**Chapter 34 Plants: Characteristics and Structures**

**34.6 Roots, 34.7 Stems, and 34.8 Leaves**

**True or False -** *Write true if the statement is true or false if the statement is false.*

\_\_\_\_\_ 1. Stems absorb water and minerals and transport them to the roots.

\_\_\_\_\_ 2. Roots contain dermal, ground, and vascular tissues.

\_\_\_\_\_ 3. Many plants with taproots use the root as a place to store food.

\_\_\_\_\_ 4. Fibrous roots anchor the plant less securely to the ground than taproots.

\_\_\_\_\_ 5. Root hairs detect gravity so the root grows downward.

\_\_\_\_\_ 6. Mycorrhizal relationships allow the plant to absorb more water.

\_\_\_\_\_ 7. Secondary stems grow from internodes on the primary stem.

\_\_\_\_\_ 8. Some plants have stems that can store water during dry seasons.

\_\_\_\_\_ 9. The only function of stems is to bear leaves and flowers.

\_\_\_\_\_ 10. The width of a tree ring represents a single year's growth in the width of the tree's stem.

\_\_\_\_\_ 11. The leaf petiole does the majority of photosynthesis for a leaf.

\_\_\_\_\_ 12. Microphylls are the leaves of flowering plants.

\_\_\_\_\_ 13. Plants with a basal rosette of leaves are taking advantage of higher temperatures close to the ground.

\_\_\_\_\_ 14. Compound leaves are made up of a number of leaflets.

\_\_\_\_\_ 15. Deciduous leaves change color in the fall when their chlorophyll breaks down.

**Critical Reading -** *Read these passages from the text and answer the questions that follow.*

**Root Structures and Functions**

The tip of a root is called the root cap. It consists of specialized cells that help regulate primary growth of the root at the tip. Above the root cap is primary meristem, where growth in length occurs.

Above the meristem, the rest of the root is covered with a single layer of epidermal cells. These cells may have root hairs that increase the surface area for the absorption of water and minerals from the soil. Beneath the epidermis is ground tissue, which may be filled with stored starch. Bundles of vascular tissues form the center of the root. Waxy layers waterproof the vascular tissues so they don’t leak, making them more efficient at carrying fluids. Secondary meristem is located within and around the vascular tissues. This is where growth in thickness occurs.

The structure of roots helps them perform their primary functions. What do roots do? They have three major jobs: absorbing water and minerals, anchoring and supporting the plant, and storing food.

* Absorbing water and minerals: Thin-walled epidermal cells and root hairs are well suited to absorb water and dissolved minerals from the soil. The roots of many plants also have a mycorrhizal relationship with fungi for greater absorption.
* Anchoring and supporting the plant: Root systems help anchor plants to the ground, allowing plants to grow tall without toppling over. A tough covering may replace the epidermis in older roots, making them rope-like and even stronger.
* Storing food: In many plants, ground tissues in roots store food produced by the leaves during photosynthesis.

*Questions*

1. Picture a plant's root cap. What additional function might it have that is not described in the above passage?

2. How do root hairs increase the surface area for water and mineral absorption?

3. What is a function of the ground tissue of a root?

4. What are the three main functions of roots?

5. What does the secondary root meristem do?

**Multiple Choice -** *Choose the letter of the correct answer.*

1. The main difference between a taproot system and a fibrous root system is that
   1. taproots can store a lot of food, while fibrous roots do not.
   2. taproots absorb water, while fibrous roots do not.
   3. fibrous roots can access water sources deep under the ground, while taproots cannot.
   4. fibrous roots have an epidermal cell layer, while taproots do not.
2. Roots grown downward because
   1. they have vascular bundles.
   2. they grow opposite to the force of gravity.
   3. they grow away from water sources.
   4. there are gravity-sensing cells in the root cap.
3. The xylem of the vascular tissue in the root
   1. carries sugars from the leaves to the roots for storage.
   2. carries water and minerals from the root up to the stem.
   3. detects gravity and causes the root to grow downward.
   4. none of the above
4. In stems, the \_\_\_\_\_\_ meristem is responsible for growth in length, and the \_\_\_\_\_ meristem is primarily responsible for growth in width.
   1. secondary, primary
   2. primary, secondary
   3. node, epidermal
   4. epidermal, node
5. A main function of the leaf petiole is
   1. to extend the leaf blade away from the stem so the blade can collect sufficient sunlight.
   2. to keep the leaf away from the secondary meristem of the stem.
   3. to produce pollen.
   4. none of the above.
6. Very thick stems are specialized for
   1. clinging and climbing.
   2. strength and support.
   3. storing water or food.
   4. photosynthesis.
7. Leaves arranged in whorls are optimized to
   1. collect sunlight from all directions.
   2. to increase resistance to wind.
   3. to increase water loss.
   4. to increase food storage capacity.
8. The air spaces in the leaf interior
   1. block gas exchange between the mesophyll cells and the environment.
   2. make the leaf weigh more than a leaf packed tightly with cells.
   3. make the leaf weigh less than a leaf packed tightly with cells.
   4. carry out most of the photosynthesis in the leaf.

**Matching** - *Match the vocabulary word with the proper definition.*

**Definitions**

\_\_\_\_\_ 1. photosynthetic leaf cells

\_\_\_\_\_ 2. increases the surface area for absorbing water in the root

\_\_\_\_\_ 3. the type of roots a plant has

\_\_\_\_\_ 4. a plant that keeps its leaves for more than one year

\_\_\_\_\_ 5. a leaf pore flanked by two guard cells

\_\_\_\_\_ 6. a plant that loses its leaves yearly and grows new ones

\_\_\_\_\_ 7. a thick primary root often growing deep into the soil

\_\_\_\_\_ 8. the outermost woody covering of a stem

\_\_\_\_\_ 9. the tip of a root

\_\_\_\_\_ 10. the part of a stem from which secondary branches grow

\_\_\_\_\_ 11. the leaf part that supports and displays the leaf blade

\_\_\_\_\_ 12. has multiple, spreading roots without a main primary root

**Terms**

a. bark

b. deciduous plant

c. evergreen plant

d. fibrous root

e. mesophyll

f. node

g. petiole

h. root cap

i. root hair

j. root system

k. stomata

l. taproot

**Fill in the Bank -** *Fill in the blank with the appropriate term.*

1. The leaf \_\_\_\_\_\_\_\_, which is connected to the leaf petiole, is a very important photosynthetic part of a plant.

2. A \_\_\_\_\_\_\_\_ can grow deep into the ground to access water, and can also store food for the plant.

3. There are two main types of \_\_\_\_\_\_\_\_ in plants for absorbing water and minerals.

4. In the fall, \_\_\_\_\_\_\_\_ lose their leaves.

5. The \_\_\_\_\_\_\_\_ can close to reduce water loss from the leaf.

6. Even though part of it is nonliving, \_\_\_\_\_\_\_\_ functions to protect the living parts of the stem.

7. \_\_\_\_\_\_\_\_ consists of photosynthetic cells located in between the upper and lower epidermis of a leaf.

8. Plants with a \_\_\_\_\_\_\_ root system are less securely anchored to the ground.

9. A pine tree is an example of a(n) \_\_\_\_\_\_\_\_.

10. Leaves and secondary stems grow out of stem \_\_\_\_\_\_\_\_.

11. \_\_\_\_\_\_\_\_ are long, thin cells in the epidermal cell layer of roots.

12. The leaf is attached to the stem via a(n) \_\_\_\_\_\_\_\_.

**Critical Writing -** *Thoroughly answer the question below. Use appropriate academic vocabulary and clear and complete sentences.*

Not all plant stems are the same. Name and describe three different stem types of plants and how they adapt a plant to its environment.