FLINN SCIENTIFIC

Name_____

Diffusion Worksheet

Observations

1. Color of the glucose–starch solution.
2. Color of glucose test strip after reacting with the known glucose–starch solution.
3. Color of iodine after reacting with the known glucose–starch solution.
4. Color of the deionized water–iodine solution.
5. Color of glucose test strip after reacting with the known deionized water–iodine solution.
6. What compounds are inside the dialysis bag at the beginning of the experiment?
7. What compounds are outside the dialysis bag at the beginning of the experiment?

Observations and Results

1. Color of the solution in the dialysis bag.
2. Color of the solution in the cup.
3. Color of the glucose test strip after reacting with the solution in the beaker.
4. Color of the glucose test strip after reacting with the solution in the bag.
5. What compounds are inside the dialysis bag after the experiment?
6. What compounds are outside the dialysis bag after the experiment?

Questions

1. Based on your observations, arrange the following substances in order of increasing size, beginning with the smallest: Glucose molecules, water molecules, iodine molecules, membrane pores, starch molecules.

2. Explain the results you obtained. Include the concentration differences and membrane pore size in your discussion.

3. Quantitative data uses numbers to measure observed changes. How could this experiment be modified so that quantitative data could be collected to show that water diffused into the dialysis bag?

4. What results would you expect if the experiment started with a glucose and iodine solution inside the bag and only starch and water outside? Why?

Osmosis Worksheet

Observations and Results

Table 1

Contents in Dialysis Bag	Initial Mass (g)	Final Mass (g)	Mass Difference (g)	% Change in Mass
0.0 M sucrose solution				
0.2 M sucrose solution				
0.4 M sucrose solution				
0.6 M sucrose solution				
0.8 M sucrose solution				
1.0 M sucrose solution				

Table 2

Contents in Dialysis Bag	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6	Class Average
0.0 M sucrose solution							
0.2 M sucrose solution							
0.4 M sucrose solution							
0.6 M sucrose solution							
0.8 M sucrose solution							
1.0 M sucrose solution							

Questions

1. On graph paper draw a graph showing the percent change in mass versus sucrose concentration. Plot both your individual data and the class averages. Determine and label the independent variable, the dependent variable, and the title.
2. Describe the mathmatical relationship between the percent change in mass and the concentration of sucrose within the dialysis bag.

3. Predict what would happen to the mass of each bag in this experiment if all the bags were placed in a 0.4 M sucrose solution instead of deionized water. Explain your response.

4. A dialysis bag is filled with deionized water and then placed in a sucrose solution. The bag's initial mass is 20 g and its final mass is 18 g.

   a. Calculate the percent change in mass, showing the calculations in the space below.

   b. Is the sucrose solution in the beaker hypotonic, hypertonic or isotonic relative to the deionized water in the bag?

5. A laboratory assistant prepared solutions of 0.8 M, 0.6 M, 0.4 M and 0.2 M sucrose, but forgot to label them. After realizing the error, the assistant randomly labeled the flasks containing these four unknown solutions as flask A, flask B, flask C, and flask D. Design an experiment, which the assistant could use to determine which of the flasks contained each of the four unknown solutions. Include in your answer a description of how to set up and perform the experiment, the expected results, and an explanation of the results based on the principles involved. (Be sure to clearly state the principles addressed in your discussion.)

Water Potential Worksheet

Observations and Results

Table 1

Contents in Beaker	Initial Mass	Final Mass	Mass Difference	% Change in Mass
0.0 M sucrose solution				
0.2 M sucrose solution				
0.4 M sucrose solution				
0.6 M sucrose solution				
0.8 M sucrose solution				
1.0 M sucrose solution				

Questions

1. On graph paper, draw a graph showing the percent change in mass versus the concentration of sucrose for all the sucrose solutions. For the graph, determine and label the independent variable, the dependent variable, and the title. *Note:* Place the zero line of the *x*-axis at the midpoint of the *y*-axis in order to plot both the positive and negative percent change in mass values.
2. Determine the equivalent molar concentration of the potato core—the concentration of a sucrose solution in which the mass of the potato core does not change. To find this, draw a "best-fit" straight line through the data points on the graph. The point at which this line crosses the *x*-axis represents the molar concentration of sucrose having a water potential equal to that of the potato tissue. At this concentration there should be no net gain or loss of water from the potato core.

   Record this equivalent molar concentration here. _____ M.
3. What is the water potential of the potato cells? *Note:* Assume the pressure potential is zero. Use the molar concentration determined in question 2.

4. Water potential values are useful because they predict the direction of the flow of water. Recall from the discussion that water flows from an area of higher water potential to an area of lower water potential. For the sake of discussion, suppose that a student calculated that the water potential of a solution inside a bag is –6.25 bar ($Y_s = -6.25$, $Y_p = 0$) and the water potential of a solution surrounding the bag is –3.25 bar ($Y_s = -3.25$, $Y_p = 0$). In which direction will the water flow?

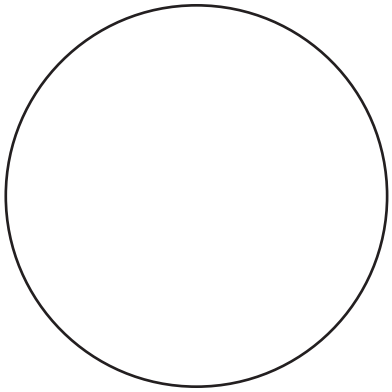
5. If a potato core is allowed to dehydrate by sitting in the open air, would the water potential of the potato cells decrease or increase? Explain.

6. If a plant cell has a lower water potential than its surrounding environment and if the pressure potential is equal to zero, is the cell hypertonic (in terms of solute concentration) or hypotonic to its environment? Will the cell gain water or lose water? Explain.

Plasmolysis Worksheet

Observations and Results

Plant epidermis tissue
Deionized water



Magnification _____

Description _____

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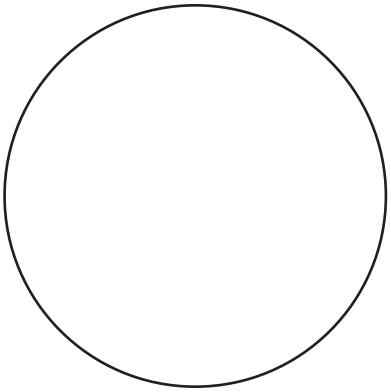
Plant epidermis tissue
Sodium chloride solution



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Description _____

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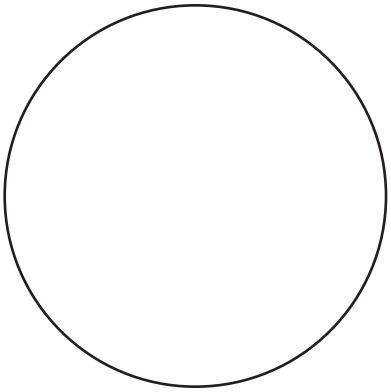
Plant epidermis tissue
Deionized water



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Description _____

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Questions

1. Using the concepts of diffusion, osmosis, and water potential, describe what occurred when the sodium chloride solution contacted the plant epidermis cells.

2. Consider what would happen to a red blood cell (RBC) placed in deionized water.

   a. Which would have the higher concentration of water molecules?

   b. Which would have the higher water potential?

   c. What would happen to the RBC? Why?