

BIO 244

Diffusion and Osmosis

In this lab, we will be using dialysis tubing to demonstrate diffusion and osmosis. Dialysis tubing is semi-permeable, because it has pores in it. Molecules larger than the pores cannot pass through, but those that are smaller can pass through. The tubing is available with different sized pores and is labeled with a "Molecular Weight Cut Off" (MWCO), which is the largest size of molecules that will fit through the pores in the membrane.

Glucose is a simple carbohydrate (sugar) with the chemical formula: $C_6H_{12}O_6$ and has a molecular weight of about 180 g/mol.

Starches are made up of long chains of sugars (100's to 1000's of glucose molecules).

SAFETY PRECAUTIONS

Benedict's solution is toxic by ingestion. In the event of skin contact, wash the affected area with water. Wash your hands after any direct contact and wash your hands at the conclusion of the laboratory period.

Iodine reagent will leave yellow-orange stains on your hands that will not wash off. Take care in handling the solution. Iodine is poisonous by ingestion. Wash your hands after any direct contact and wash your hands at the conclusion of the laboratory period. Any stains that do not wash off your hands will not be harmful to you.

Materials required

beaker
test tubes
dialysis tubing (MWCO: 3500)
clamps
starch solution
glucose solution
benedict's solution
iodine reagent
disposable pipettes

Prelab

Form a hypothesis: what do you think will happen in this activity?

Procedure

- 1 Obtain a 10 cm piece of dialysis tubing (that has soaked in water) and gently rub it between your fingers to open the tube.
- 2 Fold over and tie or clamp one end of the tube so that it is sealed and will hold liquid.
- 3 Add 5 ml starch solution and 5 ml glucose solution to your tube.
- 4 Squeeze out any extra air and then fold over and tie/clamp the other end of the tubing. Leave some space before the clamp.
- 5 Use distilled water to rinse any spilled solution from the outside of the tubing. Pat dry with paper towel and weigh your tubing.
- 6 Place the tubing in the beaker containing distilled water.
- 7 Take the tubing out every 10 minutes, pat dry, and weigh. Repeat for 1 hour.
- 8 Test the solution inside and outside of the dialysis tube for the presence of sugar and starch.
 - A) Open one end of the tubing.
 - B) Use a pipette to transfer some solution from inside of the tube into two different test tubes.

C) Use a new pipette to transfer some solution from the beaker **outside** of the tube into two different test tubes.

D) Test for starch by adding a few drops of iodine. If starch is present, the solution will turn purple

E) Test for sugar by adding three drops of Benedict's solution and heat in boiling water for 3 minutes. If sugar (glucose) is present the solution will become an orange precipitate.

Clean Up!

Questions to consider:

What molecules diffused through the dialysis tubing? Why?

What molecules remained inside the dialysis tubing? Why?

Did water diffuse in or out of the dialysis tubing?