

Reviewing Content

1. b 5. c 9. b
 2. a 6. a 10. d
 3. c 7. b
 4. c 8. c

Understanding Concepts

11. The two kinds of vascular tissue in plants are xylem and phloem. Xylem consists of tracheids and vessel elements, and phloem consists of sieve tube elements and companion cells.
12. Parenchyma cells function mainly in storage and photosynthesis. Collenchyma cells help support large plants, and sclerenchyma cells make tissue tough and strong.
13. A dicot root has a vascular cylinder at its center, surrounded by a cortex of ground tissue. A dicot stem has ground tissue in the center, surrounded by a ring of vascular tissue.
14. The cell membranes of root hairs contain active transport proteins, which pump mineral ions from the soil into the plant, a process that leads to the movement of water into the plant by osmosis. Root hairs absorb most of the water taken in by plants.

20. When the guard cells are filled with water, the pressure within them increases, and they swell. This causes the stomata to open and transpiration to occur. When the guard cells lose water, the stomata close, preventing water from leaving the leaf. This in turn prevents wilting due to excessive loss of water by the leaf.

21. The function of phloem is to pump food down from the leaves into the stems and roots for storage and back again from the roots to other parts of the plant when the food is needed.

22. Source cells are located where sugars are pumped into the phloem, and sink cells are located where there is a low concentration of sugars. The pressure-flow hypothesis explains how phloem moves sugars and water from source cells to sink cells.

30. Grasses have monocot stems, which grow only by primary growth at the apical meristems. Conifers grow by both primary growth at the apical meristems and secondary growth at the vascular cambium.

31. Sample answers: Like a skyscraper, a tree has structures that transport materials from its lowest level to its highest. Unlike a skyscraper, a tree is an organism that functions without human intervention.

32. In early spring, the daily rise and fall of temperature causes the sap to start flowing up from the maple trees' roots. During the summer and autumn, the flow would be in the opposite direction and the sap would not be as concentrated.

Critical Thinking

23. The person training the miniature tree trims off the apical meristems at the tips of shoots and roots. This keeps the tree short. However, the person does not touch the vascular cambium in the stem, so the stem continues to increase in thickness.

24. Students might choose cells from any of the three types of plant tissue: dermal tissue, vascular tissue, or ground tissue. Students should describe how the structure of the cell types is specialized to move water and minerals through the plant.

25. Without the Casparian strip, water could flow out of the xylem and back into the cortex of the root. The Casparian strip seals and waterproofs the cells of the endodermis around their edges so that water can move through them in only one direction.

26. a. How the rates of water intake and transpiration vary with the time of day b. Between about 12:30 and 3:30 PM c. About 35 grams of water d. As transpiration increases or decreases, water intake also increases or decreases.

27. Cactus: spinelike leaves reduce water loss; pine: waxy epidermis and sunken stomata reduce water loss.

28. Students' experimental designs should include reasonable hypotheses and controls.

29. Students' definitions should reflect an understanding of how leaf structures catch light and take in carbon dioxide and water for photosynthesis, as well as how they move the products of photosynthesis to the rest of the plant.

Standardized Test Prep

1. C 5. A 9. B
 2. E 6. E 10. D
 3. E 7. D
 4. D 8. D

(Continued from page 604)

15. In the secondary growth of a stem, the vascular cambium produces vascular tissue and increases the thickness of stems over time.

16. Bark develops from the cork cambium.

17. The three main functions of leaves are photosynthesis, transpiration, and gas exchange.

18. The epidermis and cuticle layers of dermal tissue that form the outer covering of a plant prevent water loss. The function of porelike openings in these layers is to allow gas exchange between the plant and the environment.

19. The properties of water that are important in its movement up a plant are cohesion, or the attraction of water molecules to one another, and adhesion, or the attraction of water molecules to the walls of a tube. As a result of this combination of forces, water is able to rise in tubes by capillary action.