TRANSPORT IN PLANTS

OVERVIEW OF TRANSPORT IN PLANTS
PROTON PUMPS
LATERAL TRANSPORT ROUTES IN PLANTS

LATERAL TRANSPORT IN ROOTS
WATER TRANSPORT IN STEM
TRANSPIRATION
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 Active or Passive 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:

<table>
<thead>
<tr>
<th>at the source end</th>
<th></th>
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<tbody>
<tr>
<td>at the sink end</td>
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