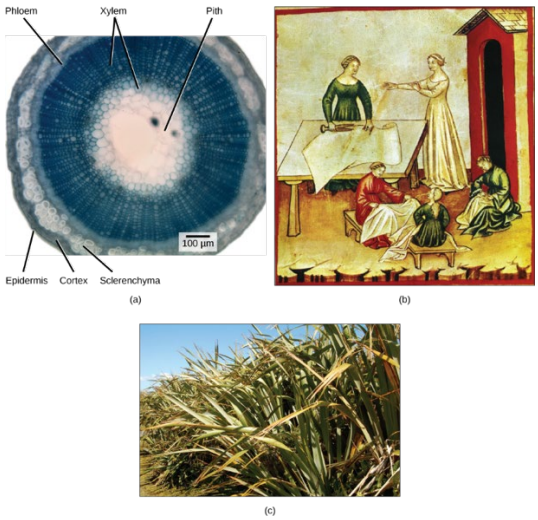
Biology 2e
Unit 6: Plant Structure and Function
Chapter 30: Plant Form and Physiology

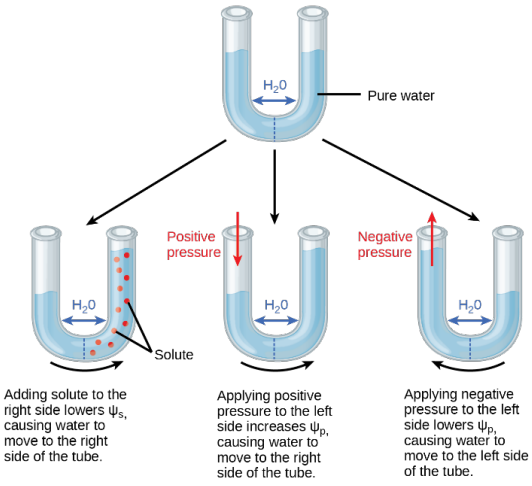
Visual Connection Questions

1. Which layers of the stem are made of parenchyma cells?



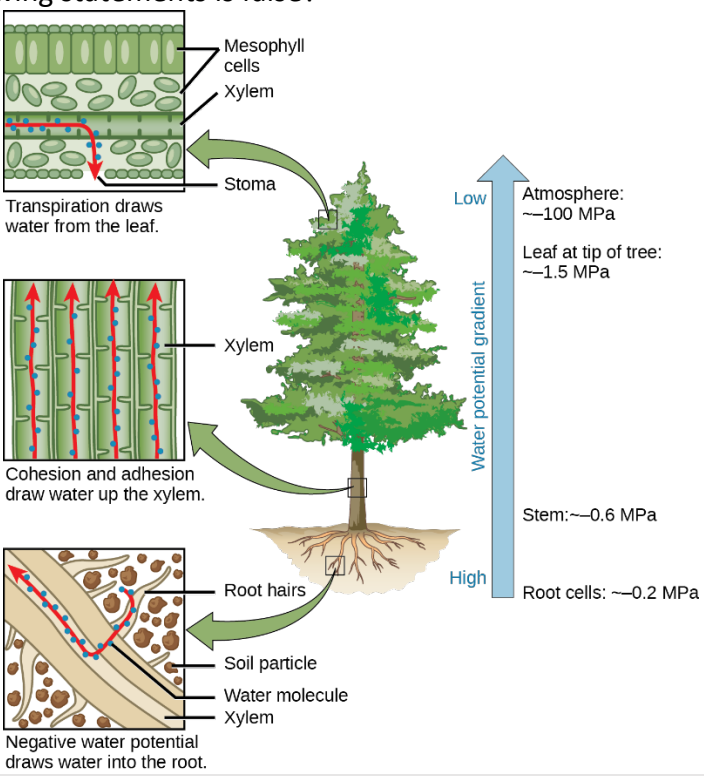
A and B. The cortex, pith, and phloem are made of parenchyma cells.

2. Positive water potential is placed on the left side of the tube by increasing Ψp such that the water level rises on the right side. Could you equalize the water level on each side of the tube by adding solute, and if so, how?



Yes, you can equalize the water level by adding the solute to the left side of the tube such that water moves toward the left until the water levels are equal.

3. Which of the following statements is false?



b. Negative water potential draws water into the root hairs. Cohesion and adhesion draw water up the phloem. Transpiration draws water from the leaf.

Review Questions

4. Plant regions of continuous growth are made up of _____.

c. meristematic tissue

5. Which of the following is the major site of photosynthesis?

b. ground tissue

6. Stem regions at which leaves are attached are called _____.

c. nodes

7. Which of the following cell types forms most of the inside of a plant?

d. parenchyma cells

8. Tracheids, vessel elements, sieve-tube cells, and companion cells are components of _____.

a. vascular tissue

9. The primary growth of a plant is due to the action of the _____.

c. apical meristem

10. Which of the following is an example of secondary growth?
b. increase in thickness or girth

11. Secondary growth in stems is usually seen in _____.
b. dicots

12. Roots that enable a plant to grow on another plant are called _____.
a. epiphytic roots

13. The _____ forces selective uptake of minerals in the root.
c. endodermis

14. Newly-formed root cells begin to form different cell types in the _____.
b. zone of maturation

15. The stalk of a leaf is known as the _____.
a. petiole

16. Leaflets are a characteristic of _____ leaves.
c. compound

17. Cells of the _____ contain chloroplasts.
d. mesophyll

18. Which of the following is most likely to be found in a desert environment?
b. spines instead of leaves

19. When stomata open, what occurs?
a. Water vapor is lost to the external environment, increasing the rate of transpiration.

20. Which cells are responsible for the movement of photosynthates through a plant?
d. sieve-tube elements, companion cells

21. The main photoreceptor that triggers phototropism is a _____.
c. phototropin

22. Phytochrome is a plant pigment protein that:
c. mediates morphological changes in response to red and far-red light

23. A mutant plant has roots that grow in all directions. Which of the following organelles would you expect to be missing in the cell?
b. amyloplast

24. After buying green bananas or unripe avocadoes, they can be kept in a brown bag to ripen. The hormone released by the fruit and trapped in the bag is probably:
c. ethylene

25. A decrease in the level of which hormone releases seeds from dormancy?
a. abscisic acid

26. A seedling germinating under a stone grows at an angle away from the stone and upward. This response to touch is called _____.
c. thigmotropism

Critical Thinking Questions

27. What type of meristem is found only in monocots, such as lawn grasses? Explain how this type of meristematic tissue is beneficial in lawn grasses that are mowed each week.
Lawn grasses and other monocots have an intercalary meristem, which is a region of meristematic tissue at the base of the leaf blade. This is beneficial to the plant because it can continue to grow even when the tip of the plant is removed by grazing or mowing.

28. Which plant part is responsible for transporting water, minerals, and sugars to different parts of the plant? Name the two types of tissue that make up this overall tissue, and explain the role of each.
Vascular tissue transports water, minerals, and sugars throughout the plant. Vascular tissue is made up of xylem tissue and phloem tissue. Xylem tissue transports water and nutrients from the roots upward. Phloem tissue carries sugars from the sites of photosynthesis to the rest of the plant.

29. Describe the roles played by stomata and guard cells. What would happen to a plant if these cells did not function correctly?
Stomata allow gases to enter and exit the plant. Guard cells regulate the opening and closing of stomata. If these cells did not function correctly, a plant could not get the carbon dioxide needed for photosynthesis, nor could it release the oxygen produced by photosynthesis.

30. Compare the structure and function of xylem to that of phloem.
Xylem is made up tracheids and vessel elements, which are cells that transport water and dissolved minerals and that are dead at maturity. Phloem is made up of sieve-tube cells and companion cells, which transport carbohydrates and are alive at maturity.

31. Explain the role of the cork cambium in woody plants.
In woody plants, the cork cambium is the outermost lateral meristem; it produces new cells towards the interior, which enables the plant to increase in girth. The cork cambium also produces cork cells towards the exterior, which protect the plant from physical damage while reducing water loss.

32. What is the function of lenticels?

In woody stems, lenticels allow internal cells to exchange gases with the outside atmosphere.

33. Besides the age of a tree, what additional information can annual rings reveal?

Annual rings can also indicate the climate conditions that prevailed during each growing season.

34. Give two examples of modified stems and explain how each example benefits the plant.

Answers will vary. Rhizomes, stolons, and runners can give rise to new plants. Corms, tubers, and bulbs can also produce new plants and can store food. Tendrils help a plant to climb, while thorns discourage herbivores.

35. Compare a tap root system with a fibrous root system. For each type, name a plant that provides a food in the human diet. Which type of root system is found in monocots? Which type of root system is found in dicots?

A tap root system has a single main root that grows down. A fibrous root system forms a dense network of roots that is closer to the soil surface. An example of a tap root system is a carrot. Grasses such as wheat, rice, and corn are examples of fibrous root systems. Fibrous root systems are found in monocots; tap root systems are found in dicots.

36. What might happen to a root if the pericycle disappeared?

The root would not be able to produce lateral roots.

37. How do dicots differ from monocots in terms of leaf structure?

Monocots have leaves with parallel venation, and dicots have leaves with reticulate, net-like venation.

38. Describe an example of a plant with leaves that are adapted to cold temperatures.

Conifers such as spruce, fir, and pine have needle-shaped leaves with sunken stomata, helping to reduce water loss.

39. The process of bulk flow transports fluids in a plant. Describe the two main bulk flow processes.

The process of bulk flow moves water up the xylem and moves photosynthates (solutes) up and down the phloem.

40. Owners and managers of plant nurseries have to plan lighting schedules for a long-day plant that will flower in February. What lighting periods will be most effective? What color of light should be chosen?

A long-day plant needs a higher proportion of the Pfr form to Pr form of phytochrome. The plant requires long periods of illumination with light enriched in the red range of the spectrum.

41. What are the major benefits of gravitropism for a germinating seedling?

Gravitropism will allow roots to dig deep into the soil to find water and minerals, whereas the seedling will grow towards light to enable photosynthesis.

42. Fruit and vegetable storage facilities are usually refrigerated and well ventilated. Why are these conditions advantageous?

Refrigeration slows chemical reactions, including fruit maturation. Ventilation removes the ethylene gas that speeds up fruit ripening.

43. Stomata close in response to bacterial infection. Why is this response a mechanism of defense for the plant? Which hormone is most likely to mediate this response?

To prevent further entry of pathogens, stomata close, even if they restrict entry of CO_2. Some pathogens secrete virulence factors that inhibit the closing of stomata. Abscisic acid is the stress hormone responsible for inducing closing of stomata.