Name _____ Period _____

Chapter 36: Resource Acquisition and Transport in Vascular Plants

Concept 36.1 Land plants acquire resources both above and below ground

1. Competition for light, water, and nutrients is intense among the land plants. Let's look first at adaptations to increase light capture. How do plants reduce *self-shading*?

2. What triggers *self-pruning*?

3. There are different *leaf orientations*, and each orientation affects light capture. Compare the following as to the type of plant that has each orientation, and describe the advantage.

Orientation	Type of Plant	Advantage
vertical leaf orientation		
horizontal leaf orientation		

4. What are *mycorrhizae*, and what is their role in resource acquisition?

Concept 36.2 Transport occurs by short-distance diffusion or active transport and long-distance bulk flow

This section gives you a good review of the transport mechanisms you studied in Chapter 7. The information in the next group of questions should be familiar to you. Also, many AP courses do AP Laboratory 1, Diffusion and Osmosis, along with Chapter 7. It covers the concept of water potential, so now might be a good time to review that lab activity.

5. What is *passive transport*?

6. What is *active transport*?

7. What is the role of *transport proteins*?

8. What are the most important plant cell *transport proteins*? How do they work?

9. What is *membrane potential*? How can it be established?

10. Explain *cotransport*.

11. What is *osmosis*?

12. Plant cells have a rigid cell wall, which adds another factor that affects osmosis: *pressure*. Define *water potential*.

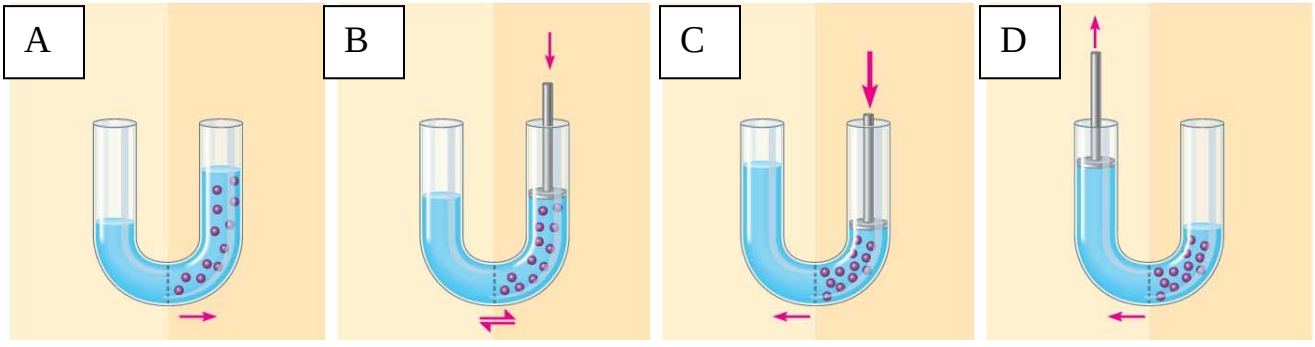
The equation for water potential is $\psi = \psi_s + \psi_p$, where ψ is *water potential*, ψ_s is *solute potential*, and ψ_p is the *pressure potential*. The understanding of this formula is an objective from Laboratory 1 in the AP Laboratory book.

13. By definition, what is the ψ_s of pure water?

14. How does adding solutes to pure water affect water potential?

15. The *solute potential* of a solution is therefore always _____. (negative or positive)

16. What is *pressure potential*? Under what conditions will it decrease?



17. What is the water potential on the left side of tube A? Why?

18. Is the water potential on the right side of tube A positive or negative?

19. Explain, in terms of water potential, why the level of the liquid is higher on the right side of tube A.

20. In tube B, pressure is being applied on the right side. This is much like the pressure exerted by the cell wall when a plant cell takes up water. Explain, in terms of water potential, why the level of liquid is the same on both sides even though the two solutions are not isotonic to each other.

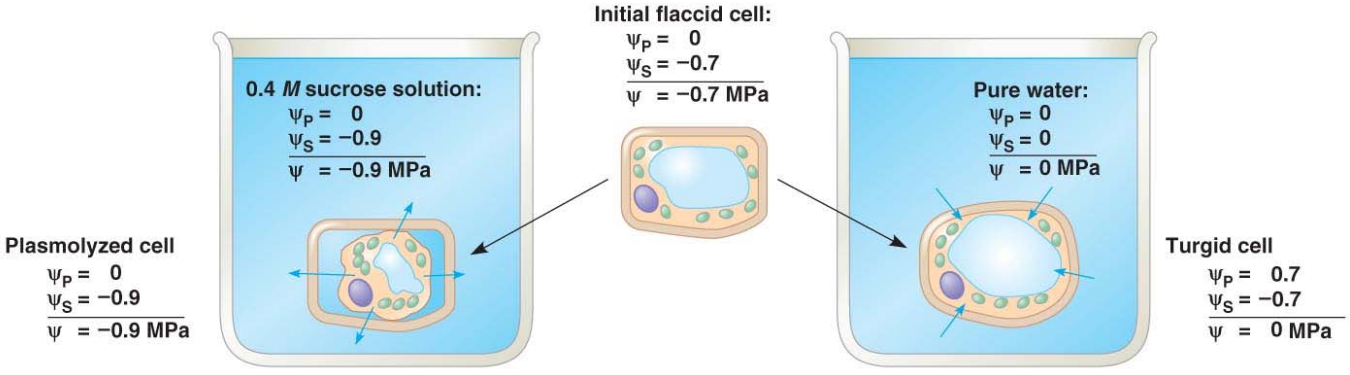
21. To summarize, *water moves from regions of* _____*water potential to regions of* _____*water potential.*

22. Define these terms:
flaccid

turgid

plasmolysis

23. In the figure below, a plant cell that has an initial water potential of –0.7 MPa is placed into two different conditions. Explain, in terms of water potential, what is happening in each case.



a.

b.

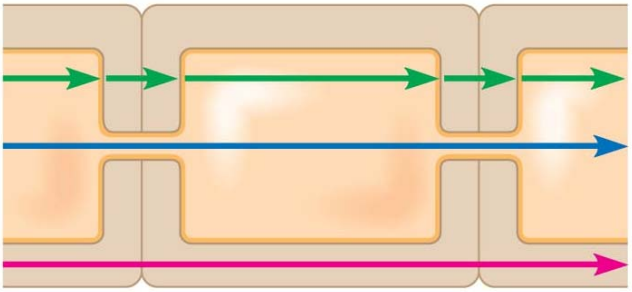
24. What are *aquaporins*?

25. There are three major pathways of transport between plant cells. On the sketch, label and explain:

transmembrane route

apoplast

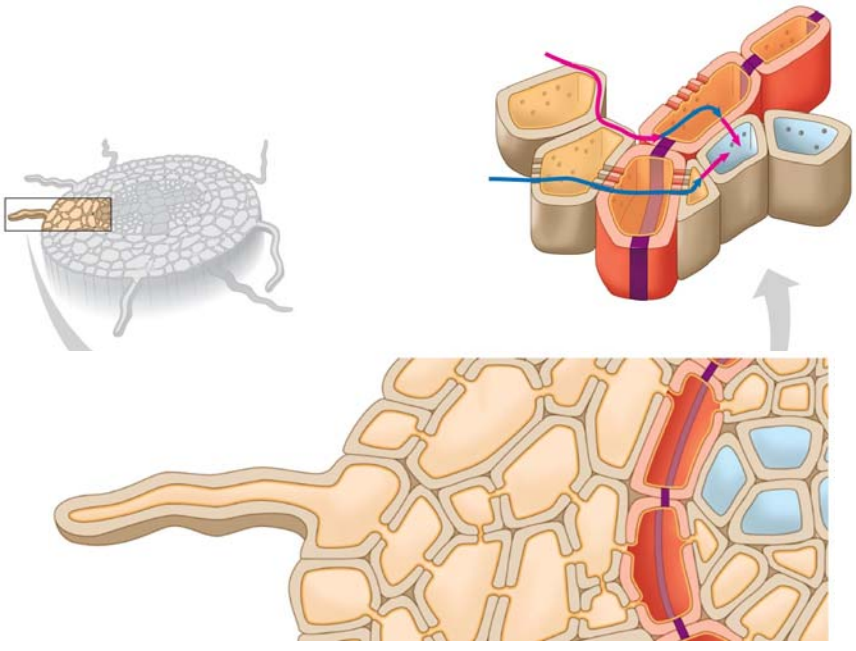
symplast



26. What is *bulk flow*?

Concept 36.3 Water and minerals are transported from roots to shoots

27. On the sketch, use colored pencils to trace the uptake of water and minerals from root hairs to the xylem and phloem in a root, following a *symplastic route* and an *apoplastic route*. Then, label each of the following elements: *root hair, plasma membrane, plasmodesmata, stele, endodermis, Casparian strip, symplastic route*, and *apoplastic route*.



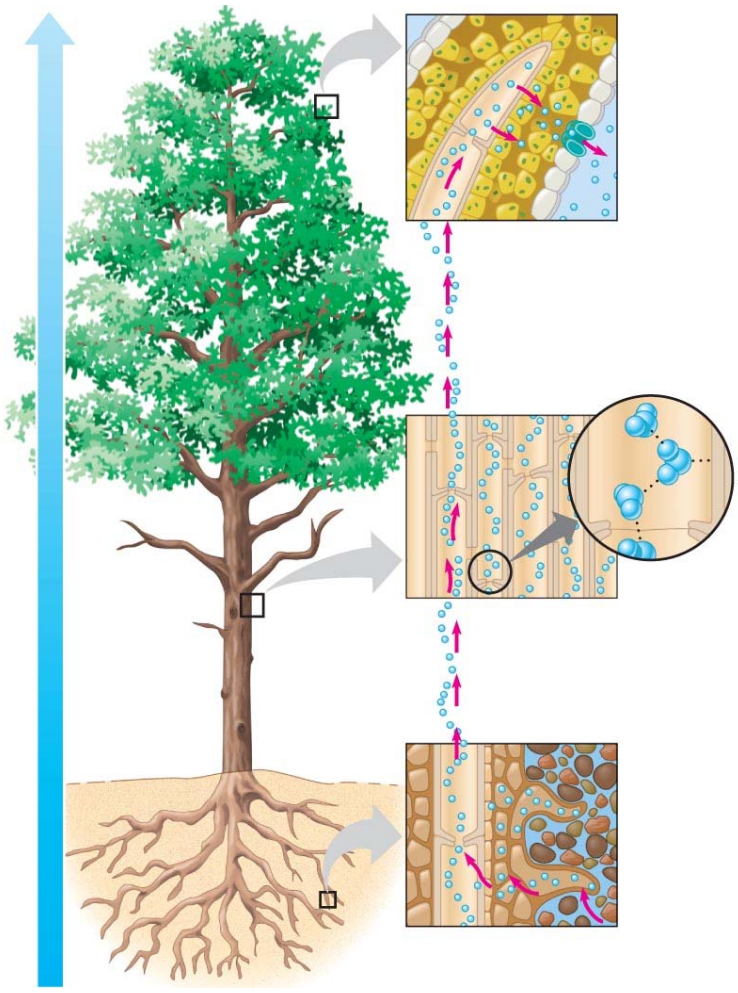
28. What is the role of the *Casparian strip*?

29. Write a short essay to explain the movement of water from the soil into the stele of the root, using all the terms in question 27.

30. What is *transpiration*?

31. There are two mechanisms that pull water up through the plant, from roots to leaves. Explain *root pressure*.

32. The second mechanism that pulls water up through the plant is *transpiration-cohesion-tension*. Refer to this sketch in your text. Note that water is moving from a region of high water potential to a region of lower water potential. The arrow on the left side of the figure shows this gradient. Beginning from where you stopped in question 29, write an essay to explain the movement of water from the roots to the leaves. Include each of these terms in your essay, and label them on the figure: *lower water potential, higher water potential, hydrogen bonding, adhesion, cohesion, xylem tubes*, and *stomata*.



Concept 36.4 Stomata help regulate the rate of transpiration

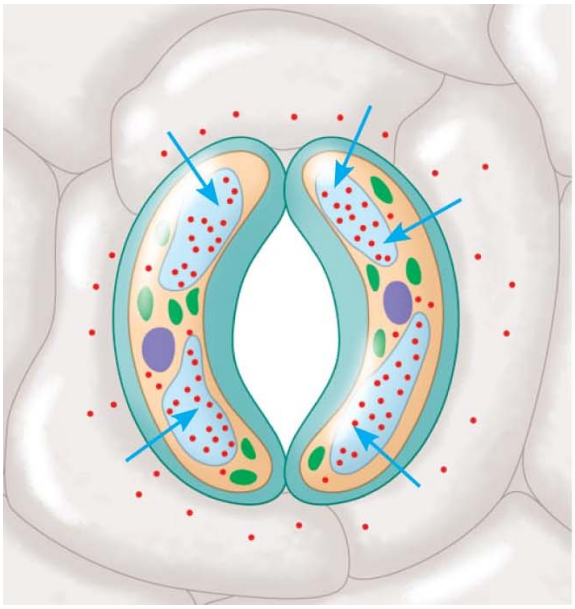
33. Leaves generally have large surface areas and high surface-to-volume ratios. Give an advantage and disadvantage of these traits.

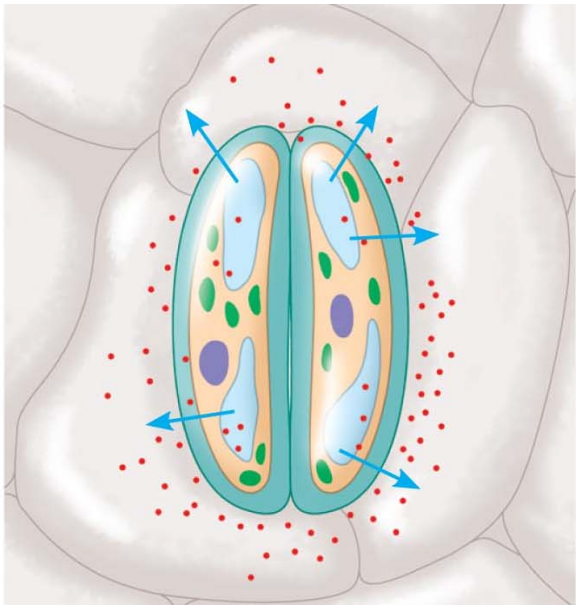
advantage

disadvantage

34. Plants lose 95% of their water through stomata! What controls the amount of water loss?

35. On the sketches, label the *guard cell*, *stomata*, K^+, and H_2O. Explain why the stoma opens when K^+ accumulates in the guard cells.





36. Three types of stimuli can cause guard cells to open. Name and explain how each one works.

Stimulus for Stomatal Opening and Closing	**Explanation**

37. What plant hormone is produced in response to water deficiency?

38. List four different physiological or morphological adaptations of *xerophytes*, and explain how each of them reduces water loss.

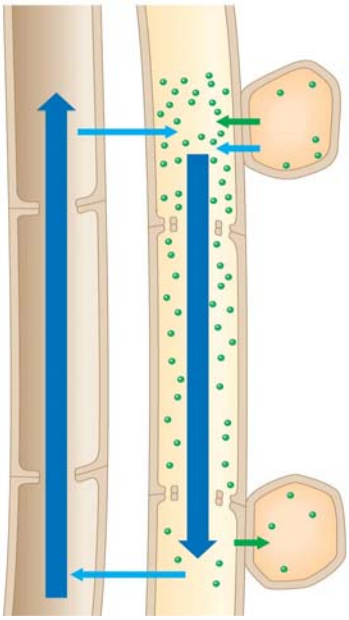
Concept 36.5 Sugars are transported from leaves and other sources to sites of use or storage

39. What is *translocation*?

40. What is a *sugar source*, and what is a *sugar sink*? Give an example of each.

41. What cell types transport the sugars?

42. Explain the process of *pressure flow* by annotating the figure below. Refer to your text, and divide this process into four steps.



43. Study Figure 36.21. How do aphids feed? When houseplants are infested with aphids, why is there a sticky mess on the floor around them?

Concept 36.6 The symplast is highly dynamic

44. Give two specific signals that move through the symplast, and describe the function of each signal.

Testing Your Knowledge: Self-Quiz Answers
Now you should be ready to test your knowledge. Place your answers here:

1._____ 2._____ 3._____ 4._____ 5._____ 6._____ 7._____

8._____ 9._____ 10._____