Selectively permeable membranes and osmosis

Class Copy – Do not write on!

Problem: What is a selectively permeable membrane?

When does osmosis occur in living cells?

Cells need to take in food, oxygen, water, and other vital molecules. They also need to excrete waste materials. Some substances are allowed to pass in and out – the plasma membrane surrounding the cell is ***permeable*** to those substances. But the plasma membrane is actually ***selectively*** permeable. Only certain substances are allowed to pass in and out. ***Osmosis*** is the diffusion of water through a selectively permeable membrane. This occurs when there is an area of greater concentration and an area of lower concentration (of water). The water moves in the direction from greater to lesser concentration.

Materials:

Cellophane dialysis tubing glass rod

Starch suspension (complex carbohydrate) 80% glucose solution (simple sugar)

Distilled water 2 beakers

Micropipettes 2 test tubes

Benedict's solution hotplate

Iodine ruler

Objectives:

To observe how a selectively permeable membrane works

To observe osmosis in cells placed in varying solutions of salt concentrations

Procedure (dialysis tubing):

In order to understand how a selectively permeable membrane works, it is helpful to make a model of a cell. We will do this with ***dialysis tubing***. Dialysis tubing allows the passage of small molecules but not larger ones.

1. Soak a 20-cm section of cellophane dialysis tubing in water for a few minutes. Rub the ends between your thumb and index finger until the ends separate. Insert a glass rod to hold it open. Tie a knot in one end. Remove the glass rod.

2. Fill the dialysis bag **¾** full with ***starch suspension*** and **¼** full with *80%* ***glucose*** ***solution***.

3. Tie the top of the bag with a long piece string. Leave a loose piece of string 10-15 cm long.

4. Rinse the bag with distilled water. Place the bag in a beaker of distilled water. Leave the string outside the beaker so that you may remove the bag from the water.

5. After 20 minutes, withdraw a dropperful of water from the beaker.

6. Place this liquid in a test tube and add 10 drops of Benedict's solution. Put the test tube in a boiling water bath for 10-15 minutes. ***A positive result for the presence***

***of a simple sugar like glucose is that the solution will turn a murky yellow to***

***orange color.***

7. While the water bath is boiling, place 30 drops of the liquid from the beaker into a test tube. Add 3 drops of iodine. Observe the color of the water after the iodine has been added. ***A positive result for the presence of a complex carbohydrate like starch is that the solution will turn a purplish-black.***

QUESTIONS :

1. Why is it necessary to rinse the dialysis bag with distilled water?

2. What organic molecule were you testing for when you added

Benedict's solution to the water you removed from the beaker?

3. What did you observe when you did this and heated it?

4. This result tells you that what has happened?

5. What organic molecule were you testing for when you added iodine to

the water from the beaker?

6. What did you observe when you did this?

7. This result tells you that what has happened?

8. What do your results tell you about the permeability of dialysis tubing?

9. Looking at your results, which molecule is larger – starch or glucose?