

#22 OSMOSIS AND DIFFUSION KIT

Student Worksheet and Guide

Problem: Will glucose, starch, water or iodine pass through a semi-permeable membrane?

Theory: In the cells of plants and animals, protoplasm is limited or restrained from the environment by the existence of a membrane. These membranes, by necessity, must be relatively permeable to assist in such life processes as respiration and excretion. Membranes must permit some substances to pass through, yet prohibit other substances from doing so. They may allow rapid diffusion of some substances or very slow diffusion of others. Diffusion is the movement of particles from where they are more concentrated to where they are less concentrated. Osmosis specifically refers to the diffusion of water through a membrane. Membranes can be referred to as differentially permeable, selectively permeable, or semi-permeable.

In this lab, you will perform an experiment which will illustrate diffusion and osmosis. You will be able to determine through your observations that in a mixture of substances some substances will diffuse through a semi-permeable membrane and some will not.

NOTE: Before doing this experiment note that the following solutions or items will be the tools used to indicate the presence or certain substances.

Lugol's Solution contains iodine which is an indicator for the presence of starch. Its golden-brown color turns blue-black as a positive reaction to starch.

The Glucose Testing Strips react quickly to small amounts of glucose. The reacting area is the small bright yellow rectangle on the very end of the plastic strip. A green color indicates a positive test for glucose. DO NOT TOUCH THE TESTING AREA OF THE STRIP WITH YOUR FINGERS BEFORE USING.

Procedure: You will need on your desk:

- 1 semi-permeable membrane
- 1 beaker of water
- 1 plastic cup
- 2 Glucose Test Strips

1. Fill the plastic cup with water to within 2 cm (width of your pinkie) of the top. Test the water for the presence of glucose by dipping the yellow reacting area of one of the test strips in the water. Remove the strip and observe any color change.

The color of the strip is _____. Is glucose present? _____

2. Add 30 drops of Lugol's Solution to the water in the cup and stir. Set aside for later use.
3. Thoroughly wet one end of the membrane with water from the beaker and rub the end between the thumb and forefinger. This should open the tube. When opened, the tube should be thoroughly moistened by allowing water to run through it.
4. Tie a knot VERY TIGHTLY close to one end of the tube.
5. Put 2.5 - 3 cm of LIQUID STARCH into the tube through the open end, then add about the same amount (2.5 - 3 cm) of GLUCOSE SOLUTION to the tube.
6. Hold the top of the tube closed by pinching it together and RINSE THE TUBE (VERY IMPORTANT) under running water to remove any glucose or starch on the outside. Gently squeeze the tube to mix the contents.

7. Tie another knot VERY TIGHTLY just above the level of the solutions inside the membrane.
8. Carefully place the filled membrane into the cup of water containing the Lugol's Solution. Use a fine-point permanent marker to mark the outside of the cup showing the level of the contents (water and tube) inside the cup. Also mark the level of contents in the tube on the outside of the membrane.

After 7-10 minutes, look at the contents inside the membrane tube and at the liquid inside the plastic cup. What changes (if any) do you notice:

9. Inside the membrane? _____

10. To the water in the cup? _____

11. Test the water in the cup for glucose.
Results? _____

On the basis of the above tests and observations, you should be able to explain and prove the following:

12. What happened to the iodine that was in the cup? _____

13. How do you know? _____

14. What happened to the starch? _____

15. How do you know? _____

16. What happened to the glucose? _____

17. How do you know? _____

18. Did any water diffuse through the membrane? _____
What is this called? _____
19. How do you know? _____

20. Name the material(s) that diffused through the membrane: _____

21. Name the material(s) that did not diffuse through the membrane: _____
22. Suggest a reason for the fact that some materials were able to pass through the membrane, while others were not. _____

Student's Name _____ Date _____