Chapter 8 Review

READING TOOLBOX

1. **Four-Corner Fold** Make a four-corner fold to compare methods cells use to transport substances across their membranes.

2. **Concept Map** Make a concept map that shows how cells maintain homeostasis. Try to include the following terms in your map: *concentration gradient, diffusion, osmosis,* and *carrier protein.*

Using Key Terms

3. Differentiate between *diffusion* and *osmosis.*

Use each of the following terms in a separate sentence.

4. *equilibrium*

5. *concentration gradient*

Understanding Key Ideas

6. In the cell membrane, the fatty acid tails of phospholipid molecules point
   - **a.** toward each other.
   - **b.** away from each other.
   - **c.** toward the cytoplasm.
   - **d.** toward the outside of the cell.

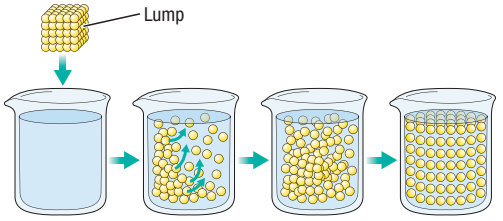
7. What keeps membrane proteins within the cell membrane?
   - **a.** the pressure of the cytoskeleton against the proteins in the membrane
   - **b.** the pressure of the phospholipids in the lipid bilayer against the proteins in the membrane
   - **c.** the pressure of the cytoplasm against the proteins in the membrane
   - **d.** the attractions between the polar and nonpolar portions of the proteins and the lipid bilayer

8. What does the sodium-potassium pump do?
   - **a.** It moves sodium and potassium into the cell.
   - **b.** It moves sodium and potassium out of the cell.
   - **c.** It moves sodium into the cell and potassium out of the cell.
   - **d.** It moves sodium out of the cell and potassium into the cell.

9. A cell that produces a signal molecule is called a
   - **a.** target cell.
   - **b.** marker cell.
   - **c.** recipient cell.
   - **d.** signaling cell.

10. Signal molecules bind to
    - **a.** carbohydrates.
    - **b.** phospholipids.
    - **c.** marker proteins.
    - **d.** receptor proteins.

Use the diagram to answer the questions that follow.



11. What process does the diagram show?
    - **a.** osmosis
    - **b.** diffusion
    - **c.** active diffusion
    - **d.** facilitated diffusion

12. In this process, the substance moves
    - **a.** down its concentration gradient.
    - **b.** independently of its concentration.
    - **c.** against its concentration gradient.
    - **d.** from an area of lower concentration to an area of higher concentration.

Explaining Key Ideas

13. **Explain** why the cell needs a selectively permeable barrier.

14. **Describe** the structure of the lipid bilayer of the cell membrane.

15. **Relate** osmosis and diffusion.

16. **Contrast** the action of carrier proteins in facilitated diffusion and active transport.

17. **Explain** how the sodium-potassium pump contributes to homeostasis in an animal.

18. **Compare** two ways that the binding of a signal molecule to a receptor protein causes a change in the activity of the receiving cell.

Assignment Guide

Section	Questions
1	6, 7, 13, 14, 19, 20, 21
2	1, 2, 3, 4, 5, 8, 11, 12, 15, 16, 17, 22, 23, 24, 28, 29, 30, 31
3	9, 10, 18, 25, 26, 27

Review

Reading Toolbox

1. Check students' work for accuracy.
2. See previous page for answer to concept map.

Using Key Terms

3. *Diffusion* is the movement of a substance down its concentration gradient whereas osmosis is the diffusion of water.
4. When a space is filled evenly, a state called *equilibrium* is reached.
5. In active transport, substances move against the *concentration gradient.*

Understanding Key Ideas

6. a 7. d 8. d 9. d
10. d 11. b 12. a

Explaining Key Ideas

13. A selectively permeable barrier enables needed materials to pass into and out of the cell while keeping other materials out.
14. The phospholipids are oriented in a double layer. The nonpolar tails make up the interior of the lipid bilayer. The polar heads are oriented toward the outside and interior of the cell.
15. Osmosis is a type of diffusion that involves free water molecules.
16. In facilitated diffusion, carrier proteins move substances down their concentration gradients. In active transport, carrier proteins use energy to move substances against their concentration gradient.
17. The pump prevents sodium ions from accumulating in the cell, thus helping the cell maintain its sodium ion balance. Osmosis resulting from an increased sodium ion concentration could cause the cell to swell and burst. Thus, the sodium-potassium pump also helps the cell maintain its water balance.
18. When a signal molecule binds to a receptor protein, the receptor protein may cause an ion channel to open. Alternatively, the activated receptor protein may activate a second messenger, which may activate enzymes or open ion channels.

Using Science Graphics

19. the amoeba cell
20. the amoeba cell

Critical Thinking

21. Nonpolar molecules can pass through the membrane unassisted because the nonpolar lipid tails in the interior of the bilayer repel water and other polar/water-soluble molecules and ions.
22. The jellyfish's tissues would absorb freshwater by osmosis and most likely die.
23. The sodium-potassium pump transports potassium ions into muscle cells.
24. This suggests that the cell membrane's inner and outer layers have common elements and may be very similar in structure.
25. The liver cells would be unable to communicate with each other and cells in the rest of the body; the organism would die.

Alternative Assessment

26. Students' stories and cartoons should not be overly complicated, including just a few main cell types.

Why It Matters

27. Caffeine replaces adenosine in the binding sites, changing normal cell responses. So, the binding site must be complementary to the parts that are similar in caffeine and adenosine.

Methods of Science

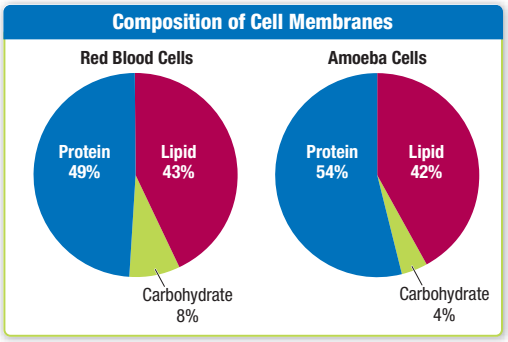
28. No, because the bag is not selectively permeable.
29. One can infer that the inside of the lysosome is acidic because of the hydrogen ions in lysosomes.

Math Skills

30. 0.4 g/mL × 2 mL = 0.8 g of sugar; 2 mL + 8 mL = 10 mL; The concentration of the solution in beaker B will be 0.8 g/10 mL, or 0.08 g/mL.
31. A sodium potassium pump transports 2 potassium ions into the cell for every 3 sodium ions it transports out of the cell. 12 × 2/3 = 8. The pump transports 8 potassium ions into the cell.

Using Science Graphics

The amounts of protein, lipid, and carbohydrate found in the cell membrane differ depending on the type of cell. The two diagrams show the composition of the cell membrane of a human red blood cell and the cell membrane of an amoeba, a single-celled protist. Use the diagrams to answer the questions that follow.



19. **Identify** the type of cell in which the percentage of the cell membrane made up of proteins is larger.
20. **Identify** the type of cell in which the ratio of carbohydrate to lipid is smaller.

Critical Thinking

21. **Recognizing Relationships** How does the arrangement of phospholipids influence the permeability of the lipid bilayer?
22. **Applying information** Using what you know about osmosis, explain what would happen to a jellyfish if it were placed in a freshwater lake.
23. **Applying Information** During exercise, potassium ions tend to accumulate in the fluid that surrounds muscle cells. Which protein in the cell membrane helps muscle cells counteract this tendency? Explain your answer.
24. **Inferring Relationships** When a cell takes in substances through endocytosis, the outside of the cell membrane becomes the inside of the vesicle. What might this transformation suggest about the structure of the cell membrane?
25. **Making Inferences** What would happen if all receptor proteins were removed from the membranes of all liver cells?

Alternative Assessment

26. **Cellular Conversation** When a physician taps your knee, your leg automatically jerks. Use Internet or library resources to learn about the rapid cell signaling that is involved in this knee-jerk reflex. Write a "conversation" that could occur between these cells. Create a comic strip, a short story, or a skit based on the conversation, and present it to your class.

Why It Matters

27. **Research** The molecular structure of caffeine is similar to the structure of a signal molecule that your body produces naturally. Find out what this signal molecule is, and compare its structure to caffeine's. Propose some properties of the binding site of the receptor protein to which caffeine binds.

Methods of Science

28. **Evaluating Models** A student wants to model osmosis by placing a mesh bag in a solution of salt water. The bag fills up with a saltwater concentration that is the same as the concentration of the solution outside of the bag. Is this model a good model for osmosis?
29. **Connecting Concepts** Transport proteins in the membrane of a lysosome move hydrogen ions into the lysosome. Use this information to predict whether digestive enzymes in a lysosome work best in a neutral, basic, or acidic environment.

Math Skills

30. **Concentration** The concentration of a solution in Beaker A is 0.4 g/mL. Beaker B contains 8 mL of water. Two milliliters of the solution in Beaker A is poured into Beaker B. When the solution in Beaker B reaches equilibrium, what is its concentration?
31. **Ratios** Suppose a sodium-potassium pump transports 12 sodium ions out of the cell. How many potassium ions did this pump transport into the cell?