

CHAPTER 9—HOMEOSTASIS AND THE PLASMA MEMBRANE

MULTIPLE CHOICE

- Water moves into a cell placed in a(n) _____ solution.
 - osmotic
 - hypertonic
 - hypotonic
 - isotonicANS: C DIF: B OBJ: 9-4
- Water moves out of a cell if the cell is placed in a(n) _____ solution.
 - hypertonic
 - isotonic
 - hypotonic
 - passiveANS: A DIF: B OBJ: 9-4
- If cells are placed in a strong sugar solution, water will _____.
 - pass from the sugar solution to the cells
 - pass from the cells to the sugar solution
 - stay in the cell
 - pass back and forthANS: B DIF: B OBJ: 9-4
- Because cells have a watery environment both inside and outside, the polar ends of the phospholipids in the plasma membrane form _____ layers.
 - several
 - mosaic
 - double
 - singleANS: C DIF: B OBJ: 9-2
- The fluid mosaic model describes a structure with _____.
 - polar layers on the outside and a nonpolar layer on the inside
 - nonpolar layers on the outside and a polar layer on the inside
 - polar layers on both inside and outside
 - nonpolar layers on both inside and outsideANS: A DIF: B OBJ: 9-2
- Because the phospholipid molecules and some proteins are free to move, the plasma membrane is said to be a _____.
 - bilayer
 - solid
 - fluid mosaic
 - fatty acidANS: C DIF: B OBJ: 9-2

9-1

- When some molecules go through a membrane faster than others, the membrane is _____.
 - impermeable
 - selectively permeable
 - permeable
 - defectiveANS: B DIF: B OBJ: 9-1
- Which of the following might be a result of a disease that causes a thickened plasma membrane?
 - increased movement of molecules entering the cell
 - decreased movement of molecules within the cell
 - decreased movement of molecules entering the cell
 - increased movement of molecules leaving the cellANS: C DIF: B OBJ: 9-1
- A cell's contents would be the same as its surroundings, were it not for _____.
 - plasmolysis
 - selective permeability
 - phagocytosis
 - dynamic equilibriumANS: B DIF: B OBJ: 9-3
- A cell moves particles from a region of lesser concentration to a region of greater concentration by _____.
 - facilitated diffusion
 - passive transport
 - osmosis
 - active transportANS: D DIF: B OBJ: 9-3
- A plasma membrane is most fluid if it contains _____.
 - unsaturated fatty acids
 - cholesterol
 - saturated fatty acids
 - proteinsANS: A DIF: B OBJ: 9-1
- If it is not watered, a tulip plant wilts because it _____.
 - increases active transport
 - increases turgor pressure
 - loses active transport
 - loses turgor pressureANS: D DIF: B OBJ: 9-3

9-2

13. If a cell is placed in salt water, water leaves the cell by _____.

- a. osmosis
- b. diffusion
- c. active transport
- d. phagocytosis

ANS: A DIF: B OBJ: 9-3

14. Diffusion continues until there is no _____.

- a. dynamic equilibrium
- b. turgor pressure
- c. concentration gradient
- d. homeostasis

ANS: C DIF: B OBJ: 9-3

15. Which of the following is not a form of passive transport?

- a. facilitated diffusion
- b. endocytosis
- c. diffusion
- d. osmosis

ANS: B DIF: B OBJ: 9-3

16. A plasma membrane is made up of a(n) _____.

- a. cholesterol layer
- b. enzyme bilayer
- c. lipid bilayer
- d. protein layer

ANS: C DIF: B OBJ: 9-1

17. Brownian motion is evidence of _____.

- a. polar ions
- b. random motion of molecules
- c. chemical energy
- d. microorganisms

ANS: B DIF: B OBJ: 9-3

18. The structure most responsible for maintaining cell homeostasis is the _____.

- a. cytoplasm
- b. mitochondrion
- c. cell wall
- d. plasma membrane

ANS: D DIF: B OBJ: 9-1

MATCHING

Match each item with the correct statement below. Write the answer in the space provided.

- a. exocytosis
- b. plasmolysis
- c. diffusion
- d. contractile vacuole
- e. osmosis
- f. dynamic equilibrium

- 1. _____ movement of particles from an area of higher concentration to one of lower concentration
- 2. _____ continuous movement of particles but no overall change in concentration
- 3. _____ structure inside protists that collects excess water and squeezes it outside through the membrane
- 4. _____ loss of water from a cell resulting in a drop in turgor pressure
- 5. _____ diffusion of water molecules through a selectively permeable membrane
- 6. _____ release of wastes or cell products from inside to outside a cell

- | | | |
|-----------|--------|----------|
| 1. ANS: c | DIF: B | OBJ: 9-4 |
| 2. ANS: f | DIF: B | OBJ: 9-4 |
| 3. ANS: d | DIF: B | OBJ: 9-3 |
| 4. ANS: b | DIF: B | OBJ: 9-3 |
| 5. ANS: e | DIF: B | OBJ: 9-3 |
| 6. ANS: a | DIF: B | OBJ: 9-3 |

SHORT ANSWER

1. Compare and contrast the structure and function of *channel proteins* and *carrier proteins*.

ANS: Both are transport proteins embedded in the plasma membrane. Channel proteins enable passive transport to take place; channel proteins are tubelike and provide openings that allow dissolved particles to diffuse across the cell membrane. Carrier proteins generally have a shape that fits a specific molecule or ion. When the proper molecule binds with the carrier protein, it causes the protein to change its shape so that the particle is moved across the membrane. Once the particle is released, the protein returns to its original shape. In the case of active transport, energy is required by the carrier protein.

DIF: A OBJ: 9-3

A selectively permeable membrane is stretched across a funnel filled with starch solution. Figure 9-1 shows the funnel inverted into a beaker containing an iodine solution. Starch molecules are too large to diffuse across the membrane; iodine molecules are not. If iodine reacts with starch, the starch turns blue-black. Suppose you observe the setup after several hours.

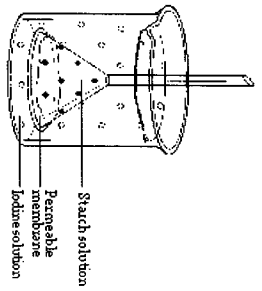


Figure 9-1

2. Does the level of the liquid rise, fall, or remain the same in the stem of the inverted funnel shown in Figure 9-1? Why?

ANS: The level rises because some of the iodine solution diffuses into the starch solution in the funnel, increasing the volume of liquid.

DIF: B OBI: 9-4

3. Referring to Figure 9-1, does the starch solution change color? Explain.

ANS: Yes; iodine diffuses into the starch solution, turning it blue-black.

DIF: B OBI: 9-4

4. Referring to Figure 9-1, does the iodine solution change color? Explain.

ANS: No, because starch molecules do not diffuse into the iodine solution.

DIF: B OBI: 9-4

5. Predict what would happen if a saltwater plant were placed in a freshwater aquarium.

ANS: Water would move into the plant cells, causing them to swell. If the cell wall were not strong enough to tolerate the increasing turgor pressure, the cell would burst.

DIF: A OBI: 9-4

6. Pickled foods are preserved with salt. How might a strong salt solution preserve cucumbers?

ANS: When fresh cucumber is placed in a salt solution that is hypertonic, the water from the cucumber cells passes into the salt solution until it is isotonic. Any bacterial cells present would also lose water to the salt solution, causing the bacteria to shrivel and die. The pickle is then preserved from decay.

DIF: A OBI: 9-3

7. Imagine that a bottle of perfume is opened at the back of a classroom. Explain how your teacher can detect the odor on the other side of the room within a few minutes.

ANS: As the molecules of the perfume enter the air, they diffuse from an area of greater concentration near the perfume to the area of lesser concentration in the room. As the molecules continue to diffuse, the concentration will increase enough so that the teacher can detect the odor.

DIF: A OBI: 9-4

8. Why is it important that some proteins extend all the way through the bilayer of a plasma membrane?

ANS: These proteins provide a means by which small dissolved particles that cannot diffuse through the lipid bilayer can cross the cell membrane.

DIF: A OBI: 9-2

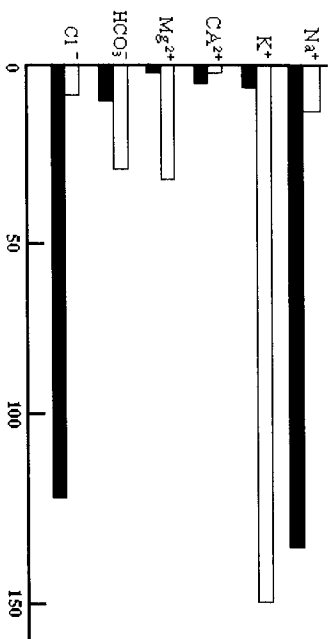


Figure 9-2

9. The graph in Figure 9-2 shows typical concentrations of several ions inside and outside an animal cell. Concentrations of ions inside the cell are shown in white, outside in black. Describe the process by which the cell maintains differences in concentration of certain ions inside and outside the cell.

ANS: To move ions into or out of a cell, against a gradient, cells use the process of active transport. Transport proteins bind with the ions and carry them across the membrane. Chemical energy from the cell is needed for active transport.

DIF: A OBI: 9-3

10. The graph in Figure 9-2 shows typical concentrations of several ions inside and outside an animal cell. Concentrations of ions inside the cell are shown in white, outside in black. If all available Na^+ and Cl^- ions combine to form NaCl , do any excess Na^+ or Cl^- ions remain? If so, which?

ANS: Yes; Na^+ ions

DIF: B OBI: 9-3