

Name: _____

Chapter 29 Active Reading Guide

Resource Acquisition, Nutrition, and Transport in Vascular Plants

Section 1

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		
Horizontal		

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

Section 2

The information in the next group of questions should be familiar to you. Also, many AP courses do AP Laboratory 4, Diffusion and Osmosis, along with Chapter 5. This lab covers the concept of water potential, so now might be a good time to review that lab activity.

5. Plant tissues have two major compartments. What are the components of the:
apoplast:

symplast:

6. These compartments provide three routes for transport within plant tissues or organs. Explain each.
apoplastic route:

symplastic route:

transmembrane route:

7. Transport in plants involves the same mechanisms seen in other cells, but for now, let's focus on some ways plants differ from animals in solute transport. As you read your text, study Figure 29.5 to highlight processes of solute transport across plant cell membranes. Give a short description of each process.

8. What is membrane potential? How can it be established?

9. Explain cotransport.

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

11. By definition, what is the Ψ_s of pure water? _____

12. How does adding solute to pure water affect water potential?

13. The solute potential of a solution is therefore always _____.
14. What is pressure potential? Under what conditions will it decrease?
15. To summarize, water moves from regions of _____ water potential to regions of _____ water potential.
16. Define these terms:
flaccid:

turgid:

plasmolysis:
17. In Figure 29.6, 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)
18. What are aquaporins?
19. What is bulk flow?

Section 3

20. What is an essential nutrient? (Text refers to essential elements.)
21. What are the nine macronutrients? List them in order of relative abundance in plants. (You may use atomic symbols.)
22. What is a primary role of magnesium?

23. What three macronutrients are most commonly deficient? You should notice that these are the same three nutrients found in most fertilizers.
24. Which nutrient is most limiting to plant growth on a global scale?

Section 4

25. Plants have mutualistic relationships with bacteria that help make nitrogen more available. Nitrogen-fixing bacteria such as *Rhizobium* are able to convert atmospheric nitrogen (N_2), which plants cannot use, to ammonia (NH_3), which they can use. Briefly describe the nitrogen cycle.
26. Where is the nitrogen-fixing bacterium *Rhizobium* found?
27. The principle of crop rotation employs alternation of a crop that depletes nitrogen with a legume crop that fixes nitrogen. In the United States, this often means alternation of corn with soybeans. Which of these two crops is the nitrogen depleter? The nitrogen fixer?
28. How do mycorrhizae enhance plant nutrition?
29. In many parts of the eastern United States, garlic mustard has become a serious pest. What is its negative impact on native species, and how does it appear to do this?
30. What is an epiphyte? Name three different plant types that are epiphytic.
31. Dodder and Indian pipes are nongreen, nonphotosynthetic flowering plants. How do they obtain nutrients?

32. Carnivorous plants such as the Venus flytrap and sundews are photosynthetic. Why, then, do they capture insects?

Section 5

33. What is the role of the Casparian strip?
34. Explain the movement of water from the soil into the stele of the root.
35. What is transpiration?
36. There are two mechanisms that pull water up through the plant, from roots to leaves. Explain root pressure. Note that it is a minor mechanism for the movement of water upward.
37. What is the cohesion-tension hypothesis? Explain this hypothesis.

Section 6

38. Leaves generally have large surface areas and high surface-to-volume ratios. Give an advantage and disadvantage of these traits.
- advantage:
- disadvantage:
39. Plants lose 95% of their water through stomata! What controls the amount of water loss?

40. Explain why the stoma opens when K^+ accumulates in the guard cells.
41. Three types of stimuli can cause guard cells to open stomata. Name and explain how each one works.
42. What plant hormone is produced in response to water deficiency?
43. List four different physiological or morphological adaptations of xerophytes, and explain how each of them reduces water loss.

Section 7

44. What is translocation?
45. What is a sugar source, and what is a sugar sink? Give an example of each.
46. What cell types transport the sugars?
47. Explain the process of pressure flow.