Detecting Diffusion

CLASS COPY

Question: Which molecules will diffuse across a semi-permeable membrane?

Objective: Model the diffusion of solutes across a cell membrane, and to observe the effects of the movement of water across a membrane.

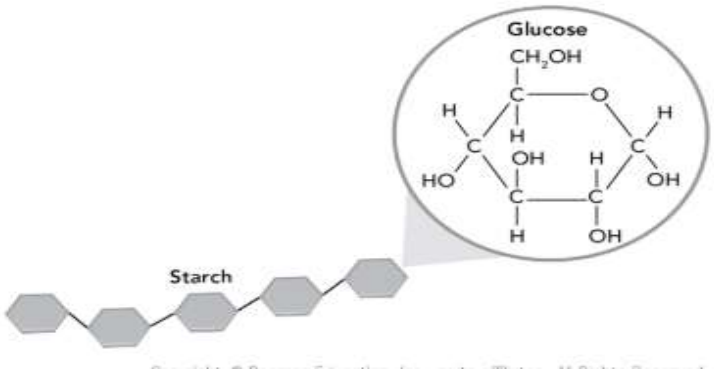
Background:
A cell membrane is a selectively permeable barrier. The membrane allows some particles to pass through it. It stops the passage of other particles.

Solutes are substances that are dissolved thoroughly, such as sugar in water. Solutes generally move across the membrane by diffusion. During diffusion, a solute moves from an area of high concentration to an area of lower concentration. The odor of baking bread or other foods spreading through a kitchen is an example of diffusion.

Some substances diffuse through protein channels in the cell membrane. These channels act as tunnels. The channels allow only certain substances to pass through. This type of movement is called facilitated diffusion.

In this lab, you will use dialysis tubing to act as a model of the cell membrane. Dialysis tubing is a synthetic membrane. It is used to filter wastes from the blood, and is useful for treating kidney disease. The tubing has small openings, or pores, that allow small molecules to pass through. You will investigate whether glucose and starch pass through the tubing. You will use iodine as an indicator to test for the presence of starch.

The diagram shows the chemical structure of glucose. Cells break apart glucose to release its energy. The diagram also shows how glucose molecules link together to form starch. Starch is a polymer of glucose.



Safety: ***Goggles are needed for this lab.***
Iodine solution can irritate the eyes and skin and can stain clothing. **If you have a shell fish allergy you should not come in contact with iodine.** Rinse off any solution that spills on your skin or clothing.

Materials:

- water
- starch solution
- glucose solution
- Lugol's iodine
- 400 mL beaker
- 50 mL beaker
- 10 mL graduated cylinder
- funnel
- glucose test strips
- forceps
- electronic balance
- weigh boat

Procedures:

1. Add 200 mL of tap water to a 400 mL beaker.

2. To the water, add 15 drops of iodine solution. Give the beaker a gentle swirl to completely mix the iodine solution. The water should now be an amber (light orange) color.

3. Obtain a piece of pre-soaked dialysis tubing from the front desk. Carefully tie a knot in one end of the tubing to create a bag.

4. Insert the funnel into the open end of the bag. Use the graduated cylinder to measure 5 mL of starch solution, then pour it into the bag using the funnel. ***NOTE: Be sure to shake the starch solution first to ensure it is mixed well.***

5. Rinse the graduated cylinder, measure 5 mL of glucose solution, then add it to the bag as well using the funnel.

6. Carefully tie a knot in the open end of the bag to seal it. Be sure to get out as much air out of the bag as possible and leave plenty of space in the bag.

7. Use a weigh boat and electronic balance to determine the initial (starting) mass of the dialysis bag and its contents. Record the mass in the data table.

8. Place the dialysis bag in the 400 mL beaker. Most or all of the bag should be submerged. Allow the bag to sit in the beaker for 15 minutes.

9. After 15 minutes have elapsed, use the forceps to remove the dialysis bag from the beaker. Carefully rinse it off with tap water.

10. Use the weigh boat and electronic balance again to determine the final mass of the dialysis bag and its contents. Record the mass in the data table.

11. Very carefully, use the scissors to open the dialysis bag and empty its contents into the 50 mL beaker.

12. Use a glucose test strip to test for the presence of glucose in the small 50 mL beaker and another glucose test strip to test for the presence of glucose in the 400 mL beaker. Record results in the data table.

CLEAN UP:

- ✓ all solutions: chemical waste container
- ✓ rinse (no need to dry): beakers, graduated cylinder
- ✓ wipe off: scissors (*carefully*), lab counter
- ✓ trash: dialysis tubing
- ✓ everything else returned to its original location