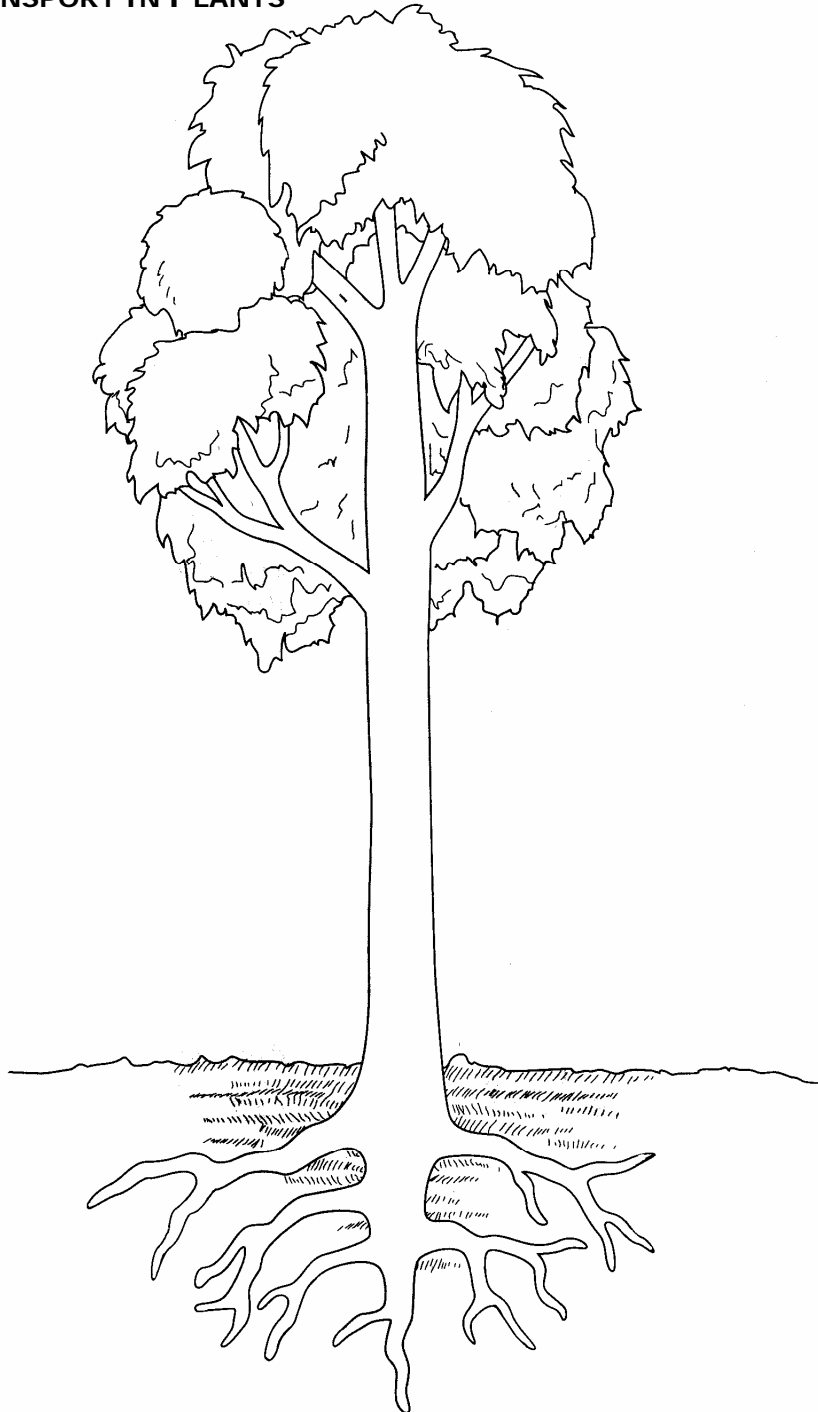
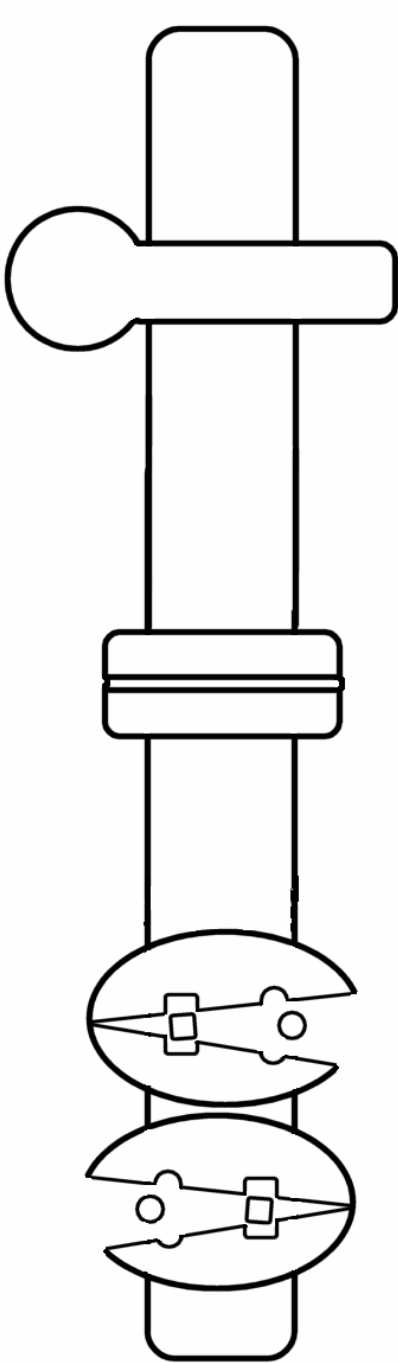


TRANSPORT IN PLANTS

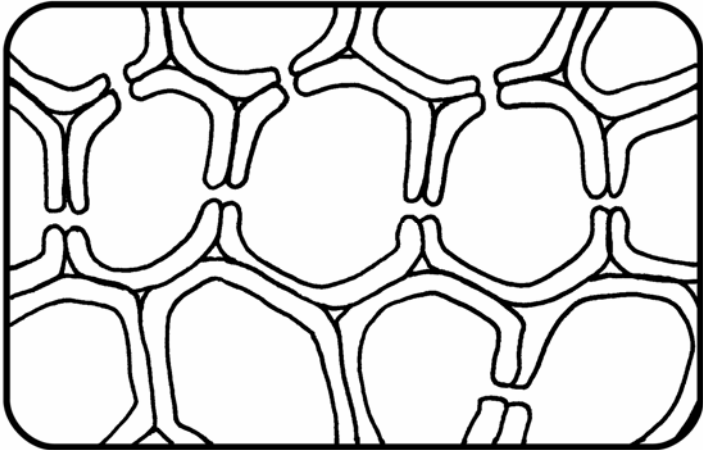
OVERVIEW OF TRANSPORT IN PLANTS



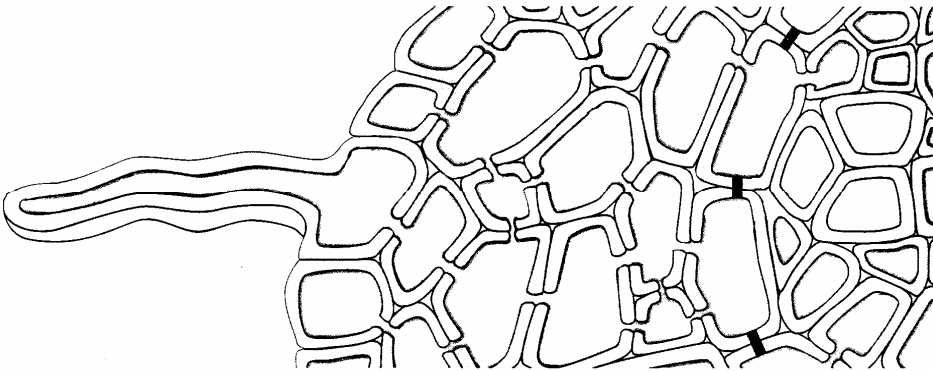
PROTON PUMPS



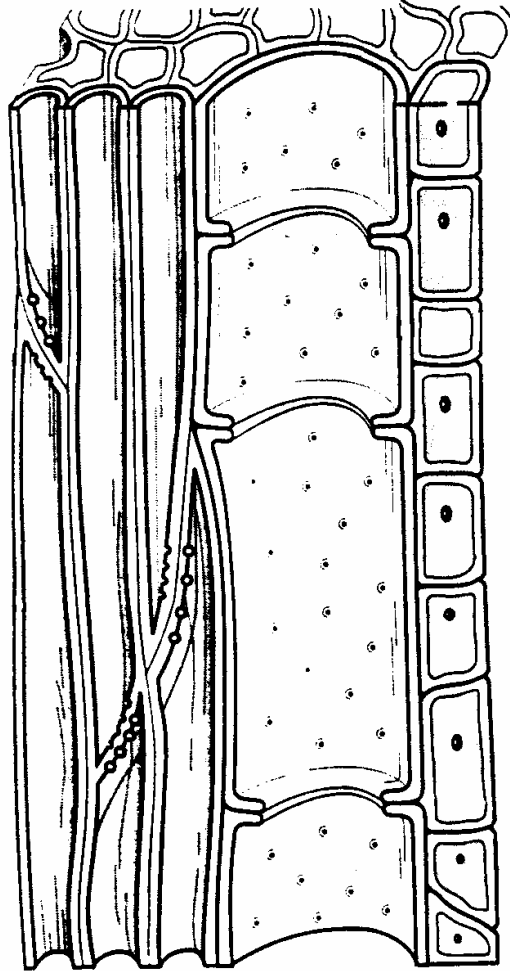
LATERAL TRANSPORT ROUTES IN PLANTS



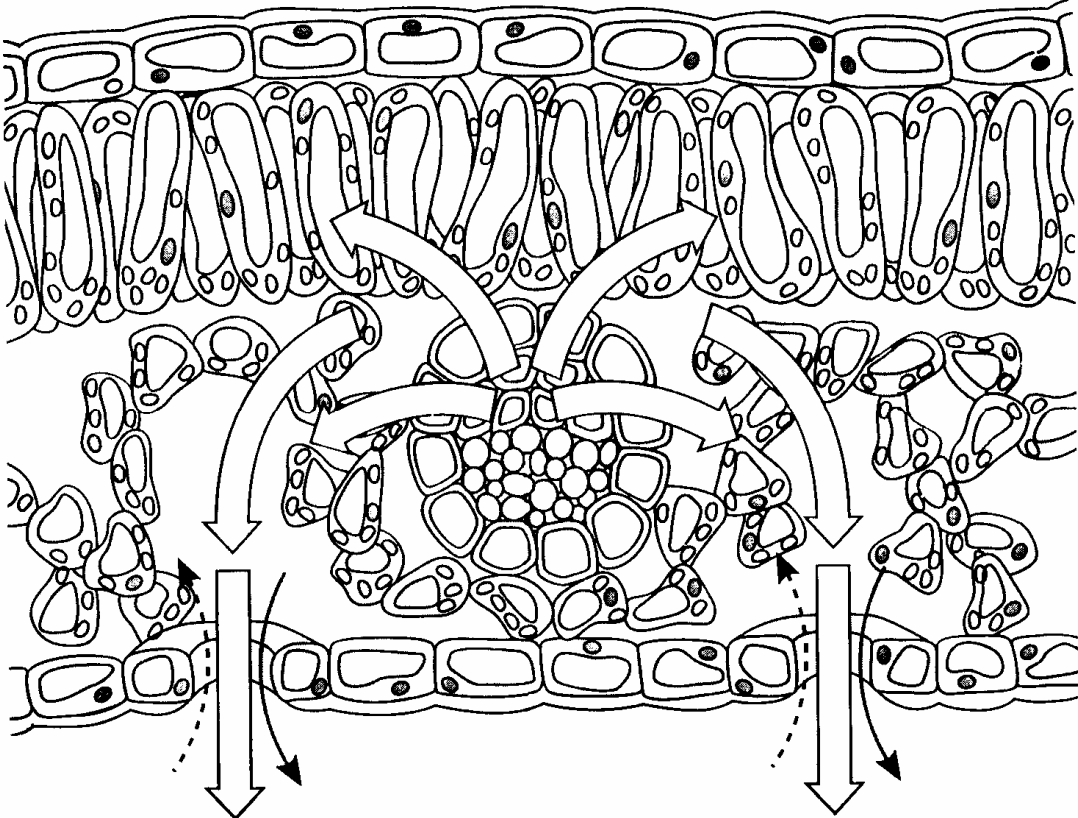
LATERAL TRANSPORT IN ROOTS



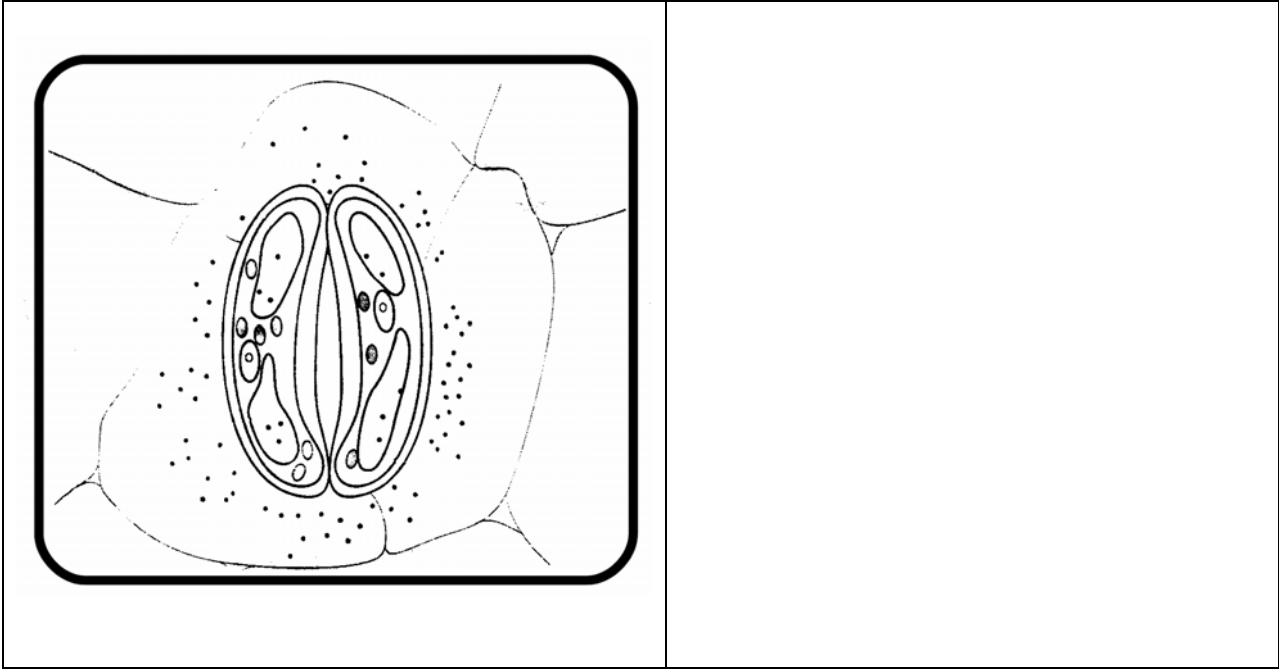
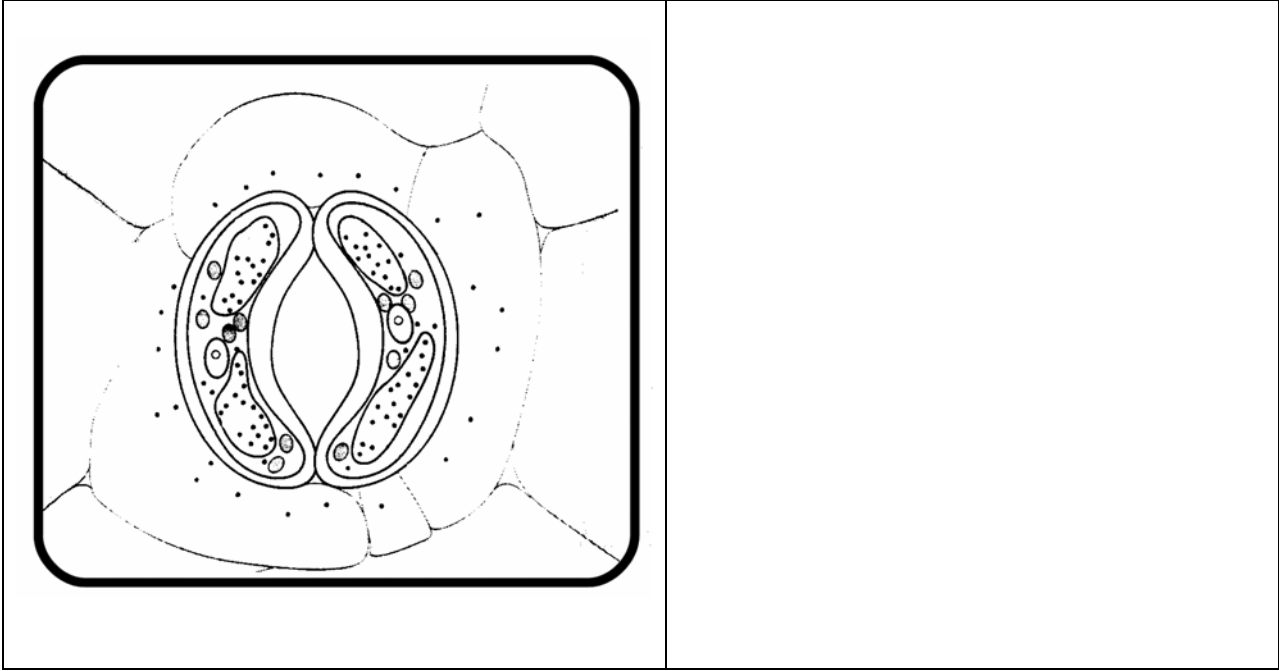
WATER TRANSPORT IN STEM



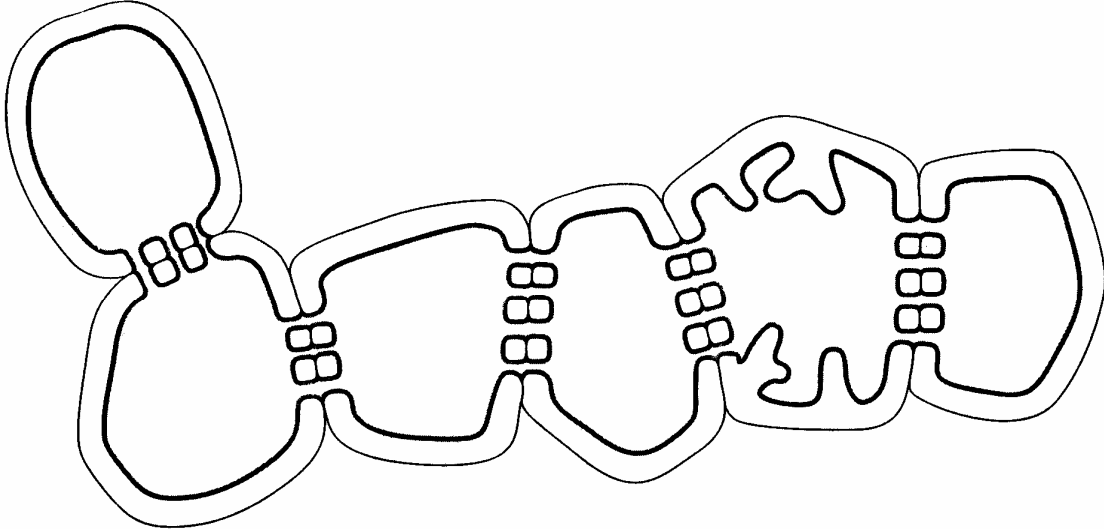
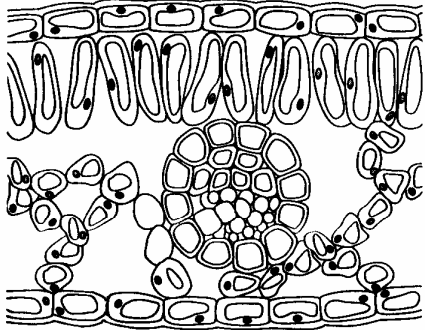
TRANSPIRATION



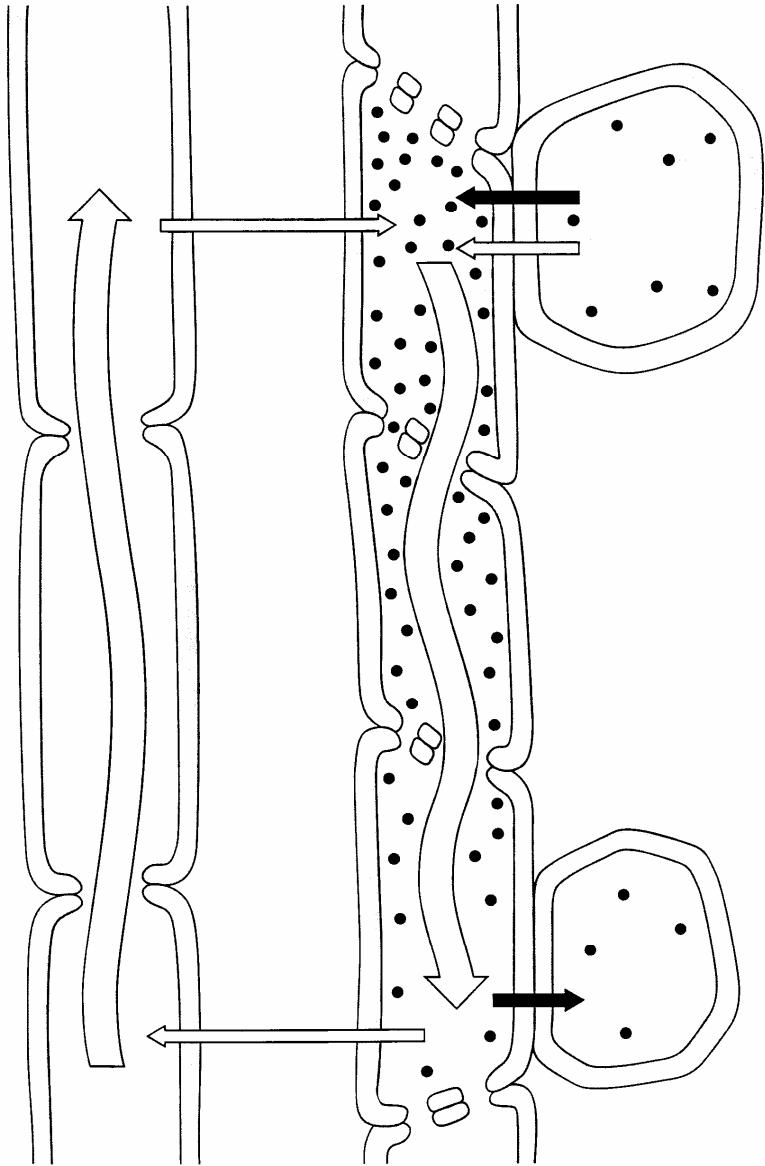
GUARD CELLS



PHLOEM LOADING



BULK TRANSPORT IN PHLOEM



QUESTIONS:

1. Transport at the cellular level depends on what membrane property?

2. Transport at the cellular level involves both active and passive transport. Determine if each of the following is true of **A**ctive or **P**assive transport.

_____ Requires cell energy

_____ Diffusion

_____ Transport proteins act as carrier molecules or provide a selective channel through which the material can pass

_____ Moves solutes down their concentration gradient

_____ Moves solutes against their concentration gradient

_____ Does not require cell energy

_____ Proton pumps

_____ Cotransport

3. Explain how the membrane potential generated by proton pumps is used to move K⁺ down its electrochemical gradient.

4. Explain how cotransport works in plant cells.

5. What is water potential?

6. Water potential takes into account two factors. List them.

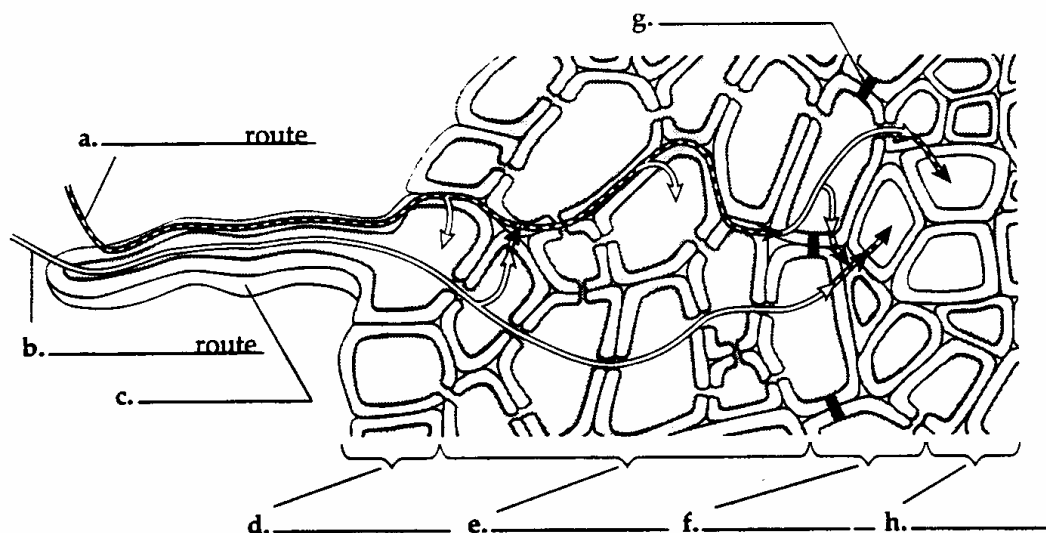
7. Water moves from _____ water potential to _____ water potential.
8. What is the water potential of pure water? _____
9. Explain what effect each of the following has on water potential:
 - a. Adding solutes to water. _____
 - b. Increased pressure. _____
10. Explain why a cell in a more concentrated solution (hyperosmotic) will lose water.

11. Explain what happens to a plant cell that is placed in pure water.

12. What is the role of the tonoplast in plant cells?

13. Match the following parts with the correct letter from the diagram at the right.

- | | |
|-----------------------|----------------------------|
| _____ Apoplastic | _____ Epidermis |
| _____ Casparian strip | _____ Root hair |
| _____ Cortex | _____ Stele (xylem vessel) |
| _____ Endodermis | _____ Symplastic |



14. Most of the water and minerals are absorbed by the: _____

15. How does the endodermis affect the movement of water and minerals into the stele?

16. What is transpiration?

17. Define root pressure. _____

18. What causes water flow into the stele? _____

19. What is guttation? _____

When does it occur? _____

20. Root pressure is not the major mechanism for moving xylem sap from the roots to the leaves. What is?

21. Why does water exit the leaf? _____

22. What causes water to be pulled from the xylem in a leaf vein into the mesophyll cells and into the surface film lining the air spaces of the leaf?

23. What is cohesion and what effect does it have on the movement of water in xylem?

24. What is adhesion and what effect does it have on the movement of water in xylem?

25. Explain how water and minerals are transported up the xylem.

26. What is the photosynthesis--transpiration compromise?

27. What are guard cells and where are they found?

28. Explain how guard cells control the rate of transpiration.

29. The stomata open when the guard cells become _____

30. The stomata close when the guard cells become _____

31. In general, the stomata are usually open _____ and closed _____.

32. List three factors that cause stomata to open at dawn.

33. Explain why guard cells swell and become turgid at dawn.

34. Explain how environmental stress can cause guard cells to close during the day.

35. What adaptations allow xerophytes to reduce transpiration?

36. What adaptations allow CAM plants to reduce transpiration?

37. What is translocation?

38. What is the function of sieve-tube members?

39. What is the composition of phloem sap?

40. Phloem sap flows from the _____ to the _____.

41. Define the following terms related to phloem sap flow:

a. Source: _____

b. Sink: _____

42. Explain how a tuber (i.e. white potato) can act as both the sink and the source.

43. What is the role of the companion cells during phloem loading?

44. Describe the mechanism involved in pressure flow (bulk flow) of phloem sap:

at the source end	
at the sink end	