

Cell Structure and Function • Section Summary

The Cell in Its Environment

Guide for Reading

- How do most small molecules cross the cell membrane?
- Why is osmosis important to cells?
- What is the difference between passive transport and active transport?

The cell membrane is **selectively permeable**, which means that some substances can pass through it while others cannot. Oxygen, food molecules, and waste products all must pass through the cell membrane. Substances that can move into and out of a cell do so by one of three methods: diffusion, osmosis, or active transport.

Diffusion is the main method by which small molecules move across the cell membrane. Diffusion is the process by which molecules tend to move from an area of higher concentration to an area of lower concentration. The concentration of a substance is the amount of the substance in a given volume. Diffusion is caused by molecules moving and colliding. The collisions cause the molecules to push away from one another and spread out. Molecules diffuse through the cell membrane into a cell when there is a higher concentration of the molecules outside the cell than inside the cell.

The diffusion of water molecules through a selectively permeable membrane is called **osmosis**. **Because cells cannot function properly without adequate water, many cellular processes depend on osmosis.** In osmosis, water molecules move by diffusion from an area where they are highly concentrated through the cell membrane to an area where they are less concentrated.

The movement of dissolved materials through a cell membrane without using cellular energy is called **passive transport**. Diffusion and osmosis are both types of passive transport. When a cell needs to take in materials that are in higher concentration inside the cell than outside the cell, the movement of the materials requires energy. **Active transport** is the movement of materials through a cell membrane using cellular energy. The main difference between passive transport and active transport is that **active transport requires the cell to use its own energy while passive transport does not**. Cells have several ways of moving materials by active transport. In one method, transport proteins in the cell membrane “pick up” molecules outside the cell and carry them in. Another method of active transport is **engulfing**, in which the cell membrane wraps around, or engulfs, a particle and forms a vacuole within the cell.

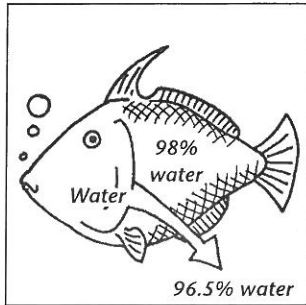
Most cells are very small. One reason is related to the fact that all materials move into and out of cells through the cell membrane. Once a molecule enters a cell, it is carried to its destination by a stream of moving cytoplasm. In a very large cell, streams of cytoplasm must travel farther to carry materials from the cell membrane to all parts of the cell.

Cell Structure and Function ▪ *Review and Reinforce*

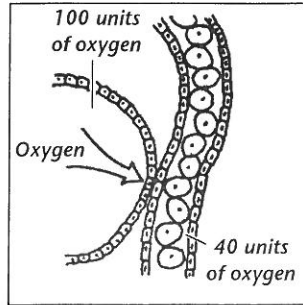
The Cell in Its Environment

Understanding Main Ideas

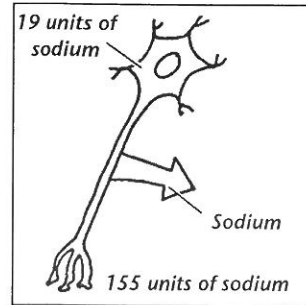
Fill in the blank to identify the process illustrated in each of the following figures.



Water moves out of the cells of a saltwater fish and into the ocean.



Oxygen moves from the lungs into the bloodstream.



Sodium is pumped out of a nerve cell.

1. _____

2. _____

3. _____

Answer the following questions on a separate sheet of paper.

4. Explain how osmosis differs from diffusion.
5. Compare and contrast active and passive transport.
6. Identify two methods of active transport.
7. State one reason that cells are small.

Building Vocabulary

If the statement is true, write true. If the statement is false, change the underlined word or words to make the statement true.

- _____ 8. Selectively permeable means letting some but not all substances pass through.
- _____ 9. Osmosis is the process by which molecules tend to move from an area of higher concentration to an area of lower concentration.
- _____ 10. The process by which water moves across a selectively permeable membrane is called diffusion.
- _____ 11. Diffusion and osmosis are types of active transport.
- _____ 12. Passive transport requires the cell's own energy.