Student # _____
Date _____

OSMOSIS:

PURPOSE:

To investigate the movements of materials into and out of cells and to demonstrate plasmolysis.

INTRODUCTION:

The cell is the "gate-keeper" for the cell; it controls what goes in and out. There are two ways in which material can get into a cell: passive and active transport. Passive transport does not require the cell to use energy and materials always move in from higher concentrations to lower concentrations. Osmosis and diffusion are examples of passive transport. Active transport requires energy and is needed when the material is too large to diffuse through the membrane, or the material is moving from low concentrations to high concentrations.

The concentration of dissolved materials in and around the cell determines how much water inside the cell and thus greatly determines the shape of the cell. When a cell is full of water, it becomes rigid and is said to to be "turgid" (normal state of a cell). When the cell is not full of water, it becomes limp and is said to be "flacid". Since water moves from an area of high concentration to an area of low concentration by osmosis, the amount of water surrounding the cell will determine if water flows into the cell to make it turgid or flows out of the cell to make it flacid. In pure water, the concentration of water outside the cell is greater than inside the cell and water flows in. In salt water, the amount of water inside the cell is greater and the water flows out of the cell. This causes the cytoplasm of the cell to shrink, This is called plasmolysis.

MATERIALS: Part 1

Starch/glucose solution
salt solution in dropper bottles
distilled water
cellophane dialysis tubing (15 cm long)
250 ml beaker
string (two 15 cm pieces per team)
Tes-Tape (1 small piece per team)

MATERIALS: Part 2

2 potato slices (thin)
2 water bowls
saltwater solution
distilled water

MATERIALS: Part 3

Elodea leaflet
salt solution in dropper bottles
paper towels
Microscopes
slides and coverslips

PROCEDURE (part 1) (This part is to done by one team member)

*See illustration below.

Soak a 20 cm section of cellophane dialysis tubing in water for a few moments. Gently rub the ends between your thumb and index finger until ends separate. Carefully push a pencil or glass rod through the opening to hold it open. Twist one end of the tubing and tie it tightly with a piece of string. Remove the pencil or rod. Fill the bag 3/4 full with the starch/glucose solution. Tie the top of the bag with string. Leave a loose piece of string 15 cm long. Rinse the bag with distilled water. Why is this step necessary?

(a)_____

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. Now place sufficient iodine solution in the beaker's distilled water so to turn it a light orange color.

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Place the beaker at the top of your teams table and begin <u>part 2</u> of the lab.

PROCEDURE: (PART 2) (This is to be done by one team member.)

Pick up 2 bowls and 3 potato slices and pour distilled water in one and salt solution in the other enough to cover the slice of potato. Make note of the texture and firmness of the slices before starting the test.. Place 1 slice of potato in each bowl's solution and make note of the time you placed them into the solutions. Put the extra slice of potato on a piece of paper towel and leave exposed to the air. Place each bowl at the top of your table and go about the rest of your lab assignments.

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PART 1 ACTIVITIES:

After about twenty minutes, place a small piece of Tes-tape into the water solution surrounding your "model cell."

1. Is there any change in the color of the tape? _____.

2. What is the significance of your discovery? _____
_____.

3 Observe the level of the liquid in the dialysis bag. Do you notice any changes?
_____.

4. Do you observe any changes of the fluid inside the "model cell"?
_____

5. What conclusions can be drawn from these observations about what went into and out of the bag and why ? _____
_____
_____

PART 2 ACTIVITIES:

6. How would you describe the stiffness and texture of the sliced potato that was not placed in either solution?_____

7. How would you describe the stiffness and texture of the slice left in distilled water?
_____

8. How would you describe the stiffness and texture of the slice left in the saltwater solution?
_____

9. Which slices have the lesser turgidity? _____

10. Explain why two of the slices lost water._____
_____

11. Why did the slice in the distilled water become crisper? _____
_____

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Procedure: (part 3) Water concentration in cells.

Take a single young Elodea leaflet and place it in a drop of water on a clean slide , then put a coverslip on it. Observe the leaf under high power magnification using the microscope. Note that the cytoplasm containing the chloroplasts is in close contact with the cell wall.

12. Draw the Elodea cell in detail in the circle below.

13. Replace the water under the coverslip with a drop of the salt solution by placing a drop of the NaCl solution on the slide next to the coverslip. Touch a piece of paper towel to the other side of the coverslip to draw the solution under the coverslip. Allow the solution a couple of minutes to demonstrate its effect on the cells. Now draw in the circle below the Elodea cells under the NaCl solution's influence.

14. What is the effect of the salt solution on the Elodea cells?_____
_____

15. Why do you think this happened? _____
_____
_____

16. Define plasmolysis. _____
_____

17. How would the terms TURGID and FLACID relate to the conditions of the Elodea cells before and after the addition of the salt solution? _____
_____
_____
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Lab Summary:

18. How has osmosis been observed in the sections of this lab activity? _____

19. What is the substance used to test for starch? _____
What is the reaction observed when it comes in contact with starch? _____

20. What is the material used to test for glucose? _____
Reaction observed? _____

21. What evidence, if any, did you find that indicated that the dialysis bags were selectively permeable? _____

22. What conclusions can you draw from this investigation concerning the action of living plasma membranes? _____

23. Based upon what you observed with the salt solution's effect on living cytoplasm, how would you use this information to explain why you get so thirsty when you eat a large amount of potato chips?

24. Discuss the processes involving the potato slices increasing of decreasing in tugor pressure.