Name_____ Date_____

Chapter 2 Lab Investigation: Diffusion and Osmosis

Purpose

In this activity you will view evidence of diffusion and osmosis.

Background

In this chapter you learned about the process of diffusion—the movement of a material from a place where it is concentrated to a place where it is less concentrated. In chapter 14 you will learn about a related concept—osmosis, which is the movement of a solvent, such as water, from a region of low pressure to a region of high pressure.

The rigidity of a plant, for example, is determined by the amount of water in the cells of the plant. If the plant cells lose water, the plant wilts. If the plant cells gain water, the plant becomes more rigid. Cells placed into a solution with relatively higher osmotic pressure will lose water; cells placed into a solution with relatively low osmotic pressure will gain water.

Temperature is one factor that affects the rate of diffusion.

Materials

For the osmosis demonstration: small potato, about 4 to 7 cm in diameter; 5 grams of salt; knife; impervious cutting surface; 2 containers; water; metric ruler; gram scale

For diffusion demonstration: food coloring (could use microbiological stain or dye); three 150 ml beakers or containers; water; Celsius thermometer; timer

Procedure

Set up the osmosis demonstration first. While the osmosis demonstration is running, set up the diffusion demonstration.

Osmosis

1. To create a solution with a higher osmotic pressure, place 100 ml of water into a container. Add 5 grams of salt. Stir this solution for at least 30 seconds to dissolve the salt.
2. To create a solution with a lower osmotic pressure, add 100 ml of water to an empty container.
3. From your potato, cut 2 slices, each of which should be 5 mm thick.
4. Place one potato slice in the solution with the higher osmotic pressure, and one slice in the solution with the lower pressure.
5. Store the potato, cut side down, on the cutting surface.
6. Allow the potato slices to remain in their respective solutions for at least 20 minutes.
7. Cut another 5 mm-thick slice from the potato, then remove the potato slices from the two solutions. Compare the flexibility of the three slices.

   A. Which slice is the most rigid?

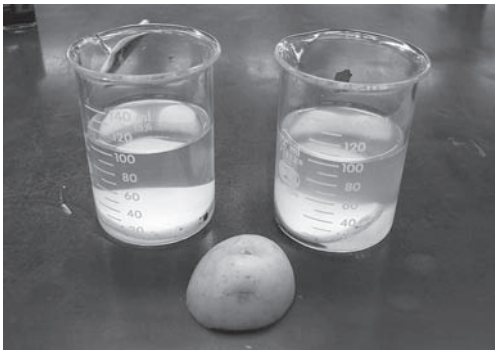
   _____

   B. Which slice is the least rigid?

   _____

   C. Which slice is intermediate?

   _____



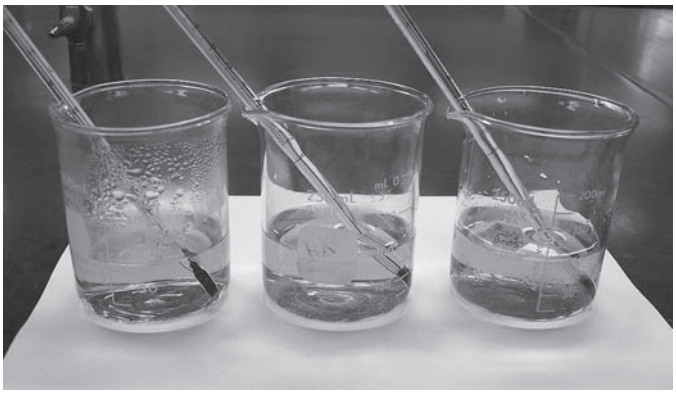
Diffusion

1. Put 100 ml of hot water (about 90–100°C) in one of the three beakers, 100 ml of cold water (about 0–5°C) in a second beaker, and 100 ml of water at air temperature (about 20–25°C) in the third beaker.
2. Place the containers on sheets of white paper. This will provide a contrasting background so that you will be better able to observe and compare changes to the solutions.
3. Simultaneously add one drop of food coloring to each solution.
4. Time and record below how long it takes for the food coloring to evenly disperse throughout each container, creating a uniform color.

   A. hot water: _____ minutes

   B. air temperature water: _____ minutes

   C. cold water: _____ minutes



Conclusions

1. In the water of which temperature did the water molecules diffuse the fastest?

   _____

2. In which temperature of water did the water molecules take the longest time to diffuse?

   _____

3. How is the rate of diffusion related to temperature?

   _____

4. Why do you think the diffusion rate is related to temperature?

   _____

5. What factor caused the potato slices to be either limp or rigid?

   _____

Select the correct word from the two choices and write it in the blank below.

6. In the solution with the higher osmotic pressure, water moved (into, out of) the potato cells.

   _____

7. In the solution with the lower osmotic pressure, water moved (into, out of) the potato cells.

   _____