

Structures of Seed Plants

BEFORE YOU READ

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

- What are the functions of roots and stems?
- What is the function of leaves?
- What is the function of a flower?



California Science Standards

7.5.a, 7.5.f

What Are Seed Plants?

Remember that seed plants include trees, such as oaks and pine trees, as well as flowers, such as roses and dandelions. Seed plants are one of the two main groups of vascular plants.

What Structures Are Found in a Seed Plant?

Just like the human body, a plant has different organs that do jobs for the organism. Seed plants have roots, shoots, and reproductive structures. A plant's roots and shoots help the plant to get water and nutrients. Roots are often found underground. Shoots include stems and leaves. They are usually found above ground. ✓



The roots of plants absorb and store water and nutrients.

VASCULAR TISSUE

Like all vascular plants, seed plants have specialized tissues that move water and nutrients through the plant. There are two kinds of vascular tissue: xylem and phloem. **Xylem** moves water and minerals from the roots to the shoots. **Phloem** moves food molecules to all parts of the plant. The vascular tissues in the roots and shoots are connected.

STUDY TIP

List As you read this section, make a chart listing the structures of seed plants and their functions.

READING CHECK

1. Identify What are the three main parts of a seed plant?



CALIFORNIA STANDARDS CHECK

7.5.a Students know plants and animals have levels of organization for **structure** and function, including cells, tissues, organs, organ systems, and the whole organism.

Word Help: structure the way in which a whole is put together

2. Describe What are the functions of xylem and phloem?

SECTION 4 Structures of Seed Plants *continued*

Critical Thinking

3. Apply Concepts What do you think happens to water and minerals right after they are absorbed by roots?

TAKE A LOOK

4. Identify Where is the vascular tissue located in this root?

5. Apply Concepts How do you think food made in the leaves gets to the roots for storage?

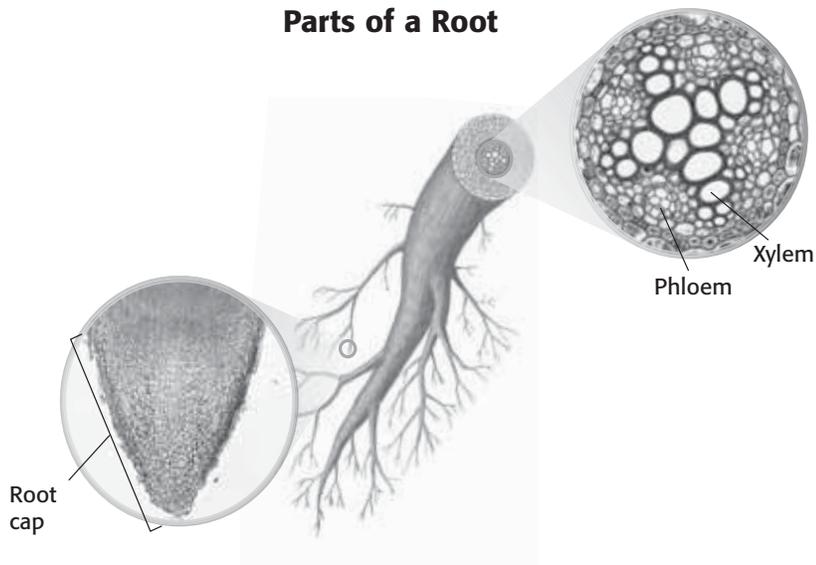
What Are Roots?

Roots are organs that have three main functions:

- to absorb water and nutrients from the soil
- to hold plants in the soil
- to store extra food made in the leaves

Roots have several structures that help them do these jobs. The *epidermis* is a layer of cells that covers the outside of the root, like skin. Some cells of the epidermis, called *root hairs*, stick out from the root. These hairs increase the root’s surface area. A larger surface area helps the root absorb more water and minerals. A *root cap* is a group of cells found at the tip of a root. The root cap protects the root as it grows down through the soil.

Parts of a Root



TYPES OF ROOT SYSTEMS

There are two kinds of root systems: taproot systems and fibrous root systems. A *taproot system* has one main root, or taproot, that grows downward. Many smaller roots branch from the taproot. Taproots can reach water deep underground. Carrots are plants that have taproot systems.

A *fibrous root system* has several roots that spread out from the base of a plant’s stem. The roots are usually the same size. Fibrous roots usually get water from close to the soil surface. Many grasses have fibrous root systems.

SECTION 4 Structures of Seed Plants *continued*

What Are Stems?

A stem is an organ that connects a plant’s roots to its leaves and reproductive structures. A stem does the following jobs:

- Stems support the plant body. Leaves are arranged along stems so that each leaf can get sunlight.
- Stems hold up reproductive structures such as flowers. This helps bees and other pollinators find the flowers.
- Stems carry materials between the root system and the leaves and reproductive structures. Xylem carries water and minerals from the roots to the rest of the plant. Phloem carries the food made in the leaves to roots and other parts of the plant.
- Some stems store materials. For example, the stems of cactuses can store water.

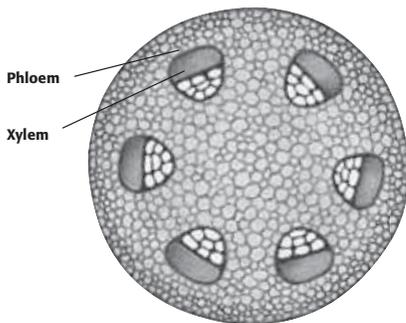
READING CHECK

6. Define What is a stem?

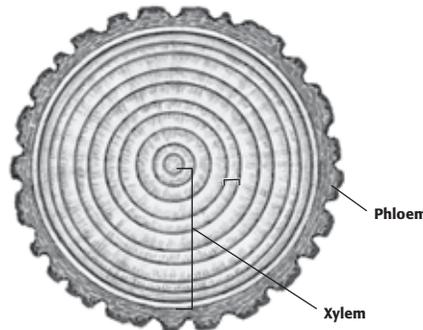
TYPES OF PLANT STEMS

There are two different types of stems: herbaceous and woody. *Herbaceous* stems are soft and flexible. Flowers, such as daisies and clover, have herbaceous stems. Many crops, such as tomatoes, corn, and beans, also have herbaceous stems.

Other plants have woody stems. *Woody* stems are stiff and are often covered by bark. Trees and shrubs have woody stems. The trunk of a tree is actually its stem!



Herbaceous stems are thin and flexible.



Woody stems are usually thick and stiff.

TAKE A LOOK

7. Compare How are these stems similar?

8. Compare How are these stems different?

SECTION 4 Structures of Seed Plants *continued*

What Are Leaves?

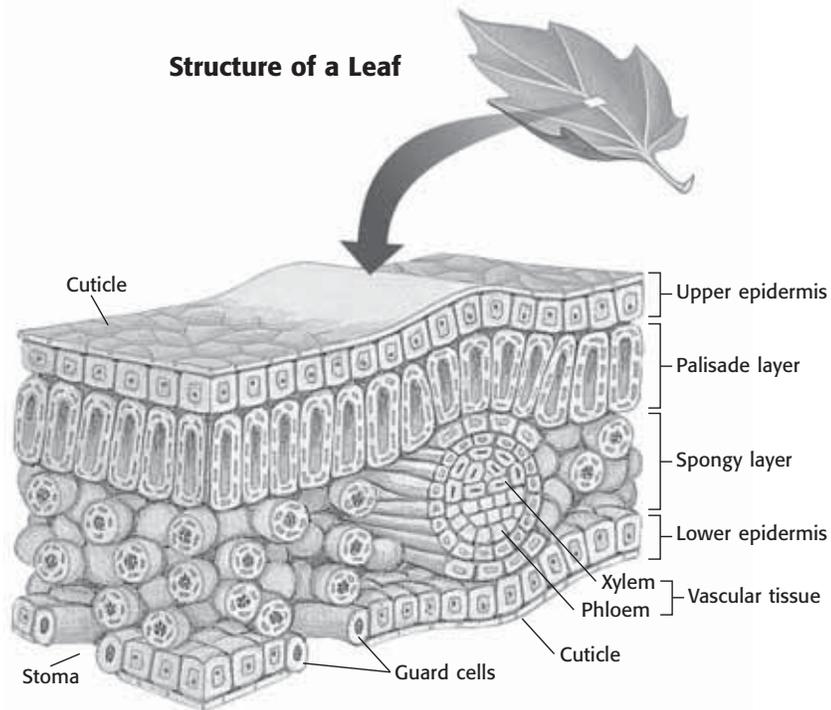
Leaves are organs, too. Photosynthesis happens in leaves. Leaves absorb carbon dioxide from the air. Chloroplasts in leaf cells capture energy from sunlight. The leaves use the energy, carbon dioxide, and water to make food. ✓

All leaf structures are related to the leaf's main job, photosynthesis. A *cuticle* covers the surfaces of the leaf. It prevents the leaf from losing water. The *epidermis* is a single layer of cells beneath the cuticle. Tiny openings in the epidermis, called *stomata* (singular, *stoma*), let carbon dioxide enter the leaf. *Guard cells* open and close the stomata.

READING CHECK

9. Identify What is the main function of a leaf?

Structure of a Leaf



TAKE A LOOK

10. Explain Is this plant vascular or nonvascular? Explain your answer.

Most photosynthesis takes place in the two layers in the middle of the leaf. The upper layer, called the *palisade layer*, contains many chloroplasts. Sunlight is captured in this layer. The lower layer, called the *spongy layer*, has spaces between the cells, where carbon dioxide can move. The spongy layer also has the vascular tissues that bring water to the leaves and move food away.

READING CHECK

11. Identify For what group of plants are flowers the reproductive structures?

What Are Flowers?

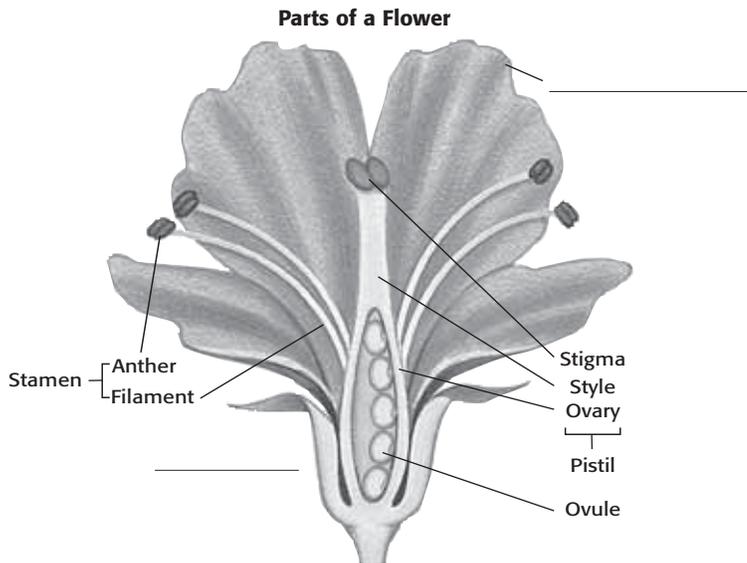
All plants have reproductive structures. In angiosperms, or flowering plants, flowers are the reproductive structures. Flowers produce eggs and sperm for sexual reproduction. ✓

SECTION 4 Structures of Seed Plants *continued*

PARTS OF A FLOWER

Flowers may have the following basic parts: sepals, petals, stamens, and one or more pistils. These parts are often arranged in rings, one inside the other. However, not all flowers have every part.

Different species of flowering plants can have different flower types. Flowers with all four parts are called *perfect flowers*. Flowers that have stamens but no pistils are male. Flowers that have pistils but no stamens are female.



TAKE A LOOK

12. Label As you read, fill in the missing labels on the diagram.

13. Identify What two parts make up the stamen ?

14. Identify What three parts make up the pistil?

SEPALS

Sepals are leaves that make up the outer ring of flower parts. They are often green like leaves, but they may have other colors. Sepals protect and cover the flower while it is still a bud. When the flower begins to open, the sepals fold back, so the petals can be seen.

PETALS

Petals are leaflike parts of a flower. They make up the next ring inside of the sepals. Petals are sometimes brightly colored, like the petals of poppy flowers or roses. This color helps attract insects and other animals. Many plants need these animals to help spread their pollen.

STAMENS

A **stamen** is the male reproductive structure of a flower. Structures on the stamen called *anthers* produce pollen. Pollen contains the male gametophyte, which produces sperm. The anther rests on a thin stalk called a *filament*. ✓

READING CHECK

15. Identify What is the male reproductive structure of a flower?

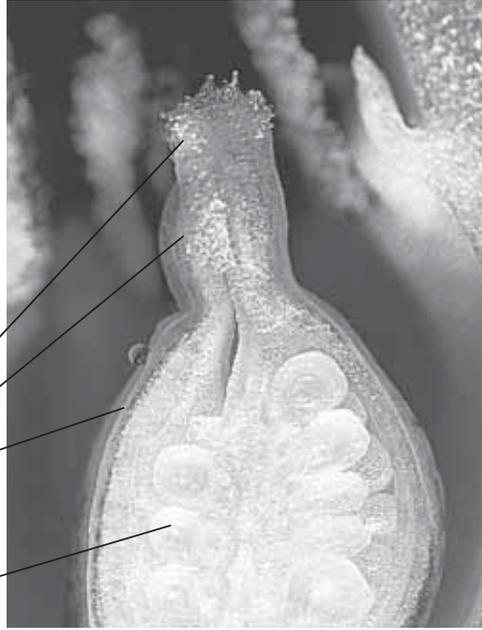
SECTION 4 Structures of Seed Plants *continued*

PISTILS

A **pistil** is the female reproductive structure. The tip of the pistil is called the *stigma*. The long, thin part of the pistil is called the *style*. The rounded base of the pistil is called the **ovary**. The ovary contains one or more ovules. Each **ovule** contains an egg. ✓

READING CHECK

16. Identify What is the female reproductive structure of a flower?



TAKE A LOOK

17. Label Label the female reproductive structures in this picture.

Pollen is brushed onto the style, and sperm from inside the pollen travel down the style to the ovary. A sperm can fertilize the egg of one ovule. After fertilization, an ovule develops into a seed. The ovary surrounding the ovule develops into a fruit.

IMPORTANCE OF FLOWERS

Flowers are important to plants because they help plants reproduce. They are also important to animals, such as insects and bats, that use parts of flowers for food. Humans also use flowers. Some flowers, such as broccoli and cauliflower, can be eaten. Others, like chamomile, are used to make tea. Flowers are also used in perfumes, lotions, and shampoos.

Say It

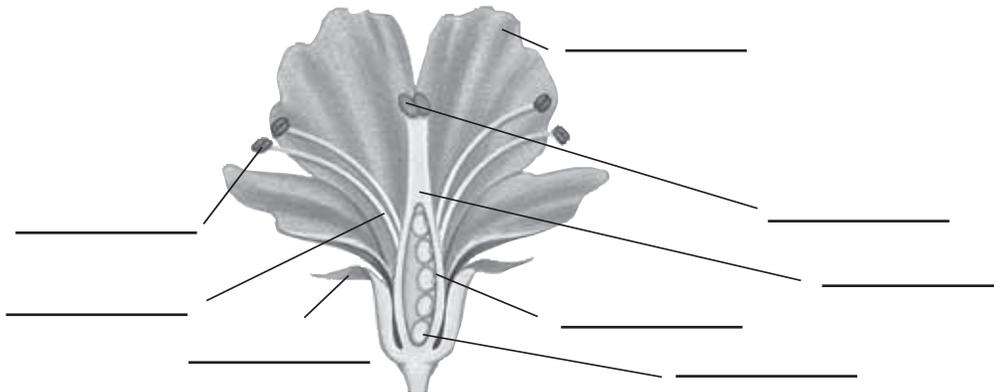
Discuss What is your favorite flower? Have you ever seen any unusual flowers in nature? In groups of two or three, discuss your experiences with flowers.

Section 4 Review

SECTION VOCABULARY

<p>ovary in flowering plants, the lower part of a pistil that produces eggs in ovules</p> <p>ovule a structure in the ovary of a seed plant that contains an embryo sac and that develops into a seed after fertilization</p> <p>petal one of the usually brightly colored leaf-shaped parts that make up one of the rings of a flower</p> <p>phloem the tissue that conducts food in vascular plants</p>	<p>pistil the female reproductive part of a flower that produces seeds and consists of an ovary, style, and stigma</p> <p>sepal in a flower, one of the outermost rings of modified leaves that protect the flower bud</p> <p>stamen the male reproductive structure of a flower that produces pollen and consists of an anther at the tip of a filament</p> <p>xylem the type of tissue in vascular plants that provides support and conducts water and nutrients from the roots</p>
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1. **Label** Label the parts of this perfect flower.



2. **Compare** How do taproot and fibrous root systems differ?

3. **Describe** What are the three functions of a stem?

4. **List** What are the four main organs of a flowering seed plant?
