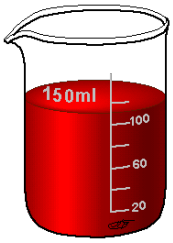
Name _____

MOVEMENT of MOLECULES to MAINTAIN HOMESTASIS PROBLEMS

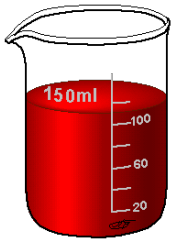
1. Compare and contrast *diffusion* and *osmosis*.

2. List conditions needed for osmosis to occur.
   a.
   b.

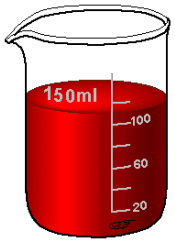
3.



Beaker A
100 % Water



Beaker B
____% Sugar
90% Water

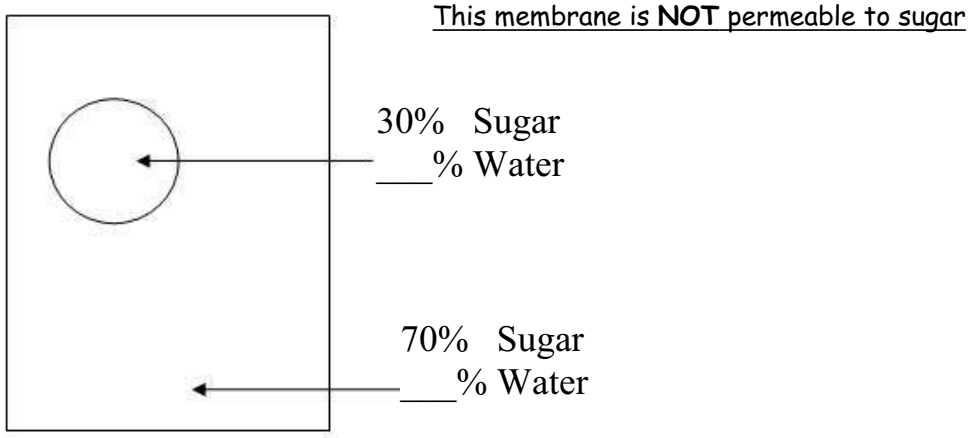


Beaker C
40% Sugar
___% Water

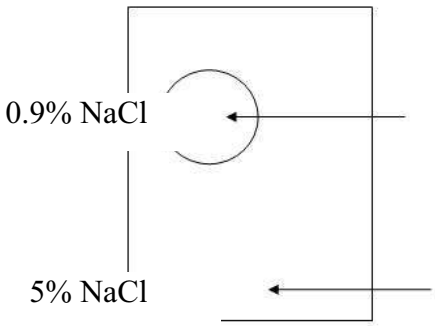
   c. What is the solute concentration of Beaker A?
   d. What is the solvent concentration of Beaker C?
   e. What would the solvent concentration be for a solution that is isotonic to Beaker B?

4. Below is a diagram of a cell submerged in a solution.
   f. What is the *solution* in this example – hypotonic, hypertonic or isotonic?
   g. How do you know?

   h. What *process* is going to take place in this example? (diffusion or osmosis)
   i. Describe exactly what is going to happen to the cell in this example.



5. The cell in this beaker is bathed in a 5% NaCl solution. The membrane is permeable to water but not to NaCl.

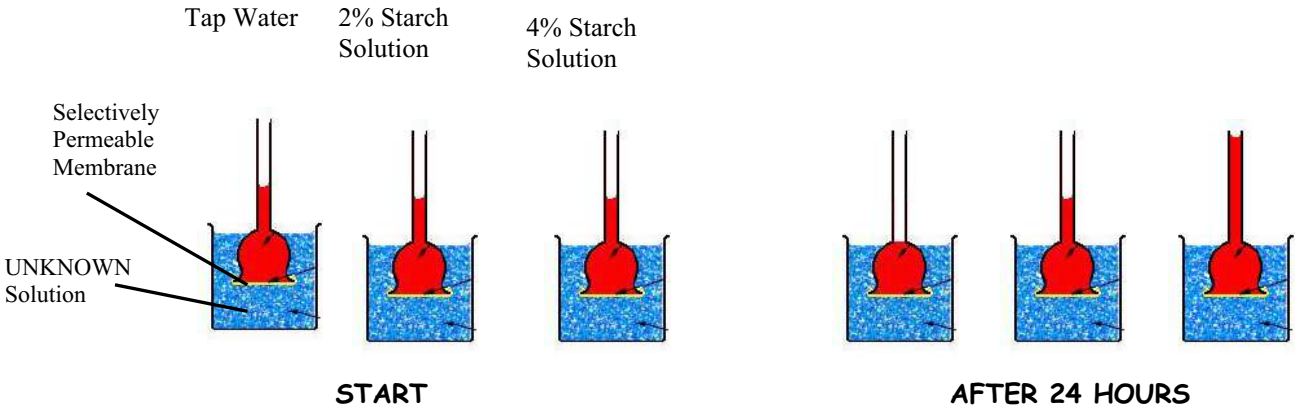


i. In which direction is the net movement of water here?

ii. How will this affect the cell?

6. Three funnels containing three different starch solutions were placed for 24 hours into a beaker that contained a starch solution of UNKNOWN concentration. The end of each funnel was covered by a selectively permeable membrane.

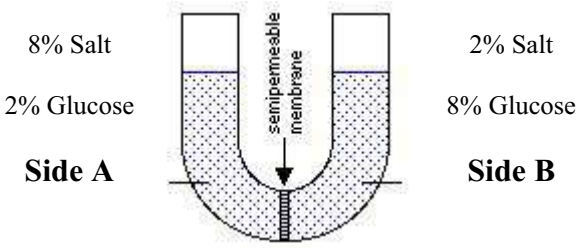
j. What can you say about the *concentration of the solution in the beaker* based on the results shown in the diagram?



7. A U-tube is divided into 2 halves, A and B, by a membrane which is freely permeable to water and salt, but NOT to glucose. Side A is filled with a solution of 8% salt and 2% glucose, while side B is filled with 2% salt and 8% glucose.

k. In terms of glucose concentration, which side is a hypotonic solution?

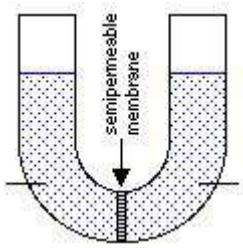
l. What could you say about the water concentration on side A relative to side B?



m. Which molecule(s) will move across the membrane and in which net direction(s)?

n. Notice that the levels of liquid in both A and B are equal. Do you think they will appear this way when the system reaches equilibrium? **Explain.**

8. The solutions in the arms of the U-tube (at right) are separated by a selectively permeable membrane that is *permeable to water and solute A, but not to solute B*. 40g of solute A and 20g of solute B have been added to the water on side 1 of the U-tube. 20g of solute A and 40g of solute B have been added to the water on side 2 of the U-tube. Assume that after a period of time, equilibrium is reached.



o. How many grams of solute A will be in solution on side 1 of the U-tube?
p. How many grams of solute A will be in solution on side 2 of the U-tube?
q. Explain your answers to questions a & b.

r. How many grams of solute B will be in solution on side 1 of the U-tube?
s. How many grams of solute B will be in solution on side 2 of the U-tube?
t. Explain your answers to questions d & e.

u. What has happened to the water level in the U-tube? Explain your answer.

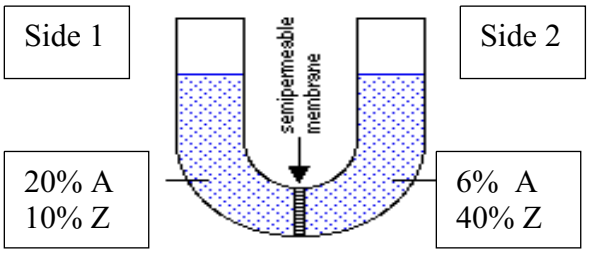
9. Flasks X, Y, and Z contain solutions with different concentrations of the solute NaCl. Flask X has 0.5% NaCl, flask Y has 0.9% NaCl, and flask Z has 1.5% NaCl. Red blood cells (0.9% NaCl) will be placed into each flask.

v. Predict what will happen to the red blood cells in flask X (hint: draw out the situation).

w. Predict what will happen to the red blood cells in flask Y (hint: draw out the situation).

x. Predict what will happen to the red blood cells in flask Z (hint: draw out the situation).

10. In the U-tube diagram below, the membrane is permeable to solute A; however, it is NOT permeable to solute Z.

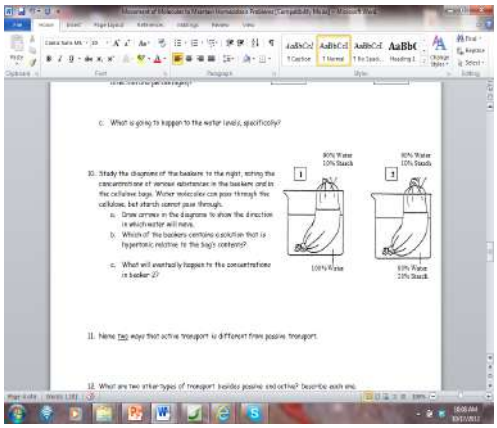


a. What is going to happen to solute A (both direction and percentages)?

b. What is going to happen to solute Z (both direction and percentages)?

c. What is going to happen to the water levels, specifically?

11. Study the diagrams of the beakers to the right, noting the concentrations of various substances in the beakers and in the cellulose bags. Water molecules can pass through the cellulose, but starch cannot pass through.



y. Draw arrows in the diagrams to show the direction in which water will move.

z. Which of the beakers contains a solution that is hypertonic relative to the bag's contents?

aa. What will eventually happen to the concentrations in beaker 2?

12. Name <u>two</u> ways that active transport is different from passive transport.

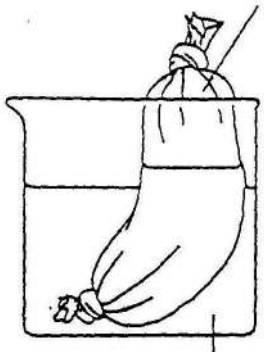
13. What are the two kinds of BULK transport? Describe each one.

14. The direction in which water molecules move during osmosis depends on where the water molecules are more highly concentrated. Study the diagrams below.

bb. Decide whether the solution in each beaker is hypotonic, isotonic, or hypertonic in relation to the solution inside the cellulose bag, then write your answer below each beaker.

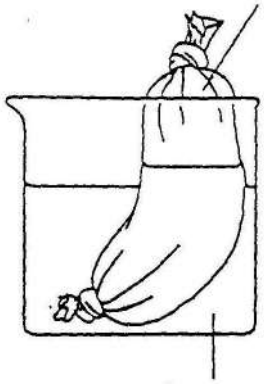
cc. Draw arrows to indicate the direction in which the water will move in each case.

90% Water
10% Starch



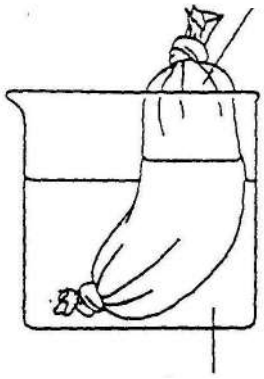
100% Water

80% Water
20% Glucose



20% Glucose

90% Water
10% Starch



90% Water
10% Starch

15. Intravenous solutions must be prepared so that they are isotonic to red blood cells. A 0.9% salt solution is isotonic to red blood cells.

dd. Explain what will happen to a red blood cell placed in a solution of 99.3% water and 0.7% salt.

ee. What will happen to a red blood cell placed in a solution of 90% water and 10% salt?

16. What keeps plants cells from bursting when they are placed in a hypotonic solution?

17. How does being placed in a hypertonic solution affect a plant cell?

18. In regard to the solutions in the bags and in the beakers, what is meant by equilibrium?

19. What happens to the motion of molecules after equilibrium is reached?

20. What is turgor pressure in a plant cell? Why is it important?