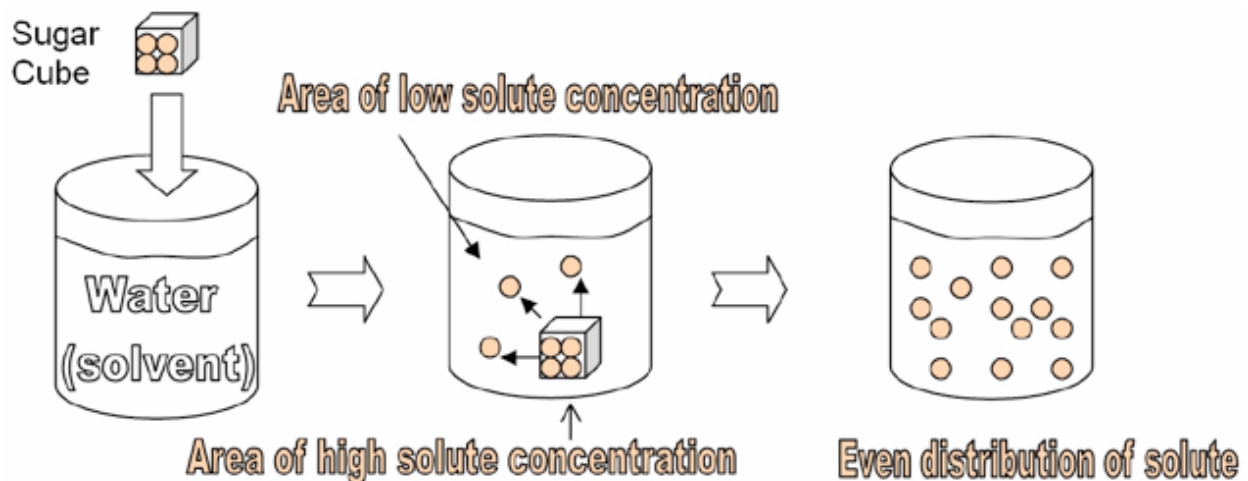


# Diffusion and Osmosis

The cell membrane plays the dual roles of protecting the living cell by acting as a barrier to the outside world, yet at the same time it must allow the passage of food and waste products into and out of the cell for metabolism to proceed. How does the cell carry out these seemingly paradoxical roles? To understand this process you need to understand the makeup of the cell membrane and an important phenomenon known as diffusion.

Diffusion is the movement of a substance from an area of high concentration to an area of low concentration due to random molecular motion. All atoms and molecules possess kinetic energy, which is the energy of movement. It is this kinetic energy that makes each atom or molecule vibrate and move around. (In fact, you can quantify the kinetic energy of the atoms/molecules in a substance by measuring its temperature.)

The moving atoms bounce off each other, like bumper cars in a carnival ride. The movement of particles due to this energy is called Brownian motion. As these atoms/molecules bounce off each other, the result is the movement of these particles from an area of high concentration to an area of low concentration. *This* is diffusion. The rate of diffusion is influenced by both temperature (how fast the particles move) and size (how big they are).



## Part 1: Brownian Motion

In this part of the lab, you will use a microscope to observe Brownian motion in carmine red powder, which is a dye obtained from the pulverized guts of female cochineal beetles.

### Materials

- Glass slide
- Toothpick

- Carmine red powder
- Coverslip
- Tap water

### Procedure

1. Obtain a microscope slide and place a drop of tap water on it.
2. Using a toothpick, carefully add a very minuscule quantity of carmine red powder to the drop of water and add a coverslip.
3. Observe under scanning, low, and then high power.

### Lab Questions

1. Describe the activity of the carmine red particles in water.
2. If the slide were warmed up, would the rate of motion of the molecules speed up, slow down, or remain the same? Why?

## Part 2: Experimental Design

You and your group will design an experiment to determine the relative molecular weights of methylene blue and potassium permanganate. You may use a petri dish of agar, which is a jello-like medium made from a polysaccharide found in the cell walls of red algae. You will also have access to a cork borer and a small plastic ruler.

### Materials

- 1 petri dish of agar
- Methylene blue
- Potassium permanganate
- Other?

### Design

Your experiment design should include all of the following portions:

- Hypothesis
- Experimental design
- Data
- Conclusions
- Further questions/other comments