

Structure and Function of Higher Plants

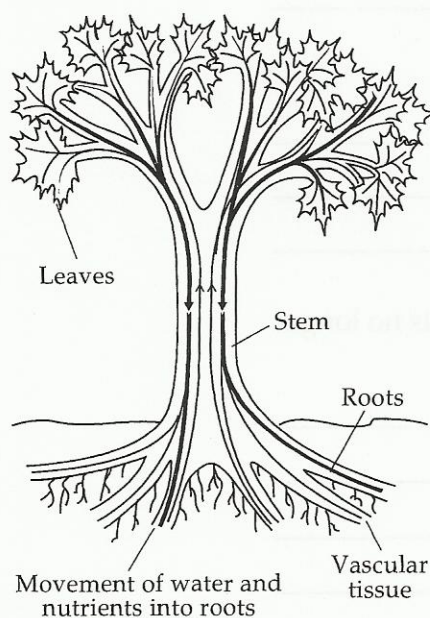
Key Words

phloem:	vascular tissue that carries food made in the leaves to all other parts of the plant
xylem:	vascular tissue that carries water and nutrients up from the roots through the stem to the leaves
stomata:	pores in leaves through which excess water is released
flowers:	special reproductive structures in which seeds form
pollen:	grains in which male sex cells, or sperm, form in flowers
ovary:	structure of flowers in which egg cells form
fertilization:	the joining of sperm and egg
embryo:	a developing plant formed through fertilization
seed:	special reproductive structure of a plant that contains an embryo and its food
fruit:	structure that protects one or more seeds

KEY IDEAS

As plants become more complex, different structures help the plant make food, reproduce, and move materials into, out of, and through the plant.

Fig. 23-1



If you have ever tried to grow plants indoors, you may have found that they have special needs. Some plants do well in warm rooms with little water; others die when they get too warm or too dry. Each type of plant is best adapted to a certain amount of light, heat, and water. Special structures of a plant help it function in its own environment. These structures help the plant make food, reproduce, and move materials into, out of, and through the plant.

Roots, Leaves, and Stems. All higher plants have roots, leaves, and stems. See Fig. 23-1. Each of these parts has a main function, or job. Roots anchor the plant in soil and bring water and other needed materials to the plant.

Leaves make food for the plant. Food may also be made in other green parts of a plant. However, making food is the main function of leaves.

The stem holds leaves up to the light and connects the leaves to the roots. Vascular tissue in the stem moves materials back and forth from the roots to the leaves. Some plants, such as trees, have woody stems. Other plants have soft stems. The basic function of stems is the same in any type of plant.



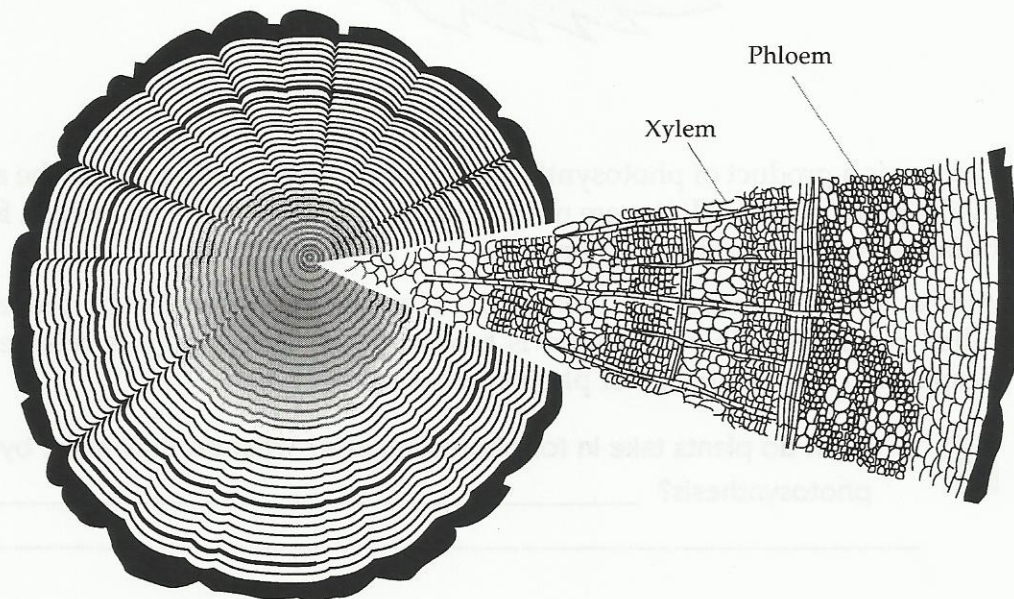
1. What are the three main parts of a higher plant?

Transport. Notice in Fig. 23-1 that the roots, stem, and leaves are connected by the vascular system. This system is made up of tubes that carry materials throughout the plant. One type of tube is made up of phloem. **Phloem** (flohm) is vascular tissue that carries food made in the leaves to other parts of the plant to be used or stored.

Another type of tissue, **xylem** (ZY-luhm), carries water and nutrients up from the roots, through the stem, and into the leaves. The leaves need a large amount of water to make food.

The cells that make up xylem have thick cell walls. When xylem cells die, their cell walls remain in place. New cells form in a circle around the dead cells. Woody stems are made up of many layers of xylem cells. If you have ever looked at the rings in a tree trunk, you were looking at layers of xylem cells. Each year a new ring is made as a new layer of xylem tissue forms. Fig. 23-2 shows xylem and phloem in a stem.

Fig. 23-2



2. What does phloem do? What does xylem do?

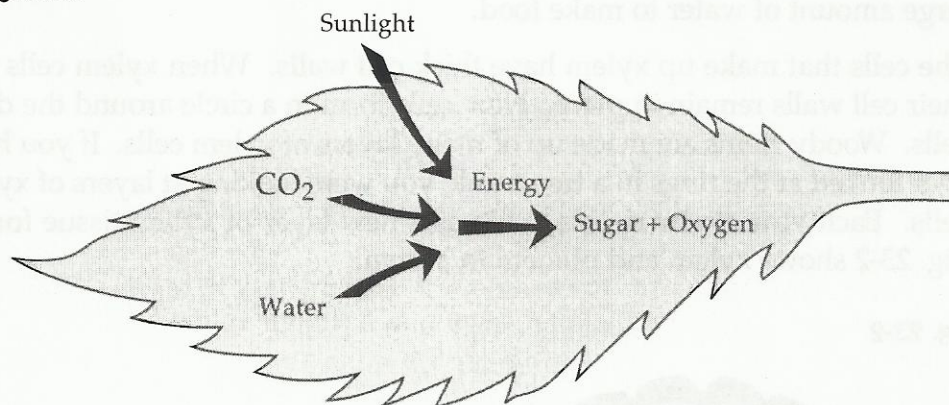


3. How do tree rings form? _____

Photosynthesis. The main function of leaves is to make food. Although plants differ in many ways, they all make their own food. Recall from Unit 1 that plants make food by the process of photosynthesis.

In photosynthesis, the plant takes in water from the soil, carbon dioxide from the air, and energy from sunlight. The plant gives off food and oxygen. Animals depend on the food made by plants. The food made by photosynthesis is a simple sugar that can either be used or stored by the plant. Often the sugar is changed to starch before it is stored. Fig. 23-3 shows the process of photosynthesis.

Fig. 23-3



Oxygen is a product of photosynthesis. Some oxygen is released into the air by the plant's leaves. If it were not for plants, there would be no oxygen for humans and other animals to breathe.

Almost all living things need oxygen. Cells take in oxygen for the process called respiration, in which food is broken down and energy is released. Respiration is the opposite of photosynthesis.



4. What do plants take in for photosynthesis? What do they make by photosynthesis? _____

During photosynthesis, a plant pulls large amounts of water up to its leaves. Excess water exits the leaves through pores, or tiny holes, called **stomata** (STOH-mah-tah). See Fig. 23-4. Stomata (sing., *stoma*) do not stay open all the time. A stoma is opened and closed by two guard cells, one on each side.

When the guard cells are full of water, they swell up and change shape, causing a hole to form between them. When the guard cells lose water, they get limp and the hole disappears. The opening and closing of the stomata allows the plant to give off excess water during photosynthesis and to save water at other times.

Reproduction. Most plants have special structures for reproduction called **flowers** (FLOW-uhrz). In seed plants, the male sex cells, or sperm, are found in **pollen** (PAHL-uhn) grains. Female sex cells, or eggs, are formed in the **ovary** (OH-vuh-ree). The sperm cells inside the pollen grains travel down to the ovary, allowing the sperm and egg to come together. The joining of sperm and egg is called **fertilization** (fuhrt-uhl-ih-ZAY-shuhn). An **embryo** (EHM-bree-oh) is a developing plant that is formed through fertilization.

A **seed** (seed) is a reproductive structure of a plant that contains the embryo and its food. After seeds have formed inside the flower, the flower petals fall off and the ovary becomes larger.

In time the ovary grows into a fruit. The fruit stays attached to the plant until the fruit is ripe. See Fig. 23-5. The **fruit** protects one or more seeds. In order for new plants to grow, seeds must be released from the fruit. When the seeds are released and land in a new location, they may form a new plant.

Fig. 23-4

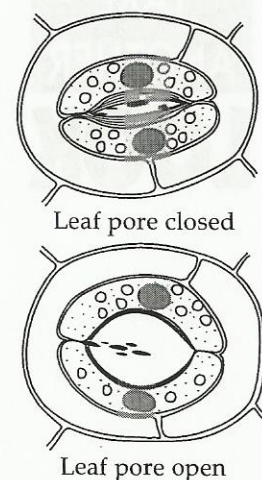
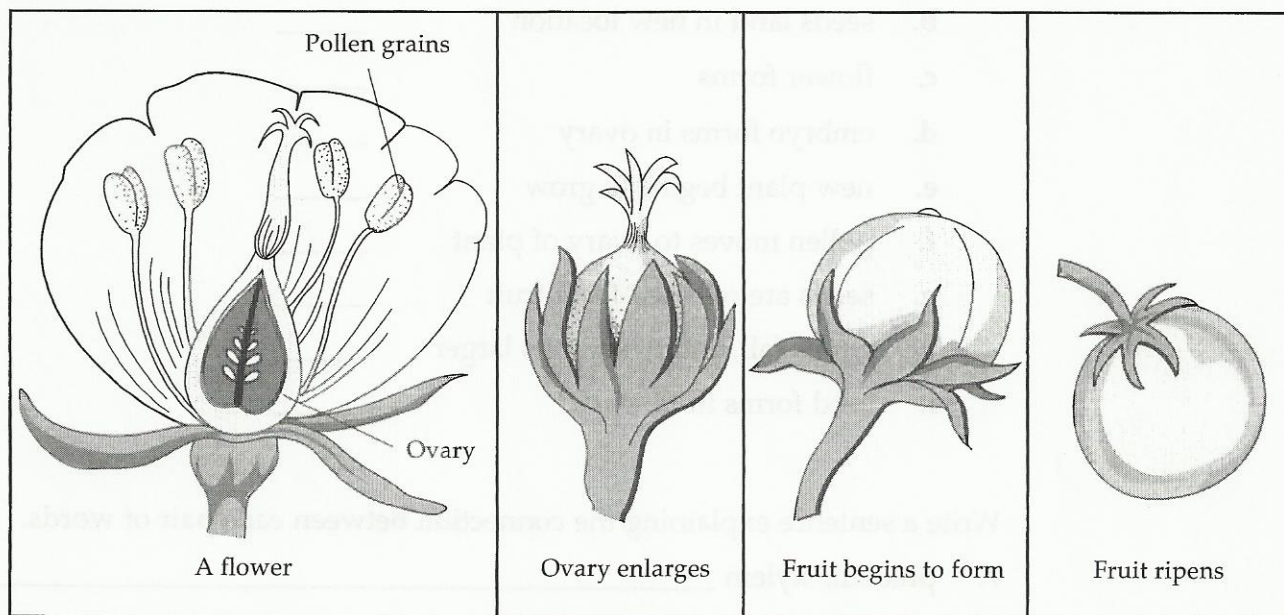


Fig. 23-5



✓ 5. How do flowering plants reproduce? _____

TAKE ANOTHER LOOK

In photosynthesis, plants take in carbon dioxide and energy. They make food and oxygen. In respiration, cells take in oxygen and some type of food, most often a sugar. The cells break down food and release energy. Photosynthesis and respiration are summarized in Fig. 23-6.

Fig. 23-6

	CO ₂	Water	Sugar	Oxygen	Energy
Photosynthesis	uses	uses	makes	makes	uses light energy
Respiration	makes	makes	uses	uses	releases energy

Check Your Understanding

6. In the spaces on the right, write the letters of the steps of plant reproduction in the correct order.
- fruit forms _____
 - seeds land in new location _____
 - flower forms _____
 - embryo forms in ovary _____
 - new plant begins to grow _____
 - pollen moves to ovary of plant _____
 - seeds are released from fruit _____
 - petals fall, and ovary gets larger _____
 - seed forms in flower _____

Write a sentence explaining the connection between each pair of words.

- phloem, xylem _____

- photosynthesis, respiration _____

- stomata, water _____

10. pollen, ovary _____

11. flower, fruit _____

12. List the three main parts of a higher plant. Describe the main function of each part. _____

13. Describe how stomata open and close. _____

14. Imagine a plant whose stomata could not close. What do you think might happen to this plant?

