

Name \_\_\_\_\_ Period \_\_\_\_\_

**Chapter 7: Membrane Structure and Function**

Transport of materials across the membrane is an essential cell function, so you will need to understand the component molecules and their functions. There is considerable vocabulary associated with the movement of materials and concentrations on either side of the membrane, which you will need to accurately describe transport. Big Idea 2 has several specific LOs on membranes and transport, which you should have mastered when you complete this chapter.

**Concept 7.1 Cellular membranes are fluid mosaics of lipids and proteins**

1. Phospholipids are *amphipathic*. Explain what this means.
2. The currently accepted model of the plasma membrane is the *fluid mosaic model*. Describe this model.
3. What is meant by *membrane fluidity*?
4. Describe how each of the following can affect membrane fluidity:
  - a. decreasing temperature
  - b. phospholipids with unsaturated hydrocarbon chains
  - c. cholesterol
  - d. increasing the number of saturated hydrocarbon tails
5. Membrane proteins are the *mosaic* part of the model. Describe each of the two main categories:  
**integral proteins**  
**peripheral proteins**

6. Study Figure 7.7 in your text. Use it to briefly describe the following major functions of membrane proteins.

| Function                           | Description |
|------------------------------------|-------------|
| Transport                          |             |
| Enzymatic activity                 |             |
| Signal transduction                |             |
| Cell-cell recognition              |             |
| Intercellular joining              |             |
| Attachment to cytoskeleton and ECM |             |

7. Membrane carbohydrates are important in cell-cell recognition. What are two examples of this?
8. Distinguish between *glycolipids* and *glycoproteins*.
9. Label the following components of an animal cell membrane on the figure. Note the role of each component.

**glycolipid**

**glycoprotein**

**integral protein**

**peripheral protein**

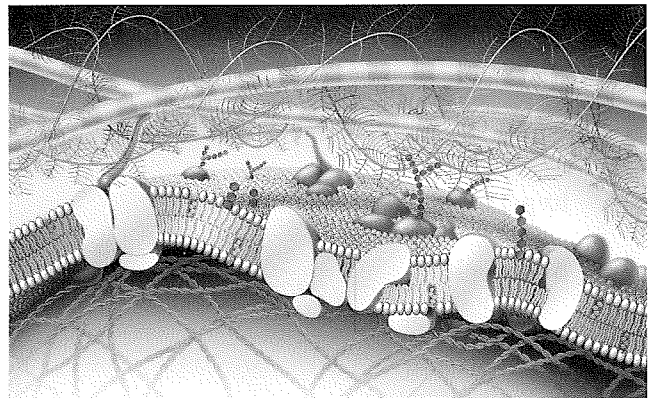
**cholesterol**

**phospholipid**

**ECM fibers**

**cytoskeleton microfilaments**

**integrins (go back to Chapter 6, Figure 6.28)**



**Concept 7.2 Membrane structure results in selective permeability**

10. Distinguish between *channel proteins* and *carrier proteins*.
11. Are transport proteins specific? Cite an example that supports your response.

12. Peter Agre received the Nobel Prize in 2003 for the discovery of *aquaporins*. What are they?
13. Consider the following materials that must cross the membrane. For each, tell how it is moved across.

| Material         | Method of Transport |
|------------------|---------------------|
| CO <sub>2</sub>  |                     |
| Glucose          |                     |
| H <sup>+</sup>   |                     |
| O <sub>2</sub>   |                     |
| H <sub>2</sub> O |                     |

*Concept 7.3 Passive transport is diffusion of a substance across a membrane with no energy investment*

14. Define the following terms:

**diffusion**

**concentration gradient**

**passive transport**

**osmosis**

**isotonic**

**hypertonic**

**hypotonic**

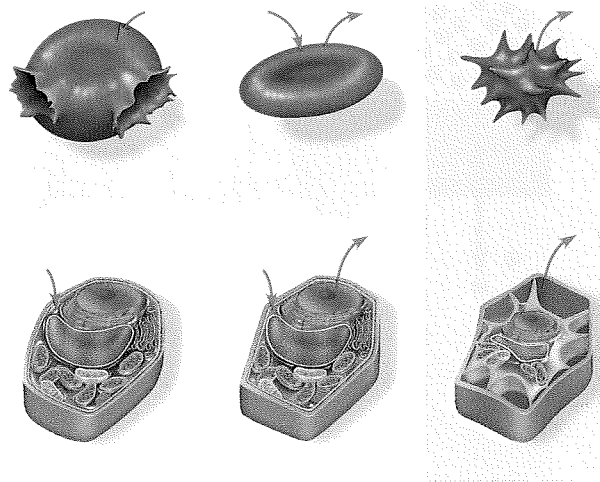
**turgid**

**flaccid**

**plasmolysis**

15. Use as many words as possible from the previous list to describe why a carrot left on the counter overnight becomes limp. Underline or highlight each word you use.
16. What is *facilitated diffusion*? Is it active or passive? Cite two examples.

17. In the following figure, label the *hypotonic solution*, *isotonic solution*, and *hypertonic solution*. What is indicated by the *blue arrows*? Label them. Which cell is *lysed*? *Turgid*? *Flaccid*? *Plasmolyzed*? Apply all these labels.



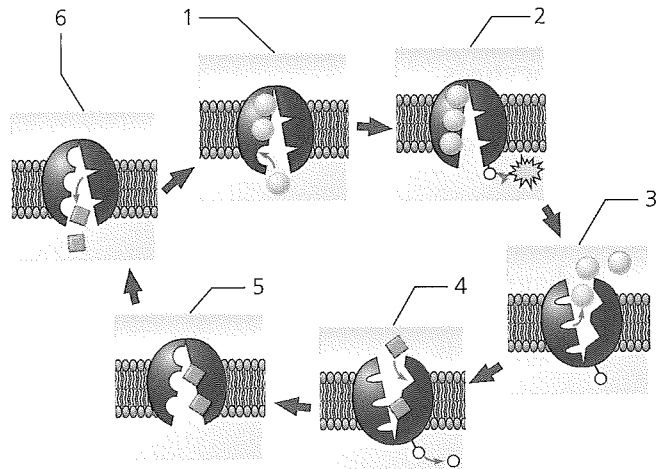
18. Why does the red blood cell burst when placed in a hypotonic solution, but not the plant cell?

**Concept 7.4 Active transport uses energy to move solutes against their gradients**

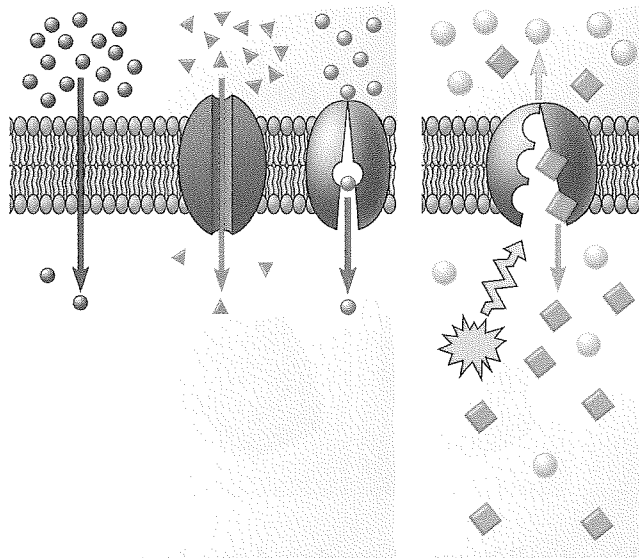
19. Describe *active transport*. What type of transport proteins are involved, and what is the role of ATP in the process?
20. The *sodium-potassium pump* is an important system for you to know. Use the following diagram to understand how it works. Use these terms to label the figures, and briefly summarize what is occurring in each step: *extracellular fluid*, *cytoplasm*,  $Na^+$ ,  $K^+$ , *ATP*, *ADP*, *P*, and *transport protein*.

**SUMMARY: SODIUM-POTASSIUM PUMP**

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.



21. On the following diagram, add these labels: *facilitated diffusion with a carrier protein*, *facilitated diffusion with a channel protein*, *active transport with a carrier protein*, and *simple diffusion*. For each type of transport, give an example of a material that is moved in this manner.



### Examples

22. What is *membrane potential*? Which side of the membrane is positive?
23. What are the two forces that drive the diffusion of ions across the membrane? What is the combination of these forces called?
24. What is *cotransport*? Explain how understanding it is used in our treatment of diarrhea.

### Concept 7.5 Bulk transport across the plasma membrane occurs by exocytosis and endocytosis

25. Define each of the following, and give a specific cellular example:

**exocytosis**

**endocytosis**

**receptor-mediated endocytosis**

**phagocytosis**

**pinocytosis**

26. What is a *ligand*? What do ligands have to do with receptor-mediated endocytosis?
27. Are the processes you described in question 26 active or passive transport? Explain your response.

*Test Your Understanding Answers*

Now you should be ready to test your knowledge. Place your answers here:

1. \_\_\_\_\_ 2. \_\_\_\_\_ 3. \_\_\_\_\_ 4. \_\_\_\_\_ 5. \_\_\_\_\_

Reproduce the diagram for question 6, and draw arrows as instructed.

6b. \_\_\_\_\_ 6d. \_\_\_\_\_ 6e. \_\_\_\_\_