

23–1 Specialized Tissues in Plants



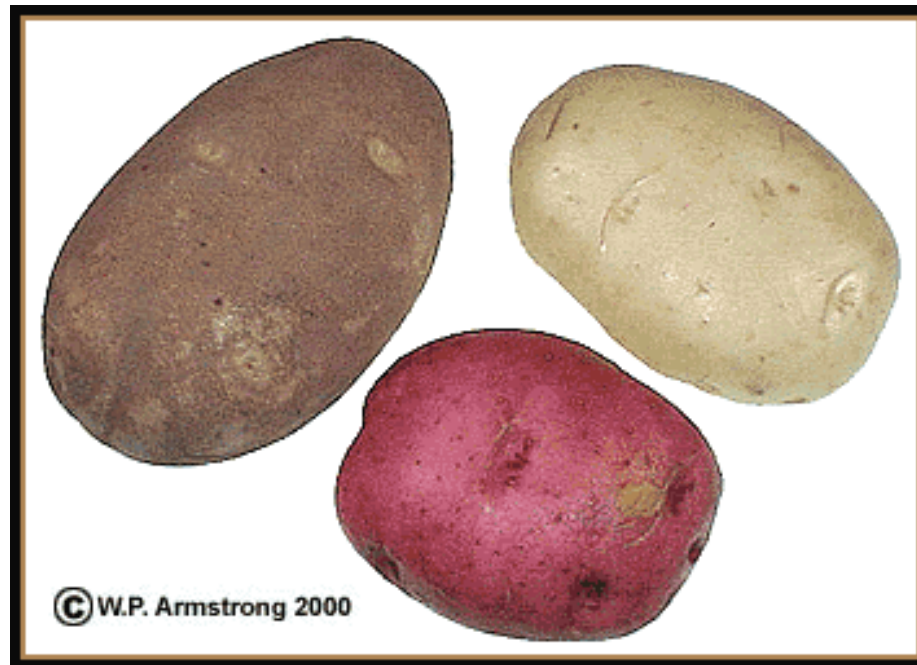


The three principal organs of seed plants are roots, stems, and leaves.

These organs perform functions such as the transport of nutrients, protection, and coordination of plant activities.

Roots:

- absorb water and dissolved nutrients.
- anchor plants in the ground.
- protect the plant from harmful soil bacteria and fungi.



Stems provide:

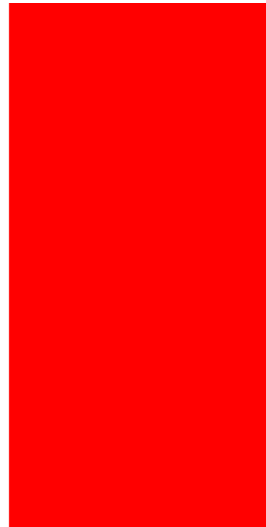
- a support system for the plant body.
- a transport system that carries nutrients.
- a defense system that protects the plant against predators and disease.



Leaves:

- are a plant's main photosynthetic systems.
- increase the amount of sunlight plants absorb.

Adjustable pores conserve water and let oxygen and carbon dioxide enter and exit the leaf.



Plant Tissue Systems



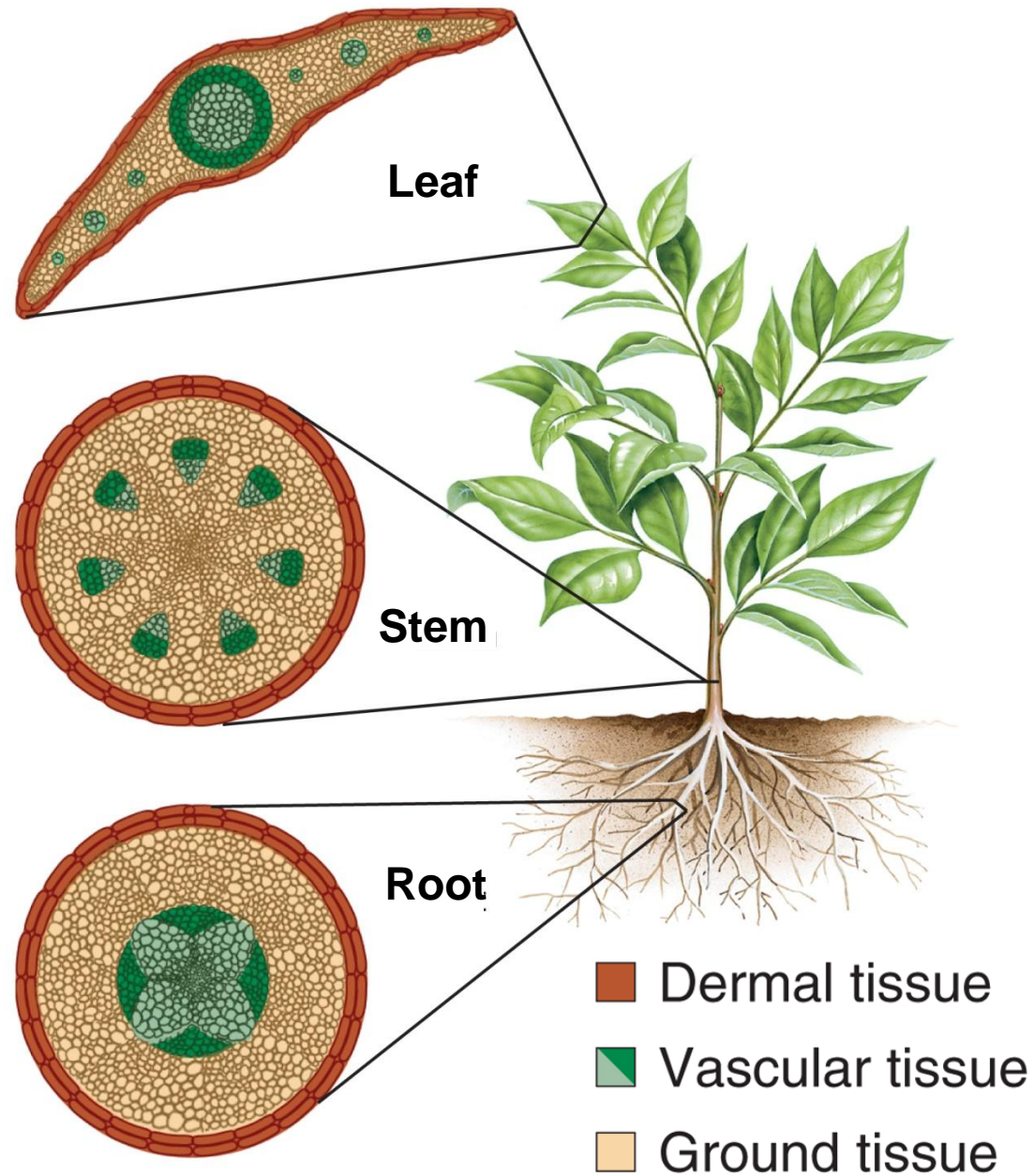
What are the three main tissue systems of plants?



Plants consist of three main tissue systems:

- **dermal tissue**
- **vascular tissue**
- **ground tissue**

23-1 Specialized Tissues in Plants → Plant Tissue Systems



Dermal Tissue

The outer covering of a plant typically consists of a single layer of epidermal cells.

Epidermal cells make up dermal tissue.

The outer surfaces of epidermal cells are covered with a thick waxy layer, known as the cuticle. The cuticle protects the plant against water loss and injury.

In roots, dermal tissue includes root hair cells that provide a large amount of surface area and aid in water absorption.

On the underside of leaves, dermal tissue contains guard cells, which regulate water loss and gas exchange.

Vascular Tissue

Vascular tissue forms a transport system that moves water and nutrients throughout the plant.

Vascular tissue is made up of xylem, a water-conducting tissue, and phloem, a food-conducting tissue.



What specialized cells make up vascular tissue?

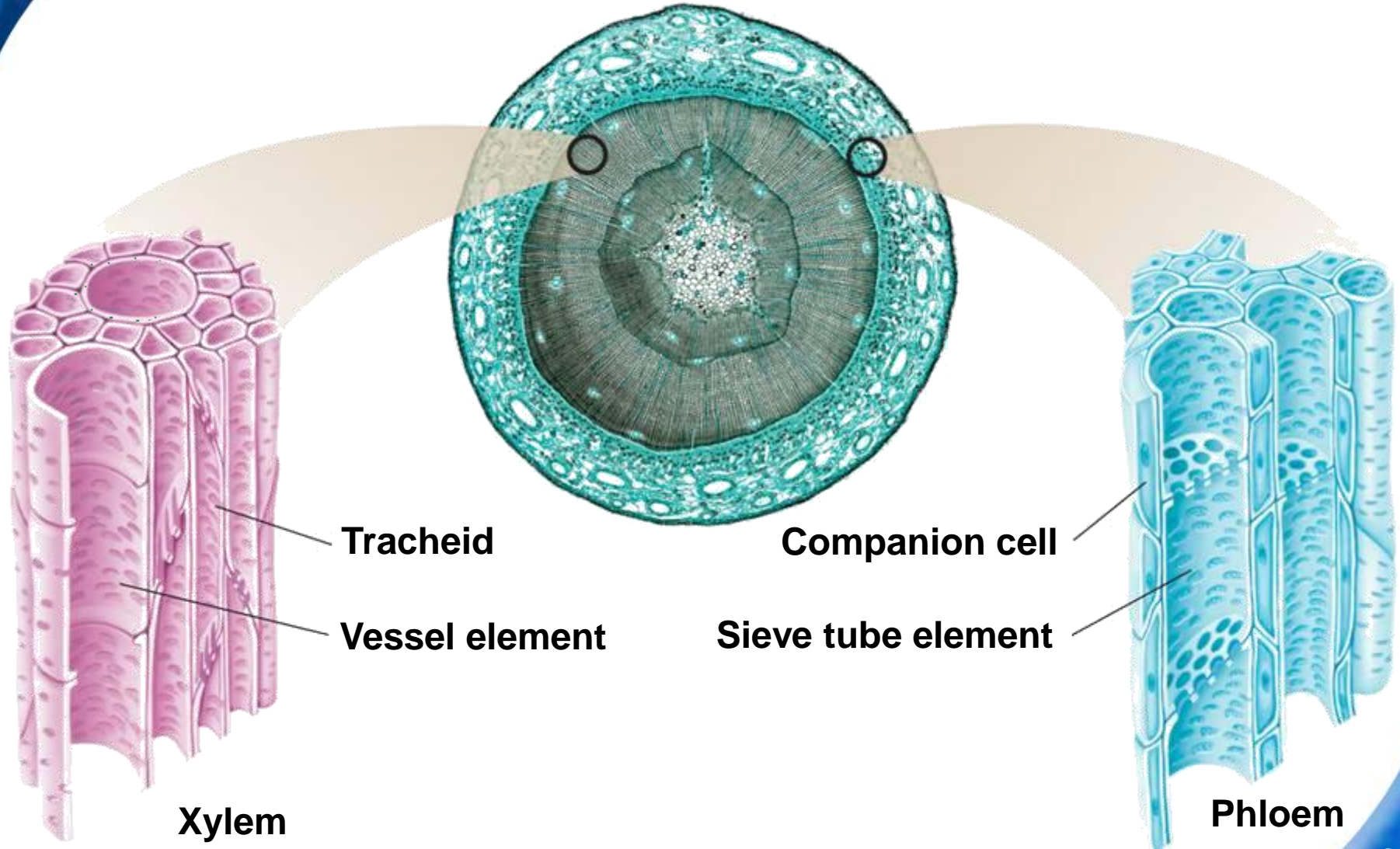
Vascular Tissue



Vascular tissue contains several types of specialized cells.

- **Xylem consists of tracheids and vessel elements.**
- **Phloem consists of sieve tube elements and companion cells.**

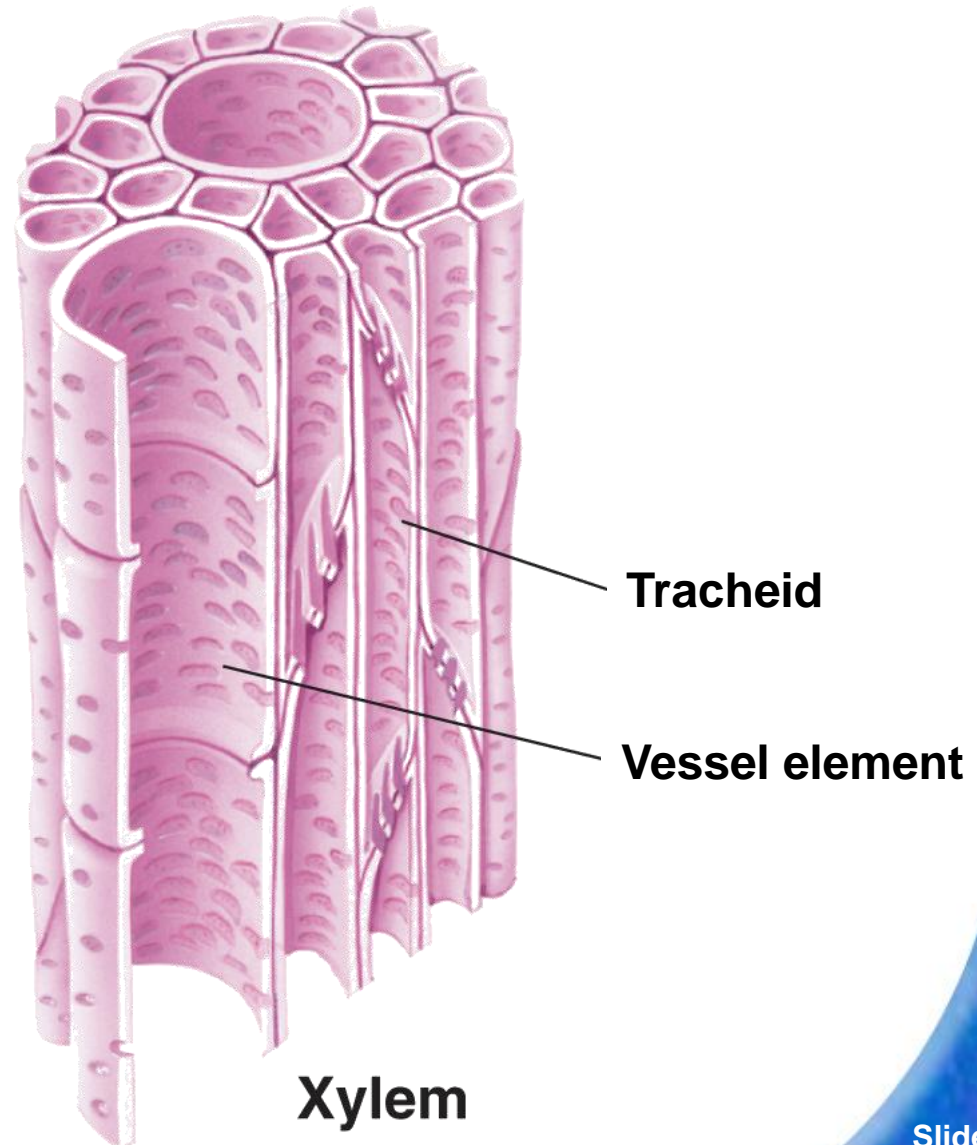
Cross Section of a Stem



Xylem

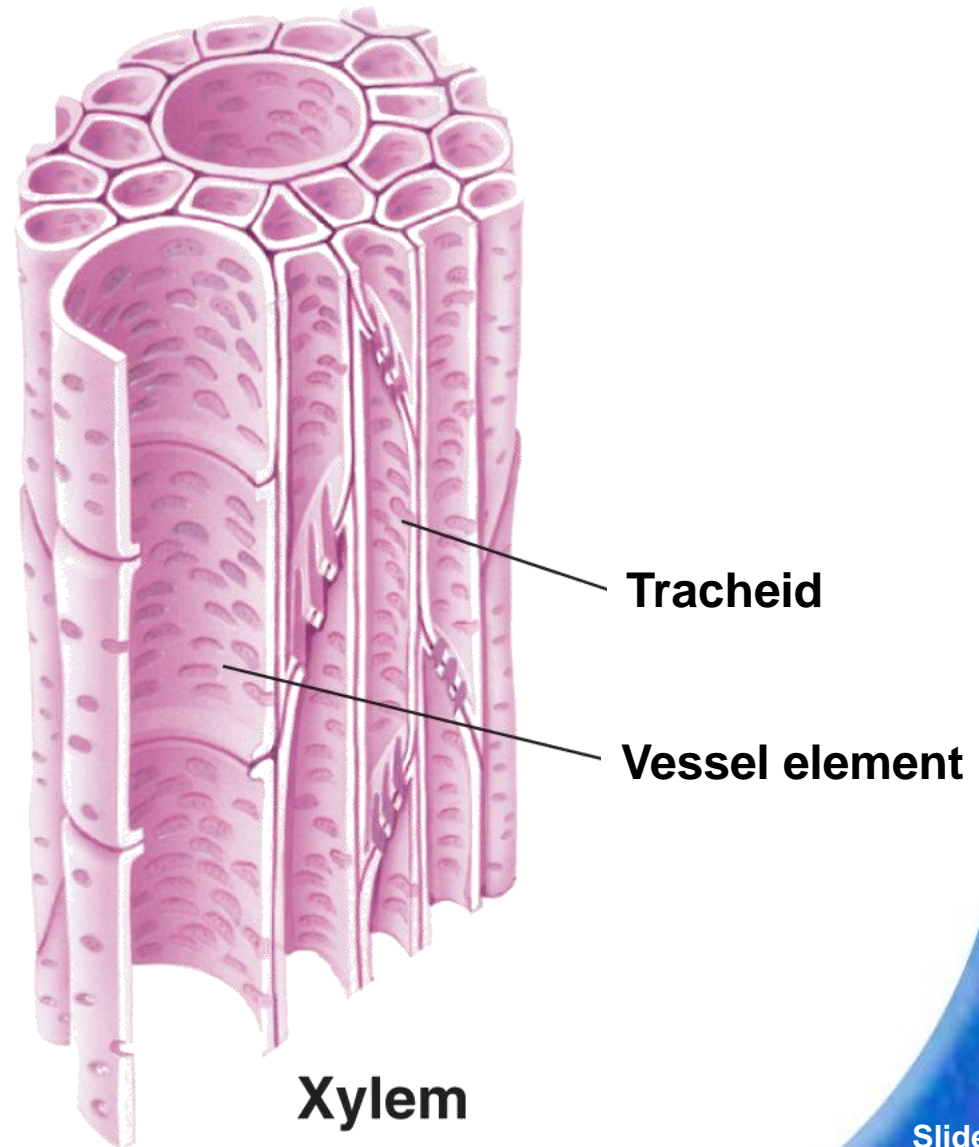
All seed plants have tracheids.

Tracheids are long, narrow cells that are impermeable to water. They are pierced by openings that connect neighboring cells to one another.



Angiosperms also have **vessel elements**.

Vessel elements form a continuous tube through which water can move.



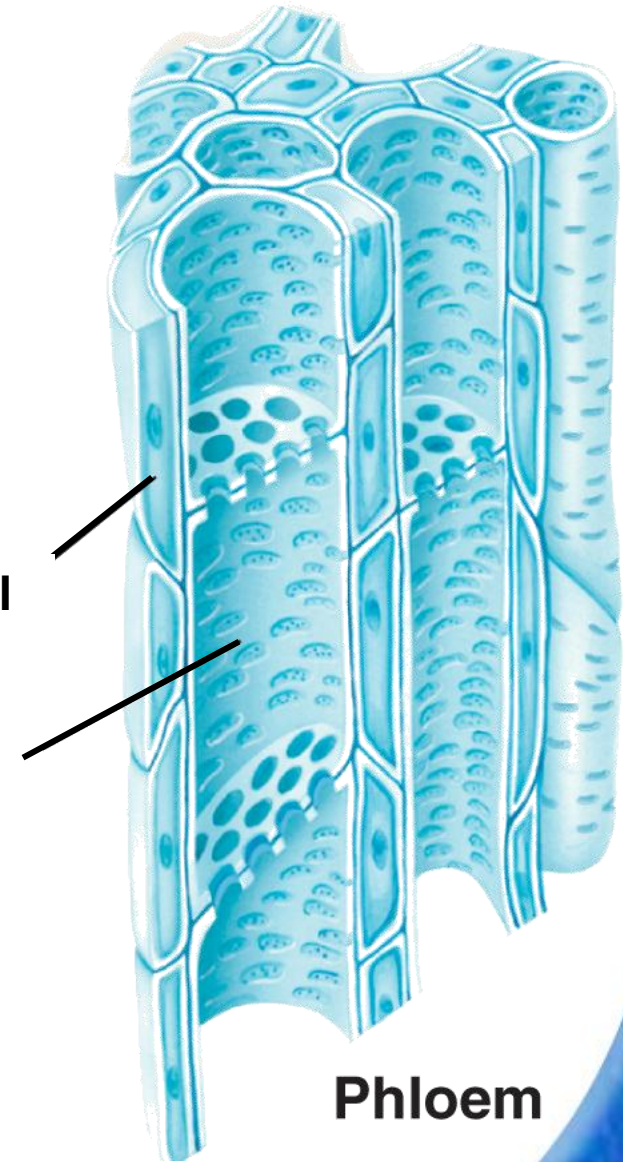
Phloem

Phloem contains sieve tube elements and companion cells.

Sieve tube elements are phloem cells joined end-to-end to form sieve tubes.

Sieve tube element

Companion cell



Phloem

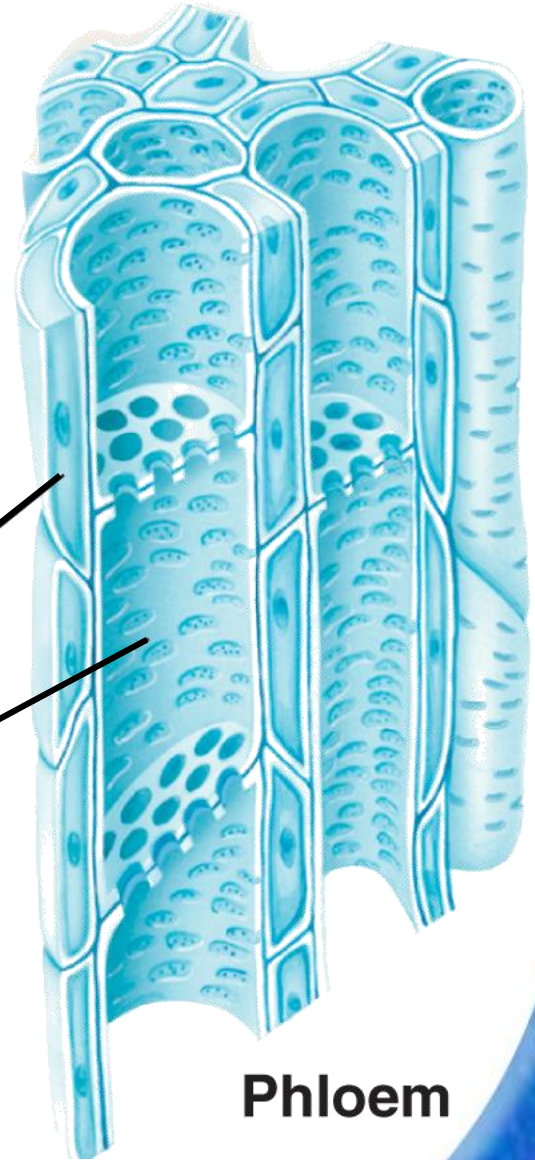
The end walls of sieve tube elements have many small holes.

Sugars and other foods can move through these holes from one adjacent cell to another.

Sieve tube element

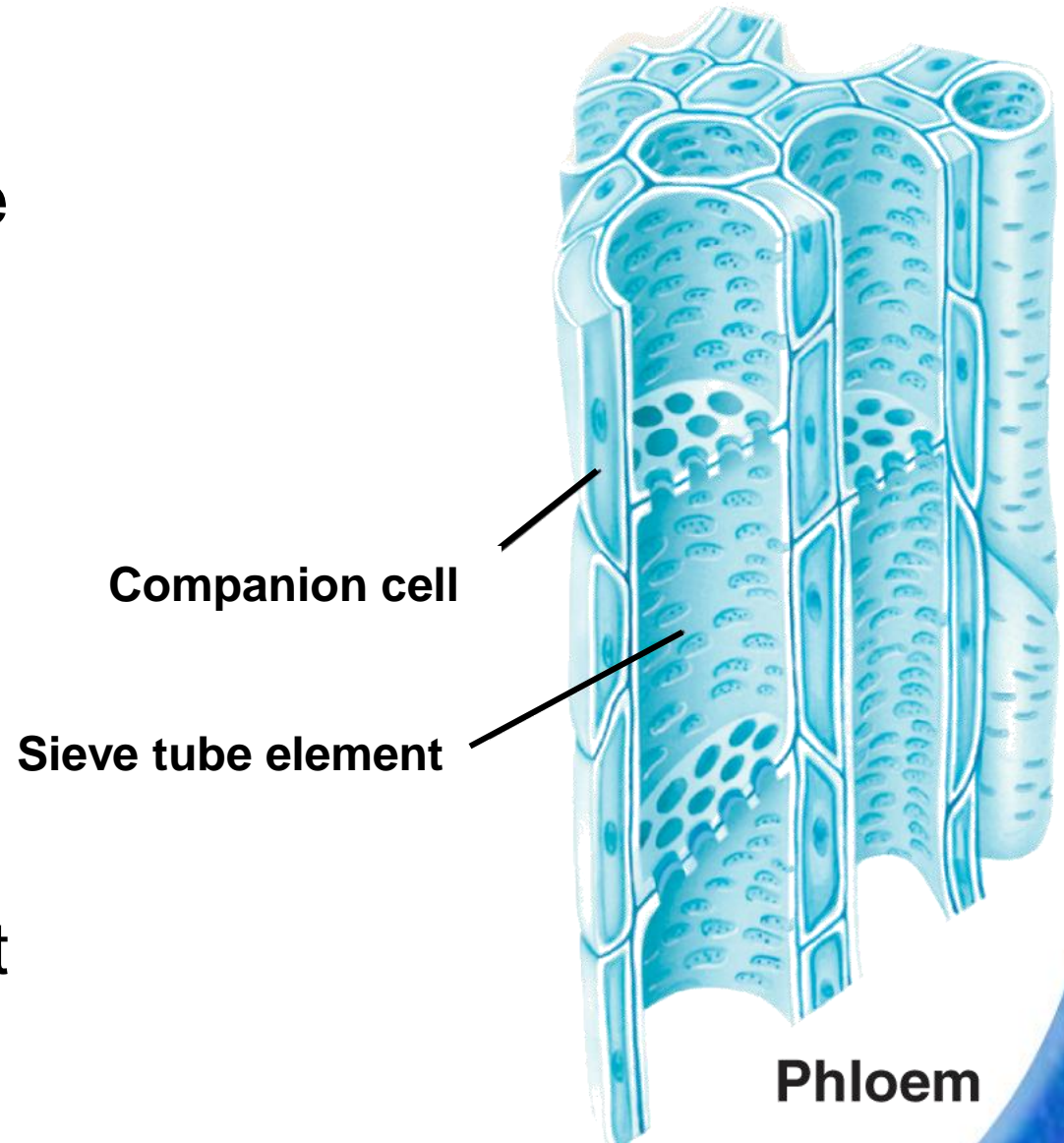
Companion cell

Phloem



Companion cells are phloem cells that surround sieve tube elements.

Companion cells support the phloem cells and aid in the movement of substances in and out of the phloem.



Ground Tissue

Cells that lie between dermal and vascular tissues make up the ground tissues.

The three kinds of ground tissue are:

- parenchyma
- collenchyma
- sclerenchyma

Parenchyma cells have thin walls and large central vacuoles surrounded by a thin layer of cytoplasm. In leaves, this is the site of photosynthesis.

Collenchyma cells have strong, flexible cell walls that help support larger plants.

Sclerenchyma cells have extremely thick, rigid cell walls that make ground tissue tough and strong.

Plant Growth and Meristematic Tissue

In most plants, new cells are produced at the tips of the roots and stems.

These cells are produced in meristems.

A **meristem** is a cluster of tissue that is responsible for **continuing growth throughout a plant's lifetime**.

The new cells produced in **meristematic tissue** are undifferentiated.

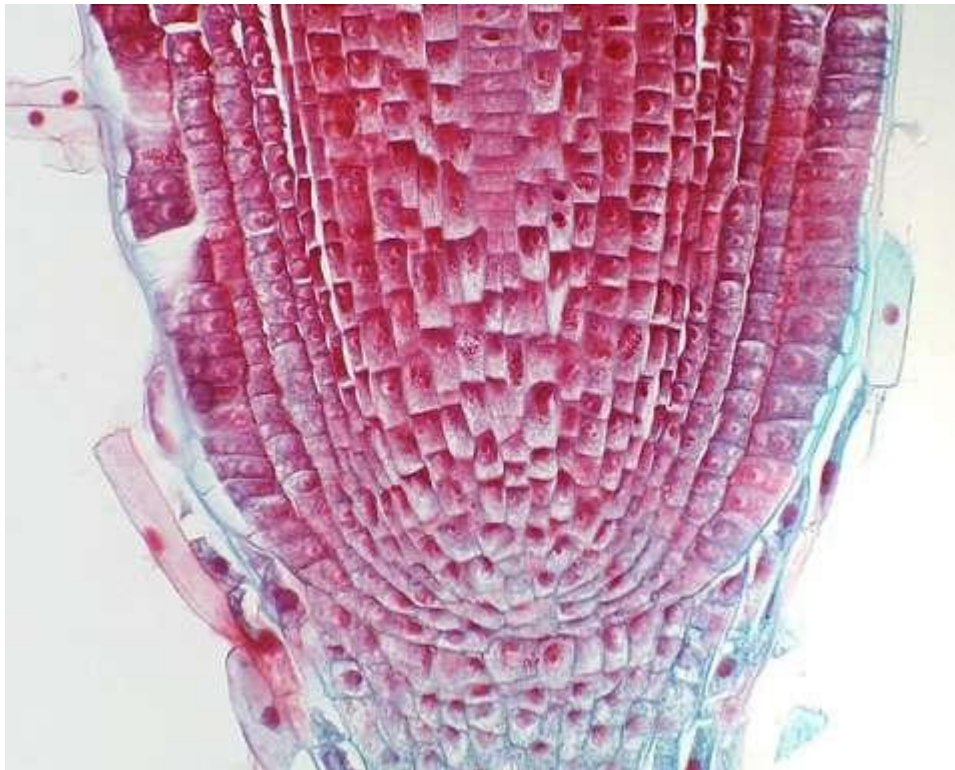
As the cells develop into mature cells, they differentiate.

Differentiation is the process in which cells become specialized in structure.

As the cells differentiate, they produce dermal, ground, and vascular tissue.

Near the tip of each growing stem and root is an apical meristem.

An **apical meristem** is a group of undifferentiated cells that divide to produce increased length of stems and roots.



23-1 Section QUIZ

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Section QUIZ

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1

The principle organs of seed plants are

- a. reproductive organs and photosynthetic organs.
- b. stems, leaves, and flowers.
- c. roots, vessels, and cones.
- d. leaves, stems, and roots.

2 Phloem cells that surround sieve tube elements are called

- a. epidermal cells.
- b. cuticle cells.
- c. companion cells.
- d. vessel elements.

3

Which type of ground tissue has thin cell walls and large central vacuoles?

a. parenchyma

b. collenchyma

c. sclerenchyma

d. tracheids

4 Cells that can differentiate into many plant tissues are found in

- a. the vascular cylinder.
- b. dermal tissue.
- c. meristematic tissue.
- d. ground tissue.

- 5** When cells in the apical meristem first develop, they are
- a. highly specialized and divide often.
 - b. unspecialized and divide rarely.
 - c. highly specialized and divide rarely.
 - d. unspecialized and divide often.**