

Passive Transport

Key Words

diffusion:	the movement of molecules from areas of greater concentration to areas of lesser concentration
concentration:	amount of a substance in a given area
osmosis:	diffusion of water across a membrane
passive transport:	movement of molecules across a cell membrane without the use of energy
carrier protein:	protein in the cell membrane that moves large molecules through the membrane

KEY IDEAS

Passive transport is the movement of molecules across a cell membrane without the use of energy. The constant motion of molecules causes them to move by diffusion from areas of greater concentration to areas of lesser concentration. Water moves in or out of a cell by a special kind of diffusion called osmosis. Other molecules move in or out of a cell with the help of carrier proteins.

Have you ever been in a supermarket's produce aisle when suddenly a mist of water shot out over the fruits and vegetables? You might have wondered why plants that have already been picked need water. The reason for misting the produce is to keep it from wilting. The water droplets land on the produce and pass into the plant's cells.

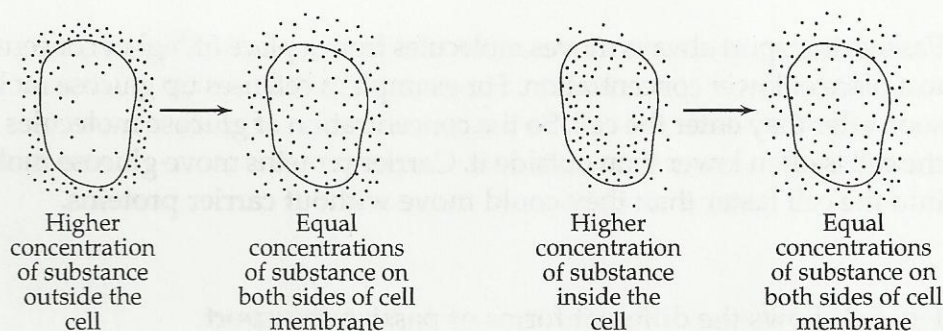
A cell must take in water to carry out its life processes. A cell also must take in certain other substances. These substances enter the cell through the cell membrane. A cell must also rid itself of waste products to work properly. Wastes leave the cell by passing through the cell membrane.

Recall that the cell membrane controls the flow of substances into and out of the cell. Not every substance can pass through the cell membrane. The cell membrane is selectively permeable. It allows only certain materials to pass into the cell and certain others to pass out. For example, the cell membrane allows food and oxygen molecules to enter the cell. It allows only waste products such as carbon dioxide to leave the cell.

Diffusion. Molecules move across the cell membrane in several ways. Some kinds of molecules, such as oxygen and carbon dioxide, pass through the cell membrane by diffusion. **Diffusion** (dih-FYOO-zhuhn) is the movement of molecules from an area of greater concentration to an area of lesser concentration. **Concentration** (KAHN-sen-TRAY-shuhn) is the amount of a substance in a given area.

Carbon dioxide is constantly made by cells as they use energy. Therefore, the concentration of carbon dioxide inside the cell is higher than that outside the cell. This causes the carbon dioxide to diffuse out of the cell. On the other hand, the cell constantly uses oxygen to perform its life processes, so the concentration of oxygen outside the cell is higher than it is inside the cell. This causes the oxygen molecules to diffuse through the cell membrane into the cell. The diffusion of molecules continues until equal amounts of the molecules lie on both sides of the cell membrane. Fig. 5-1 shows how a substance moves into or out of a cell by diffusion.

Fig. 5-1



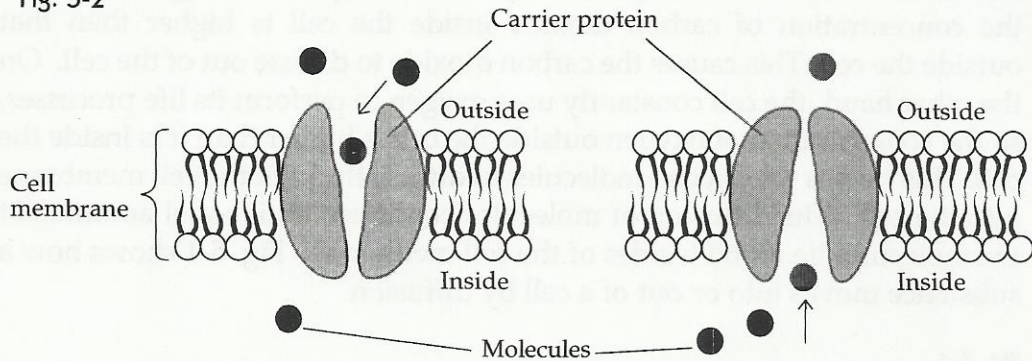
Diffusion occurs because molecules are constantly in motion. The moving molecules collide and spread out in all directions. As they spread out, molecules tend to move into and out of the cell. Small molecules such as water and oxygen are able to pass through spaces between the lipids that make up the cell membrane.

Osmosis. The diffusion of water across a membrane is called **osmosis** (ahs-MOH-sihs). Water molecules move into or out of a cell by osmosis. In osmosis, water molecules diffuse across the cell membrane until they are in equal concentration on both sides. The misting of produce in a supermarket is an attempt to trigger osmosis. Since the plant parts were removed from the live plant, they have no water supply. The cells begin to wilt. By misting the produce, osmosis can occur. The water can pass into the produce and keep it crisp.

Diffusion and osmosis occur without the use of energy. For this reason, they are said to be forms of **passive transport** (PAS-ihv TRANS-port).

Carrier Proteins. Another type of passive transport is a form of diffusion that involves carrier proteins. **Carrier proteins** (KA-ree-er PROH-teenz) are in the double layer of lipids that form the cell membrane. Most types of molecules are too large to pass through the spaces between lipids in a cell membrane. Carrier proteins move these large molecules across the cell membrane and into or out of the cell. See Fig. 5-2.

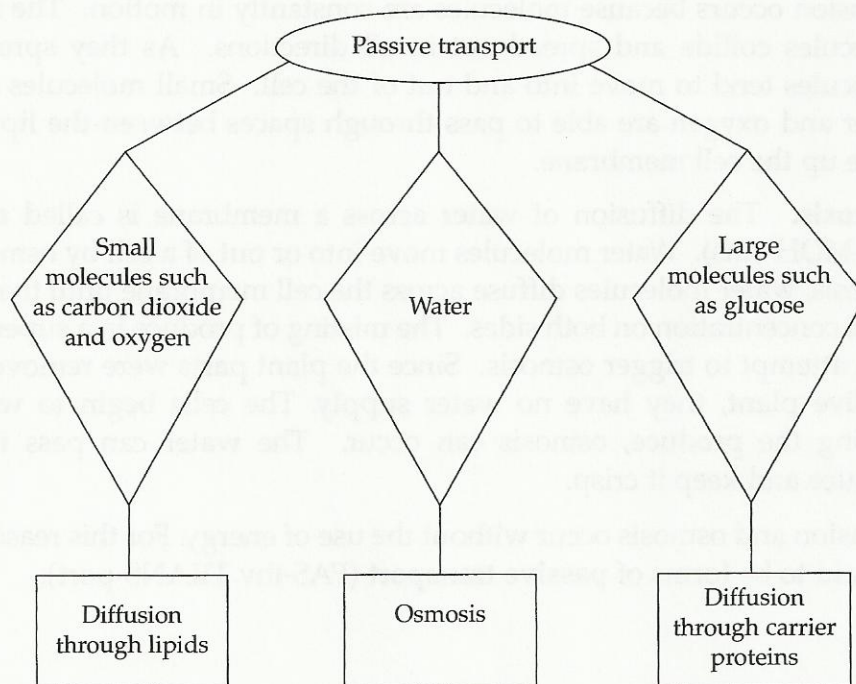
Fig. 5-2



Passive transport always moves molecules from a place of higher concentration to a place of lower concentration. For example, a cell uses up glucose molecules soon after they enter the cell. So the concentration of glucose molecules inside the cell is often lower than outside it. Carrier proteins move glucose molecules into the cell faster than they could move without carrier proteins.

Fig. 5-3 shows the different forms of passive transport.

Fig. 5-3



**TAKE
ANOTHER
LOOK**

Check Your Understanding

1. Explain the relationship between diffusion and osmosis.

Complete the paragraph with the following terms: *diffusion, higher, lipids, lower, osmosis, passive transport, carrier proteins, selectively permeable.*

The cell membrane is made up of a double layer of (2) _____.
Buried in these layers are (3) _____. Only certain substances can move into or out of the cell through the cell membrane. It is said to be (4) _____. In the process of (5) _____, molecules move from an area of (6) _____ concentration to an area of (7) _____ concentration. Water diffuses across the cell membrane by (8) _____. Both diffusion and osmosis are forms of (9) _____.

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10. Why are osmosis and diffusion called passive transport?

11. How does the motion of molecules trigger diffusion?

12. How do carrier proteins help substances enter the cell?

13. While conducting an experiment, you discover a certain substance passing out of a cell by diffusion. What might you conclude about the concentration of this substance?

