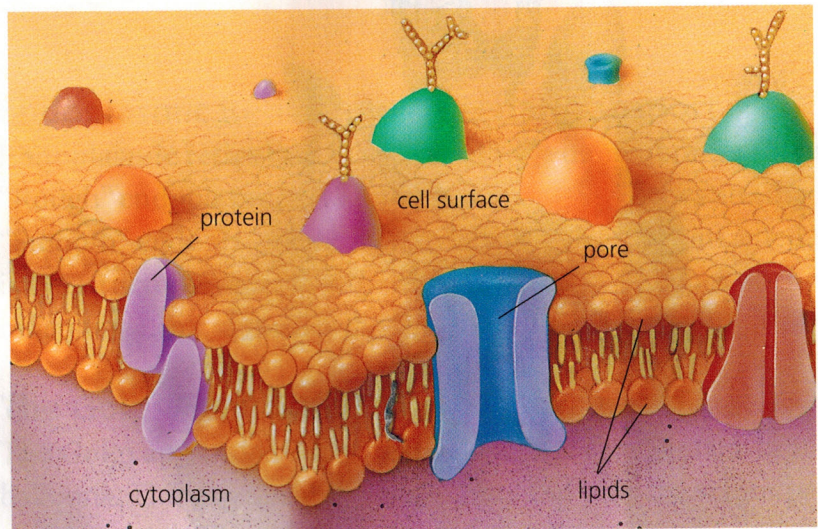


Imagine if you had to live inside a sealed plastic bag. How long would you survive? You could not survive long without holes so oxygen could enter. Soon, you also would need a way to get water and food through the plastic. Even this would not be enough. You would need a way to remove wastes, such as carbon dioxide and urine.

In some ways, the cell membrane is like a plastic bag. The cell membrane is also much more complex, however, as you can see in **Figure 1**.



**Figure 1**

The cell membrane has two layers of fat (lipid). Embedded in the fat layers are protein molecules (coloured blobs) and pores made of protein. There are pores of several different sizes.

### LEARNING TIP

Try to visualize (make a mental picture of) the process of materials entering and leaving cell membranes. Ask yourself, "What else have I read where the words *permeable* and *impermeable* have been used?"

## Cell Membranes

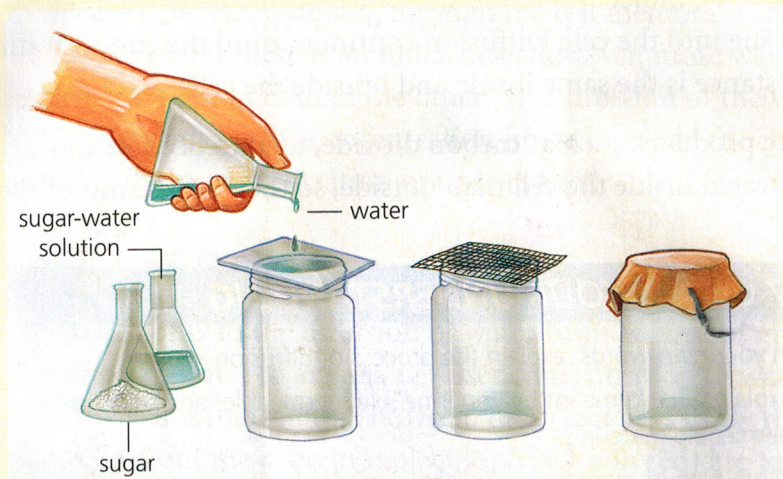
Cells allow some materials to enter or leave, but not others. Cells are said to be permeable to some materials and impermeable to others. *Permeable* means "permitting passage," and *impermeable* means "not permitting passage."

In general, small molecules pass through the cell membrane easily, medium-sized molecules pass through less easily, and large molecules cannot pass through without help from the cell. Because the cell membrane allows certain substances to enter or leave, but not others, it is said to be **selectively permeable**.

## TRY THIS: Models of Membranes

**Skills Focus:** observing, predicting

1. Look at **Figure 2**. Compare the permeability of the three materials—glass, mesh, and cloth—covering the jars.
  - (a) Which covering is impermeable to all three substances in **Figure 2**?
  - (b) Which covering is permeable to all three substances?
  - (c) Which covering is impermeable to some substances, but permeable to others?
  - (d) Predict two other materials that are permeable to some of the substances shown, but impermeable to the others. Test the permeability of the materials for yourself.

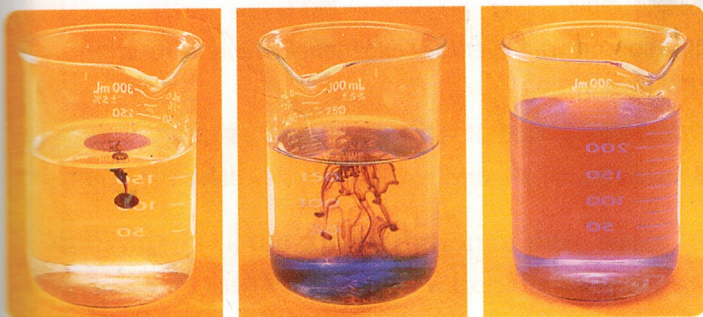


**Figure 2**

Three “membranes”: glass, wire or plastic mesh, and cloth

## Diffusion

In **Figure 3**, a blob of ink gradually spreads out and colours the whole beaker of water. Why doesn't the ink remain as a small blob? What causes it to move outward?



**Figure 3**

ink diffusing in water

## ▶ LEARNING TIP

Make connections to your prior knowledge. Ask yourself, "What do I already know about diffusion?" Consider the information you have learned in school; through reading, viewing, and listening on your own; and by direct observation and experiences.

The molecules of ink are constantly moving and colliding with other ink molecules and with the molecules of water. When they collide, they bounce off each other. This causes molecules that are concentrated in one area to spread gradually outward. **Diffusion** is the movement of molecules from an area of high concentration to an area of lower concentration.

## Diffusion and Cells

Diffusion is one of the ways that substances move into and out of cells. The concentration of a substance that a cell uses up, such as oxygen, is low inside the cell. Outside the cell, the concentration of the substance is higher. The molecules of the substance diffuse across the cell membrane into the cell. Diffusion continues until the concentration of the substance is the same inside and outside the cell.

Waste products, such as carbon dioxide, tend to become more concentrated inside the cell than outside, so they diffuse out of the cell.

### ▶▶ 1.7 CHECK YOUR UNDERSTANDING

1. In your own words, explain the process of diffusion.
2. Explain what is meant by impermeable, permeable, and selectively permeable materials.
3. What type of membrane do cells have? Explain why.
4. Hypothesize why the pores in the cell membrane are different sizes.
5. Do you think cells could survive without diffusion? Explain why or why not.
6. Speculate on what would happen if cell membranes were permeable instead of selectively permeable.
7. (a) What happens when a glass of lemonade is spilled in a swimming pool? Would you be able to detect the lemonade?  
(b) Use your answer to part (a) to predict what might happen if poisonous chemicals were dumped into a lake from which a town draws its water supply.
8. Describe two situations in your everyday experience where substances are spread around by diffusion.