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# 23.1 Specialized Tissues in Plants

## Lesson Objectives

- Identify the principal organs of seed plants.
- Explain the primary functions of the main tissue systems of seed plants.
- Contrast meristems with other plant tissues.

## Lesson Summary

**Seed Plant Structure** All seed plants have three principal organs:

- Roots anchor plants in the ground and absorb water and dissolved nutrients.
- Stems provide a support system for the plant body, a transport system that carries nutrients, and a defensive system that protects the plant.
- Leaves conduct photosynthesis and exchange gases with the air.

**Plant Tissue Systems** Plants have three main tissue systems:

- Dermal tissue is the protective outer covering of a plant. In young plants it consists of a single layer of cells called the **epidermis.** A waxy cuticle often covers epidermis and protects against water loss. In older plants, dermal tissue may be many cell layers deep and may be covered with bark.
- Vascular tissue supports the plant body and transports water and nutrients throughout the plant. The two kinds are xylem, a water-conducting tissue, and phloem, a tissue that carries dissolved nutrients.
  - Xylem contains cells called tracheids, which have cell walls with **lignin,** a complex molecule that resists water and gives wood much of its strength. Angiosperms have a second form of xylem tissue called **vessel elements,** which are arranged end to end on top of one another.
  - Phloem contains **sieve tube elements,** which are arranged end to end. **Companion cells** support the phloem cells and aid in the movement of substances in and out of the phloem.
- Ground tissue produces and stores sugars, and helps support the plant.
  - **Parenchyma** cells have a thin cell wall and a large central vacuole.
  - **Collenchyma** cells have strong, flexible cell walls that help support plant organs.
  - **Sclerenchyma** cells have extremely thick, rigid cell walls that make ground tissue tough and strong.

**Plant Growth and Meristems** **Meristems** are regions of unspecialized cells in which mitosis produces new cells that are ready for differentiation.

- **Apical meristems** are found in the tips of stems and roots.
- Floral meristems produce the tissues of flowers.

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## Seed Plant Structure

1. List the three principal organs of seed plants, and state the function of each one.

_____

_____

_____

2. What adaptation helps leaves conserve water?

_____

## Plant Tissue Systems

*For Questions 3–6, complete each statement by writing the correct word or words.*

3. The three main tissue systems of plants are _____ tissue, _____ tissue, and _____ tissue.
4. The cuticle protects against _____ loss.
5. Some epidermal cells have tiny projections known as _____, which may give a leaf a fuzzy appearance.
6. Dermal tissue in roots contains _____ cells that help absorb water.

*For Questions 7–11, match the vascular-tissue elements with their descriptions.*

**Vascular-Tissue Elements**

_____ **7.** Tracheids

_____ **8.** Lignin

_____ **9.** Vessel elements

_____ **10.** Sieve tube elements

_____ **11.** Companion cells

**Description**

**A.** The main phloem cells

**B.** Long, narrow xylem cells with openings in their cell walls

**C.** Cells that support the phloem cells and aid in the movement of substances

**D.** Xylem cells arranged end to end on top of one another

**E.** The substance in the cell walls of dead tracheids that makes wood tough

12. How can water move from one tracheid into a neighboring cell?

_____

_____

_____

13. How can materials move from one sieve tube element into the next?

_____

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**14.** Complete the table that compares ground-tissue cells.

| Ground Tissue Cells | | |
|---|---|---|
| **Type of Cell** | **Structure** | **Function** |
| | | Photosynthesis in leaves |
| | Cells with strong, flexible cell walls | |
| | Cells with extremely thick, rigid cell walls | |

## Plant Growth and Meristems

*For Questions 15–19, write True if the statement is true. If the statement is false, change the underlined word or words to make the statement true.*

_____ **15.** Meristems are regions of the plant that produce new cells by mitosis.

_____ **16.** Apical meristems are found in the growing tip of a root or stem.

_____ **17.** The specialized cells that result from cell division in meristems have thin cell walls.

_____ **18.** Newly produced plant cells undergo fertilization as they mature into different cell types.

_____ **19.** An apical meristem changes into a floral meristem when its pattern of gene expression changes.

### Apply the Big idea

**20.** Plants are the source of many useful fibers, such as cotton and linen. Fibers are long, thin structures that have strength and flexibility. Which plant tissue system produces fibers such as cotton and linen? Justify your answer.

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