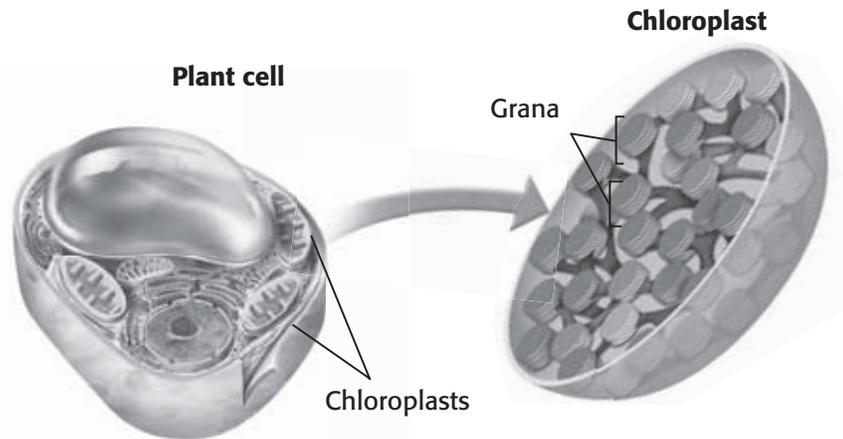
Plant cells have organelles called *chloroplasts*. Chloroplasts capture the energy from sunlight. Inside a chloroplast, membranes called *grana* contain chlorophyll. **Chlorophyll** is a green pigment that absorbs light energy. Many plants look green because chlorophyll reflects the green wavelengths of light. ✓

READING CHECK

1. **Define** What is chlorophyll?

TAKE A LOOK

2. **Identify** Where is chlorophyll found in a plant cell?



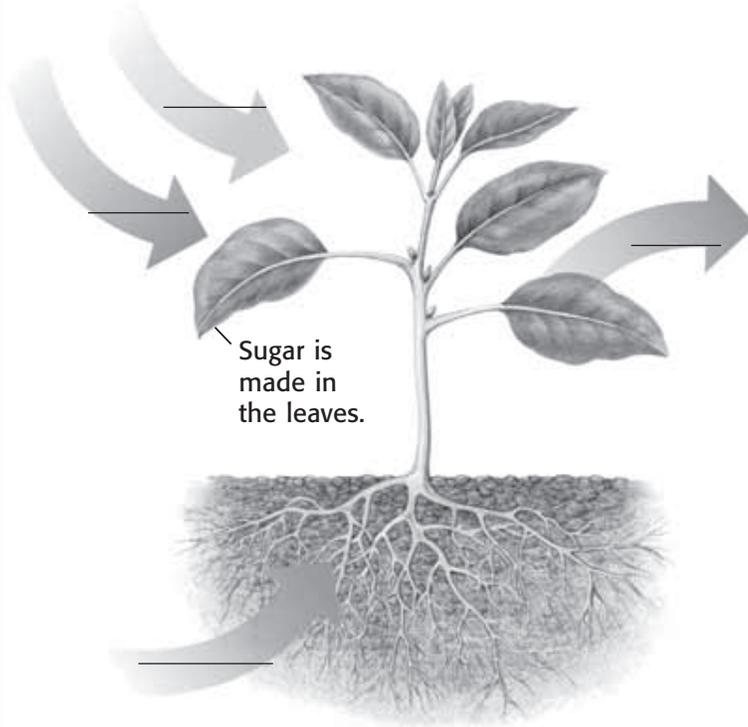
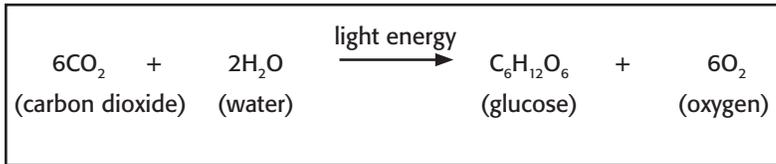
The grana in chloroplasts contain chlorophyll. Chlorophyll is a pigment that absorbs sunlight.

SECTION 1 Photosynthesis *continued*

How Do Plants Make Sugar?

During photosynthesis, plants take in water and carbon dioxide and absorb light energy. Plants use the light energy captured by chlorophyll to help form glucose molecules. *Glucose* is the sugar that plants use for food. In addition to producing sugar, plants give off oxygen during photosynthesis. ✓

The following chemical equation summarizes photosynthesis:



How Do Plants Get Energy from Sugar?

Glucose molecules store energy. To use this energy, a plant cell needs its mitochondria to break down the glucose. This process of breaking down food molecules to get energy is called **cellular respiration**. During cellular respiration, cells use oxygen to break down food molecules. Like all cells, plant cells then use the energy from food to do work.

READING CHECK

3. Identify What are two products of photosynthesis?

TAKE A LOOK

4. Label On the diagram, label the arrows to show what materials are entering and leaving the plant during photosynthesis.

	CALIFORNIA STANDARDS CHECK
<p>7.1.d Students know that mitochondria liberate energy for the work that cells do and that chloroplasts capture sunlight energy for photosynthesis.</p>	
<p>Word Help: liberate to release; to set free</p>	
<p>5. Identify Which cell structures release the energy stored in sugar?</p> <p>_____</p>	

SECTION 1 Photosynthesis *continued*

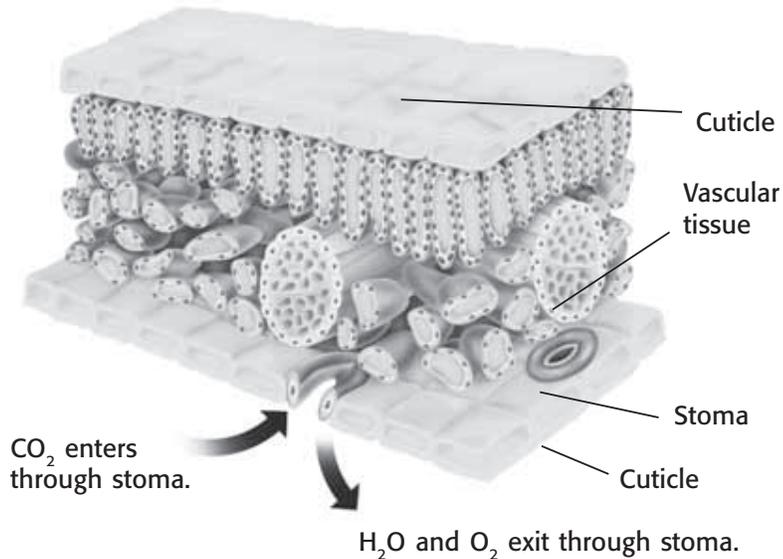
Critical Thinking

6. Predict What do you think would happen if a plant had no stomata?

How Does a Plant Take In the Gases It Needs?

Plants take in carbon dioxide and give off oxygen. These gases move into and out of the leaf through openings called **stomata** (singular, *stoma*). Stomata allow gases to move through the plant's *cuticle*, the waxy layer that prevents water loss. Each stoma is surrounded by two guard cells. The guard cells act like double doors by opening and closing a stoma.

Water vapor also moves out of the leaf through stomata. The loss of water from leaves is called **transpiration**. Stomata open to allow carbon dioxide to enter a leaf but can close to prevent too much water loss.



TAKE A LOOK

7. Identify Circle the guard cells in this picture. What is their function?

Say It

Describe Think of all the ways in which photosynthesis is important to you. Describe to the class three ways you depend on photosynthesis.

READING CHECK

8. Complete During photosynthesis, plants store light energy as

Why Is Photosynthesis Important?

Plants and other photosynthetic organisms, such as bacteria and many protists, form the base of most food chains on Earth. During photosynthesis, plants store light energy as chemical energy. Animals get this energy when they eat plants. Other animals get energy from plants indirectly. They eat the animals that eat plants. Most organisms could not survive without photosynthetic organisms. ✓

Photosynthesis is also important because it produces oxygen. Recall that cellular respiration requires oxygen to break down food. Most organisms, including plants and animals, depend on cellular respiration to get energy from their food. Without the oxygen produced during photosynthesis, most organisms could not survive.

Section 1 Review

SECTION VOCABULARY

<p>cellular respiration the process by which cells use oxygen to produce energy from food</p> <p>chlorophyll a green pigment that captures light energy for photosynthesis</p> <p>photosynthesis the process by which plants, algae, and some bacteria use sunlight, carbon dioxide, and water to make food</p>	<p>stoma one of many openings in a leaf or a stem of a plant that enable gas exchange to occur (plural, stomata)</p> <p>transpiration the process by which plants release water vapor into the air through stomata; also the release of water vapor into the air by other organisms</p>
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1. Explain Why does chlorophyll look green?

2. Identify What is the role of mitochondria in plants? In what process do they take part?

3. Compare Complete the chart below to show the relationship between photosynthesis and cellular respiration.

Photosynthesis	Cellular respiration
	Cells break down food to provide energy.
Oxygen is produced.	

4. Identify What two structures in plant leaves help prevent the loss of water?

5. Explain Why are photosynthetic organisms, such as plants, so important to life on Earth?

SECTION 2 **Reproduction of Flowering Plants**



BEFORE YOU READ

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

- What are pollination and fertilization?
- How do seeds and fruits form?
- How can flowering plants reproduce asexually?

STUDY TIP

Summarize As you read, write out or draw the steps of pollination and fertilization.

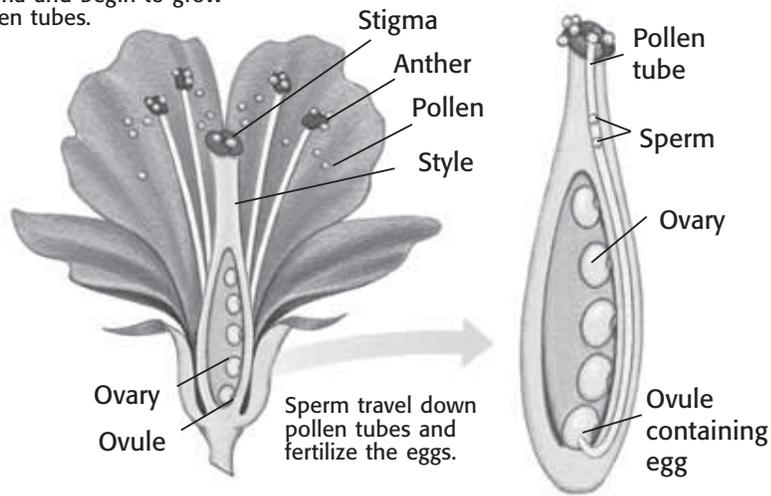
What Are Pollination and Fertilization?

Flowering plants are most obvious to us when they are in bloom. As flowers bloom, they surround us with bright colors and sweet fragrances. However, flowers are not just for us to enjoy. They are the structures for sexual reproduction in flowering plants. Pollination and fertilization take place in flowers.

TAKE A LOOK

- 1. Identify** Circle the part of the flower where pollination occurs.
- 2. Identify** Draw an arrow to show where fertilization will take place.

Pollen grains land on the stigma and begin to grow pollen tubes.



Sexual reproduction begins in flowers when wind or animals move pollen from one flower to another. *Pollination* occurs when pollen from an anther lands on a stigma. Each pollen grain grows a tube through the style to the ovary. The ovary has ovules, each of which contains an egg. *Fertilization* occurs when a sperm joins with the egg inside an ovule.

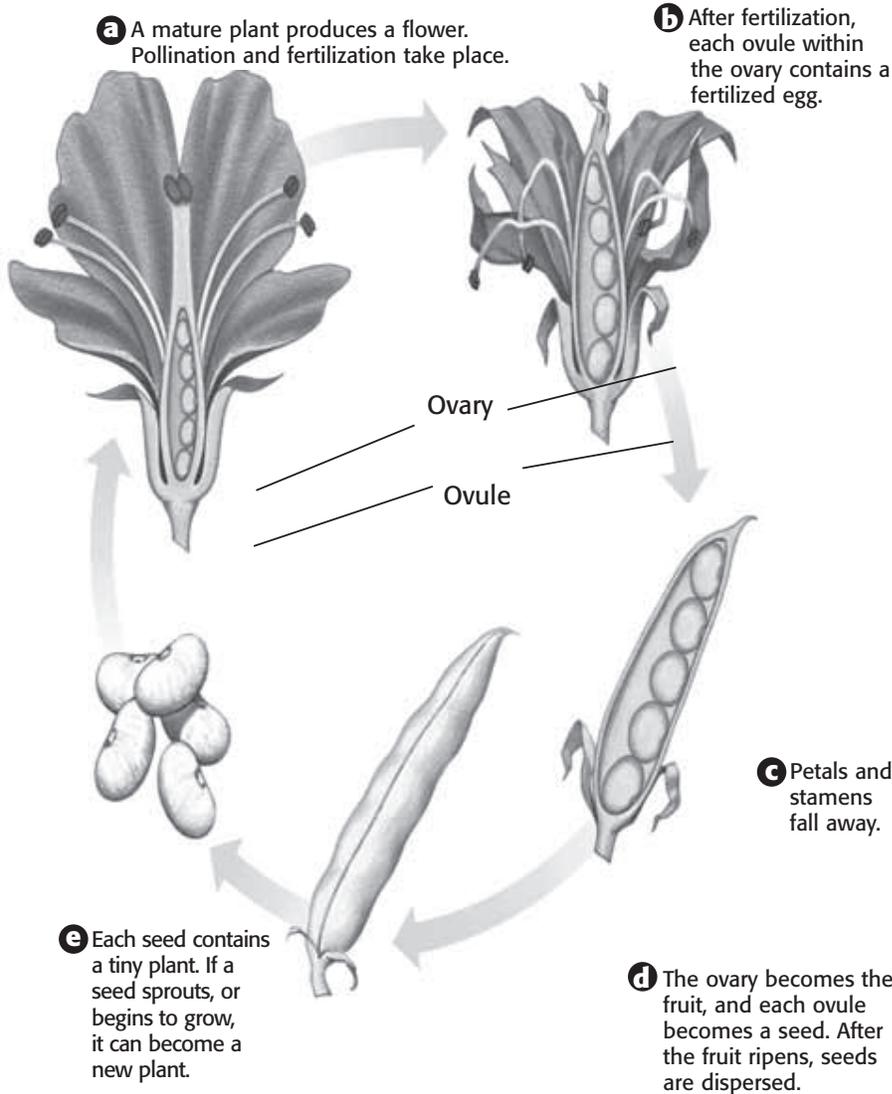
CALIFORNIA STANDARDS CHECK

7.2.a Students know the difference between the life cycles and reproduction methods of sexual and asexual organisms.

3. Explain Is fertilization a part of sexual reproduction or asexual reproduction? Explain.

SECTION 2 Reproduction of Flowering Plants *continued*

What Happens After Fertilization?



TAKE A LOOK

4. Identify In step C, circle the structures that will become seeds.



CALIFORNIA STANDARDS CHECK

7.5.e Students know the structures and processes by which flowering plants generate pollen, ovules, seeds, and fruit.

Word Help: processes a set of steps, events, or changes

5. Explain Where do seeds and fruits come from?

THE FUNCTIONS OF FRUITS

When people think of fruit, they often think of apples or bananas. However, many things we call vegetables, such as tomatoes or green beans, are also fruits! A fruit is the ovary of the flower that has grown larger.

Fruits have two major functions. They protect seeds while the seeds develop. Fruits also help a plant spread its seeds to new environments. For example, an animal might eat a fruit and drop the seeds away from the parent plant. Fruits such as burrs spread when they get caught in an animal's fur. Other fruits are carried to new places by the wind, or even by water. ✓



READING CHECK

6. List What are two functions of a fruit?

SECTION 2 Reproduction of Flowering Plants *continued*

How Do Seeds Grow into New Plants?

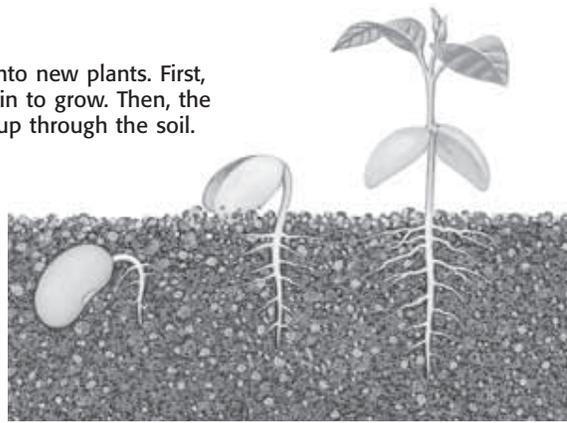
The new plant inside a seed, called the *embryo*, stops growing once the seed is fully developed. However, the seed might not sprout right away. To sprout, most seeds need water, air, and warm temperatures. A seed might become **dormant**, or inactive, if the conditions are not right for a new plant to grow. For example, if the environment were too cold or too dry, a young plant would not survive. ✓

READING CHECK

7. Explain Why would a seed become dormant?

Dormant seeds often survive for long periods of time during droughts or freezing weather. Some seeds actually need extreme conditions, such as cold winters or forest fires, to *germinate*, or sprout.

Seeds grow into new plants. First, the roots begin to grow. Then, the shoots grow up through the soil.



TAKE A LOOK

8. Identify Which part of a new plant grows first?

Critical Thinking

9. Infer When would asexual reproduction be important for the survival of a flowering plant?

How Else Can Flowering Plants Reproduce?

Flowering plants can also reproduce asexually, or without flowers. In asexual reproduction, sperm and eggs do not join. A new plant grows from a plant part such as a root or stem. These plant parts include plantlets, tubers, and runners.



Kalanchoe produces plantlets along the edges of its leaves. The plantlets will fall off and take root in the soil.



A potato is a tuber, or underground stem. The "eyes" of potatoes are buds that can grow into new plants.



The strawberry plant produces runners, or stems that grow along the ground. Buds along the runners take root and grow into new plants.

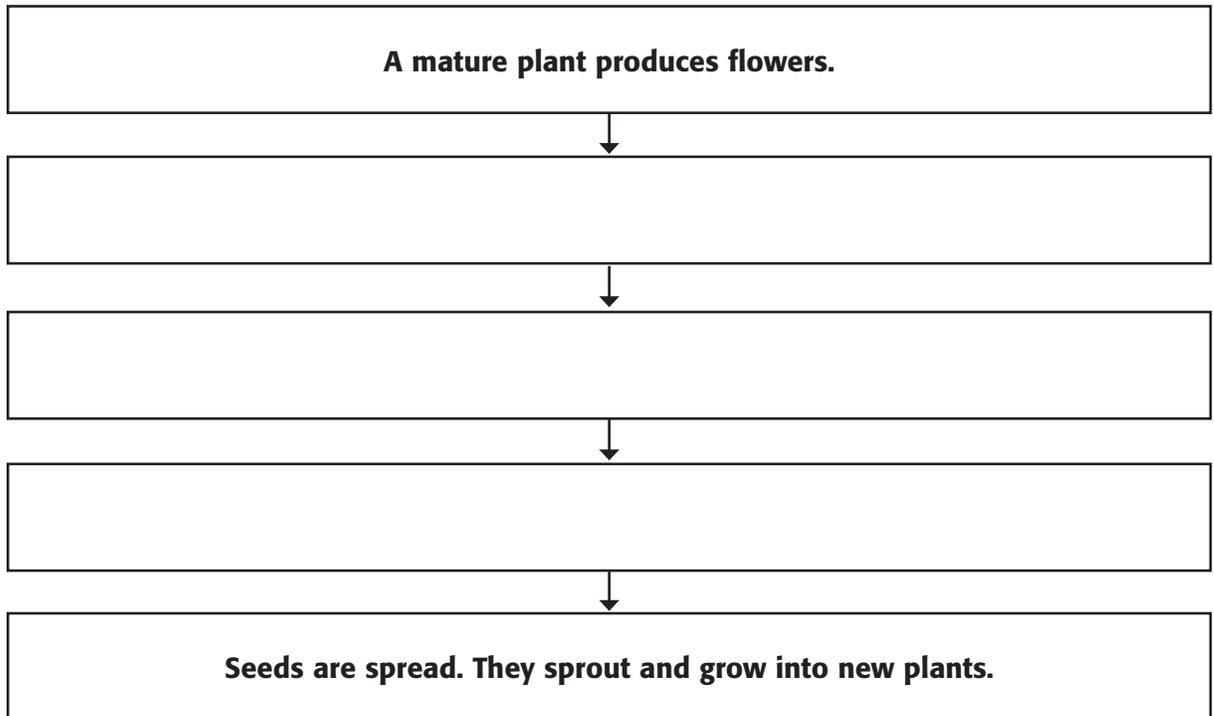
Section 2 Review

SECTION VOCABULARY

dormant describes the inactive state of a seed or other plant part when conditions are unfavorable to growth

1. Compare What is the difference between pollination and fertilization?

2. Summarize Complete the Process Chart below to summarize how sexual reproduction produces new plants.



3. Identify Name two environmental conditions that can cause a seed to become dormant.

4. List What are three structures a flowering plant can use to reproduce asexually?
