

PLANT SYSTEMS TRANSPORT

Plants use specialized cells to transport water, minerals, and nutrients through the roots, stems, and leaves. Vascular tissue transports materials, such as water, nutrients, and sugars throughout a plant.

- Xylem- transports water and minerals from the plant's roots, up the stem, and to the leaves
- Phloem- transports nutrients, such as sugars, throughout the plant

The driving force behind water movement in a plant is **transpiration** (the loss of water from a leaf). This movement of water from the leaf's surface pulls other water molecules from the root upward. Water molecules stick to each other (and to the walls of xylem) using hydrogen bonds.

Water escapes from the leaf through pores called **stomata**. Stomata are surrounded by guard cells, which are plump and form openings when water is plentiful. These openings are important for gas exchange, so that plants can take in carbon dioxide they need for photosynthesis, and remove the oxygen produced in photosynthesis. When too much water has been lost, the guard cells shrivel, which causes the stomata to close. The stomata must balance the need for gas exchange with prevention of excessive water loss.

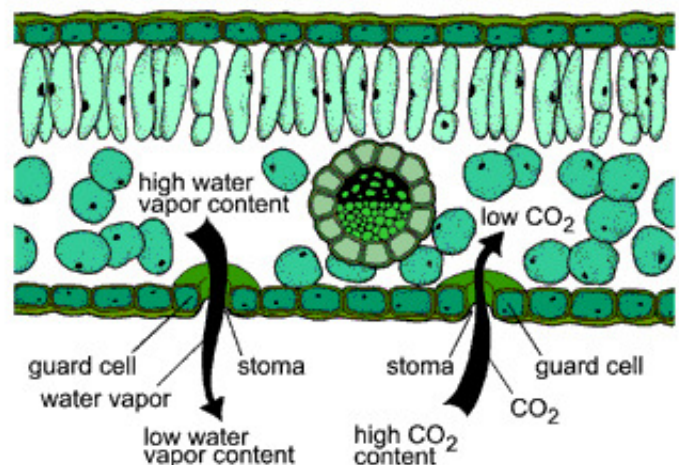
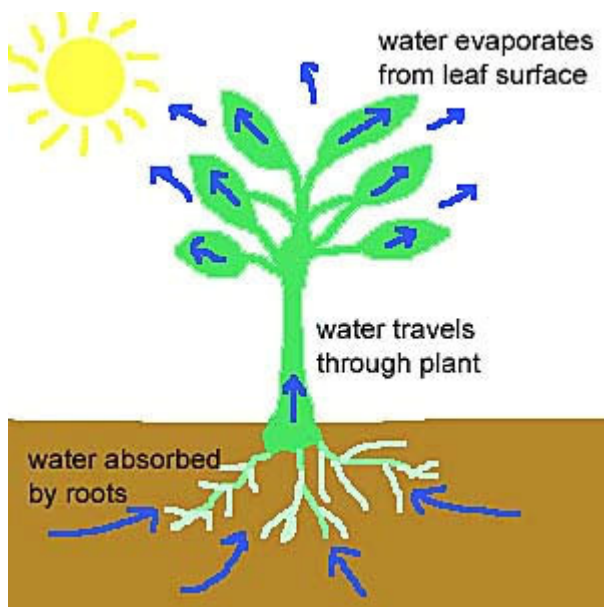


Figure 25. Stomata open to allow carbon dioxide (CO₂) to enter a leaf and water vapor to leave.

PLANT SYSTEMS REPRODUCTION

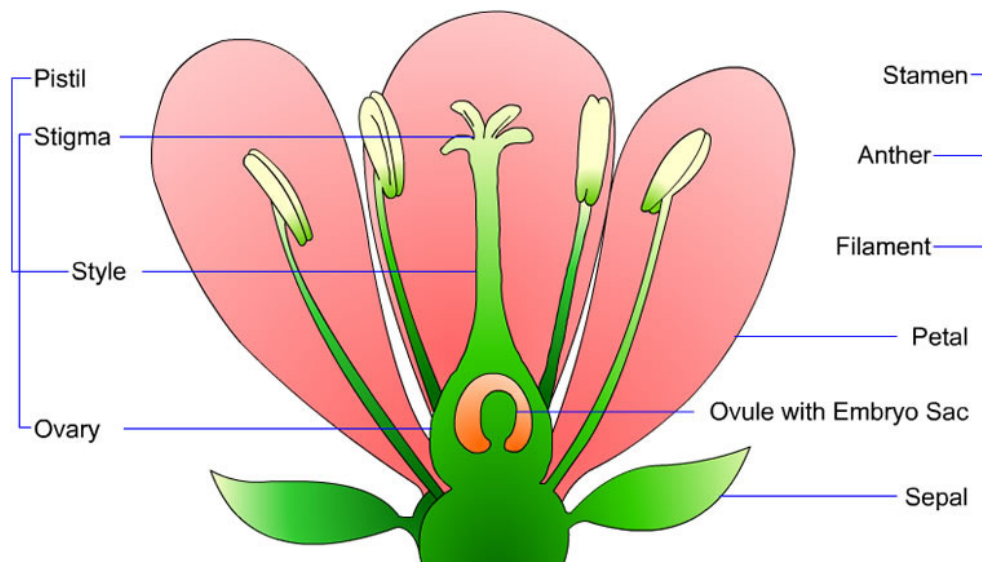
Plants use both asexual and sexual reproduction.

Vegetative propagation is a method of asexual reproduction in plants where one plant gives rise to new plants. This can be done by sending out a horizontal stem, either above or below ground. These are called runners and thizomes.

In **sexual reproduction**, some plants depend on flowers, which come in a variety of shapes and sizes. The colors, fragrances, and nectars are adaptations to attract pollinators. There are four main parts of a flower:

- The **sepals** are often green and make up the outermost part of the flower. The sepals protect the flower while it is a bud.
- The **stamen** is the male reproductive structure of a flower, where pollen is produced. Pollen contains sperm.
- The **pistil** is the female reproductive structure of a flower.
- The **petals** are the colorful parts of the flowers, which attract birds and insects.

Pollinators are important because they transfer pollen (with its sperm) to the pistil. The egg is contained at the base of the pistil within an ovule. When the sperm reach the egg, their nuclei fuse in fertilization. After fertilization, the ovule develops into a seed, which protects the tiny, developing plant. The seed is then dispersed by wind, water, or an animal, and when conditions are right (optimal temperature, water, and oxygen), it will germinate (sprout).



PLANT SYSTEMS RESPONSE

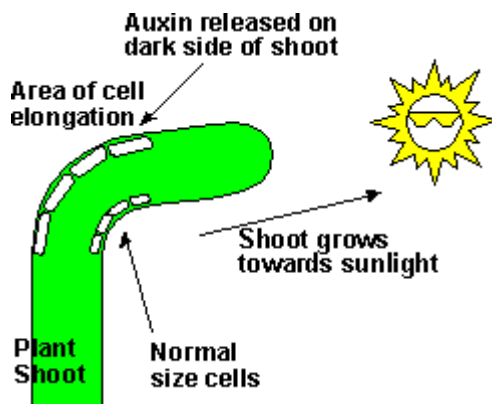
Animals respond to all kinds of things. Dogs run after toys, cats chase mice, and you answer questions when you are called on in class. Even though plants can't run or speak, they still respond to a variety of stimuli, including light, gravity, and even touch.

Plant responses are called **tropisms**. A tropism is the movement of a plant in response to a signal from the environment.

- **Positive tropism**- movement toward a stimulus
- **Negative tropism**- movement away from a stimulus

Since plants do not have nervous systems, they rely on hormones to stimulate or inhibit plant growth. A major class of plant hormones is called **auxin**, which causes plants to grow toward light.

- **Phototropism**- response to light
- **Gravitropism**- response to gravity
- **Thigmotropism**- response to touch



Phototropism



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Gravitropism



Thigmotropism

PRACTICE

1. The vascular tissue of a plant transports various substances. Which substance would you expect to find in phloem, but not in xylem?
 - a. Glucose
 - b. Iron
 - c. Potassium
 - d. Water
2. Xylem and phloem carry out specific functions in a plant. Which of the following terms does not apply to either xylem or phloem?
 - a. Specialized cells
 - b. Eukaryotic cells
 - c. Differentiated cells
 - d. Prokaryotic cells
3. The transport of water through a plant depends on roots absorbing water. Roots depend on osmosis to obtain water. In osmosis, water always
 - a. Moves from a high concentration to a lower concentration
 - b. Moves from a lower concentration to a higher concentration
 - c. Moves so that the concentration of water on one side of the cell membrane is higher than on the other side
 - d. Moves until there is no water left on one side of the cell membrane
4. What is the difference between pollination and fertilization?
5. What is a seed and what does it contain?
6. What is the function of the petals in a flower?
7. A growing seed cannot yet carry out photosynthesis. Therefore, a seed must contain
 - a. Water
 - b. Nutrients
 - c. Xylem and phloem
 - d. Reproductive structures
8. What do plants and animals have in common in their responses to stimuli?