Interactive Classroom

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Glencoe Science

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Section 1: Plant Cells and Tissues

Section 2: Roots, Stems, and Leaves

Section 3: Plant Hormones and Responses



EXIT

Plant Cells

Different kinds of plant cells make up plant tissues.





22.1 Plant Cells and Tissues

Parenchyma Cells

- Most flexible, thin-walled cells found throughout the plant are parenchyma cells.
- Functions:
 - Storage
 - Photosynthesis
 - Gas exchange
 - Protection
 - Tissue repair and replacement

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Collenchyma Cells

 Plant cells that often are elongated and occur in long strands or cylinders that provide support for the surrounding cells are collenchyma cells.

Functions:

- Support for surrounding tissues
- Provides flexibility for plant
- Tissue repair and replacement



Sclerenchyma Cells

- Plant cells that lack cytoplasm and other living components when they mature, leaving thick, rigid cell walls are called sclerenchyma cells.
- Functions:
 - Support
 - Transport of materials











Plant Tissues

- A plant tissue can be composed of one or more types of cells.
- There are four different tissue types found in plants—meristematic, dermal, vascular, and ground.



Meristematic Tissue

- Meristematic tissues make up meristems, or regions of rapidly dividing cells.
- Apical meristems
- Intercalary meristems
- Lateral meristems



22.1 Plant Cells and Tissues



22.1 Plant Cells and Tissues

Dermal Tissue

- The layer of cells that makes up the outer covering on a plant is the epidermis.
- Most epidermal cells can create a fatty substance that forms the cuticle.
- The cuticle helps reduce water loss and prevent bacteria from entering the plant.



Stomata

- Small openings through which carbon dioxide, water, oxygen, and other gases pass
- The two cells that border a stoma are guard cells.

Trichomes

Hairlike projections that protect the plant

Root Hairs

 Increase a root's surface area and enable the root to take in a greater volume of materials



22.1 Plant Cells and Tissues

Vascular Tissue

- Xylem
 - Transports substances away from the roots
 - Composed of specialized cells called vessel element



called vessel elements and tracheids



- Vessel elements are tubular cells stacked end-to-end that enable the free movement of water and dissolved substances.
- Tracheids are long, cylindrical cells with pitted ends that allow movement of water and dissolved substances.
- Because mature tracheids have end walls, they are less efficient than vessel elements.



Phloem

- Transports dissolved sugars and other organic compounds throughout the plant.
- Sieve-tube member

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Companion cells



Ground Tissue 🕥

- Consist of parenchyma, collenchyma, and sclerenchyma cells
- Functions include photosynthesis, storage, and support



Roots

 The root is usually the first structure to grow out of the seed when it sprouts.



Roots take in water and dissolved minerals that are transported to the rest of the plant.



Root Structure and Growth

- The tip of a root is covered by the root cap.
- The layer below the epidermal layer is the cortex.

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 The layer of cells at the inner boundary of the cortex is the endodermis.



Chapter 22 Plant Structure and Function

- Encircling each cell of the endodermis is a waterproof strip called a Casparian strip.
- The layer of cells directly next to the endodermis toward the center of the root is called the pericycle.



Root hair

Casparian

strip

`H₂O H₃O







22.2 Roots, Stems, and Leaves

Types of Roots

- Taproot system
 - Consists of a thick root with a few smaller, lateral-branching roots
- Fibrous root system
 - Numerous branching roots that are about the same size and grow from a central point
- Modified roots
- Pneumatophores
- Adventitious roots









Stem Structure and Function

- The main function of a plant's stem is support of a plant's leaves and reproductive structures.
- Transport water and dissolved substances
- Stores food and water















Leaf Structure

- A flattened surface called a blade has a large surface area for photosynthesis.
- The blade may be attached to the stem by a petiole.



Maple leaf



22.2 Roots, Stems, and Leaves



 Most leaves have the same internal structure.



- The internal structure of most leaves is welladapted for photosynthesis.
- Tightly packed cells directly below a leaf's upper epidermis contain many chloroplasts and make up the tissue called the palisade mesophyll.
- Below the palisade mesophyll is the spongy mesophyll.



Gas Exchange and Transpiration

- The epidermis of the leaf has many pores through which gases may enter or leave.
- Water evaporates from the inside of a leaf to the outside through a stomata in a process called transpiration that helps pull the water column upward.









Characteristics of Leaves



22.3 Plant Hormones and Responses

Plant Hormones

- Plant hormones can affect cell division, growth, or differentiation.
- Plant hormones work by chemically binding to the plasma membrane at specific sites called receptor proteins.



22.3 Plant Hormones and Responses

Auxin 🗨

- Stimulates the lengthening of cells
- Affects the rate of growth in roots, stems, and leaves





22.3 Plant Hormones and Responses

Gibberellins 🕥

- Causes cell elongation, stimulates cell division, and affects seed growth
- Applying gibberellins to a plant can cause an increase in height.



22.3 Plant Hormones and Responses

Ethylene 🕥

- Affects the ripening of fruits
- Fruits are softer and sweeter than unripe fruits.
- The only known gaseous hormone
- Found in plant tissues such as ripening fruits, dying leaves, and flowers



22.3 Plant Hormones and Responses

Cytokinins

- Promote cell division by stimulating the production of the proteins needed for mitosis and cytokinesis
- Produced in rapidly dividing cells


22.3 Plant Hormones and Responses

Plant Responses

- Nastic responses
 - A response of a plant that causes movement independent of the direction of the stimulus
 - Solar tracking
 - Closing of a Venus flytrap's leaves



22.3 Plant Hormones and Responses

Tropic Responses

- A tropism is a plant's growth response to an external stimulus.
- Phototropism
- Gravitropism
- Thigmotropism

















Chapter Resource Menu



Chapter Diagnostic Questions

Formative Test Questions

CheckPoint

CheckPoint

Chapter Assessment Questions

CheckPoint

Standardized Test Practice Biology

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Glencoe Biology Transparencies



<u>Vocabulary</u>

Image Bank



Animation

Click on a hyperlink to view the corresponding lesson.



Chapter Diagnostic Questions



Which plant tissue results in growth at the tips of roots and stems?

A. apical meristem B. intercalary meristem C. cork cambium

D. vascular cambium



Chapter Diagnostic Questions



What is produced by the pericycle?

A. leaves
B. dermal cells
C. lateral roots
D. strong stems



Chapter Diagnostic Questions



Which is *not* an example of a tropic response?

A. vine climbing a trellis
B. Venus flytrap closing its leaves
C. roots growing down into the soil
D. stems leaning toward a sunny window



22.1 Formative Questions



Which component identifies a cell as a plant cell?

A. nucleus
B. Golgi apparatus
C. large central vacuole
D. plasma membrane





Which plant cells are flexible and provide support for surrounding cells?

- A. collenchyma cells B. meristematic cells
- C. parenchyma cells
- D. sclerenchyma cells

22.1 Formative Questions



Which plant cells divide and repair damaged tissue?

A. apical cells
B. meristematic cells
C. parenchyma cells
D. sclerenchyma cells





What type of plant tissue contains rapidly dividing cells that result in primary and secondary growth?

A. dermal tissue
B. ground tissue
C. meristematic tissue
D. vascular tissue



22.1 Formative Questions



What is the term for a tissue that transports substances?

A. apical
B. endoderm
C. tropic
D. vascular





What tissue replaces cells of the root cap that are rubbed off as the root grows?

A. apical meristem
B. cork cambium
C. dermal tissue
D. ground tissue





What type of root system is *not* used for storage?

A. adventitious root
B. fibrous root
C. modified root

D. taproot





What type of stem grows along the soil's surface and can produce a new plant?

A. bulb B. rhizome C. runner D. tuber



22.2 Formative Questions



What is the main function of leaves?

A. photosynthesis
B. protection
C. transpiration
D. water storage





What is the effect of applying gibberellins to a plant?

A. an increase in height
B. a greater response to sunlight
C. an increase in lateral branching
D. a decrease in the number of leaves





How does a plant's apical meristem inhibit the growth of side branches?

- A. The apical meristem produces auxin.
 B. The side branches receive less gibberellin.
 C. The apical meristem absorbs all of the cytokinin.
- D. The side branches have a nastic response to sunlight.





What type of response causes plant movement that can be reversed and repeated?

A. hormonal response
B. nastic response
C. thigmoresponse
D. tropic response





Which is an example of negative gravitropism?

A. the dropping of fruit B. the upward growth of a stem C. the growth of roots into the soil D. the horizontal growth of rhizomes



Chapter Assessment Questions



This is an example of what type of leaf?



- A. alternate
- B. palmate
- C. pinnate
- D.whorled

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Chapter Assessment Questions



Which leaf structure has tightly-packed, columnshaped cells used in photosynthesis?





Chapter Assessment Questions





A. spongy mesophyll
B. palisade mesophyll
C. epidermis
D. cuticle

Home Resources 🗲 🛁

Chapter Assessment Questions



Identify the main food-carrying tissue of plants.

A. xylem
B. phloem
C. tracheids
D. vessel elements



Standardized Test Practice



Which type of cells provides fiber that humans use to make ropes and clothing?

A. cambium cells
B. mesophyll cells
C. sclerenchyma cells
D. trichome cells



Standardized Test Practice



What is the function of parenchyma cells in a fruit?

A. gas exchange
B. photosynthesis
C. protection
D. storage



Standardized Test Practice



Which is a result of the growth of lateral meristem tissue?

A. increasing the diameter of a branch B. lengthening of a stem C. production of leaves

D. starch and water storage in a root



Standardized Test Practice



Which plant tissue translocates nutrients from sources to sinks?

A. cambium B. mesophyll C. phloem D. xylem



Standardized Test Practice



Which tissue regulates the movement of substances into the vascular tissues?

A. epidermis
B. cortex
C. endodermis
D. pericycle





Standardized Test Practice



Where in the leaf does most of the photosynthesis take place?





Standardized Test Practice



What hormone will accumulate in an enclosed sack that contains unripe bananas?

A. auxin B. cytokinin C. ethylene D. gibberellin



Glencoe Biology Transparencies







Vocabulary

Section 1

- parenchyma cell
- collenchyma cell
- sclerenchyma cell
- meristem
- vascular cambium
- cork cambium
- epidermis
- guard cell





vessel element



- phloem
- - sieve-tube member
- companion cell
- ground tissue



Vocabulary

Section 2

- 🚯 root cap
- Cortex
- endodermis
- ericycle
- petiole
- palisade mesophyll




Vocabulary

Section 3

- 🕣 auxin
- gibberellins
- ethylene
- Cytokinin
- nastic response
- 🚯 tropism





Animation



- Visualizing Meristematic Tissues
- Movement Through Roots
- Stoma
- Phototropism

