 Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Hour:\_\_\_\_\_ Date: \_\_\_\_\_\_\_

POTATO OSMOSIS LAB

**INTRODUCTION:**

The purpose of this lab is to observe osmosis using potato cores and solutions at varying concentrations of solute (sucrose, a disaccharide) and water. We will observe how the mass of the potato cores is affected by the different sugar concentrations in each of the solutions. Recall that potatoes are very high in starch, a complex polysaccharide.

Diffusion is the random movement of molecules from an area of high concentration of those molecules to an area of lower concentration. This span of differences in concentration, from high concentration to low concentration, is known as the Concentration Gradient.

Osmosis is a specific type of diffusion, in that it refers to the diffusion of water through membranes, and plays a crucial role in many cell processes.

Cell membranes are composed of a lipid bilayer that also contains specialized proteins involved with transport of molecules. Cell membranes are said to be selectively permeable or semi-permeable.

**Three possible situations for a cell in a solution**

**Hypotonic**: When a solution contains a *lower* concentration of solute compared to the cell.

**Hypertonic**: When a solution contains a *higher* concentration of solute compared to the cell.

**Isotonic**: When a solution contains an equal concentration of solute compared to the cell.

In this lab, we will place several potato cores into 4 different solutions, each of which contain a different concentration of sugar. We will be recording the mass of each group of cores both before and after they have been placed in these solutions in order to observe if there are any changes in the masses of the cores. If water is lost from the potato cores, the mass will decrease. If water is gained, then the mass of the cores will increase.

**EXPERIMENTAL DESIGN:**

|  |  |
| --- | --- |
| **Independent Variable** |  |
| **Dependent Variable** |  |
| **Controlled Variables**  **(list at least 3)** |  |

**PRE-LAB:**

1. Develop a Hypothesis for what you believe will happen to the potato cores in each of the four solutions. Using an “If . . . Then” format, record your idea here.

2. How will we determine the mass of the potato cores, and what will this tell us about what has happened to the cores before and after being placed in the solutions?

3. What are the solutions we will be using and what is the difference between them?

4. Why does the procedure ask you to blot the cores using a paper towel when it is removed from the cup before taking a mass measurement? Why wouldn’t you just soak up the liquid from the cores by wrapping them up in the paper towel?

5. Explain the difference between Diffusion and Osmosis:

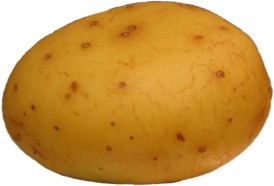
6. Explain the difference between Hypotonic and Hypertonic in terms of a cell in solution:

**MATERIALS:**

* 1 potato
* paper towels
* weigh boat
* 4 cups
* knife
* potato corer
* distilled water and sugar solutions
* forceps
* digital scale
* graduated cylinder
* tape labels

**PROCEDURE:**

1. Cut the potato into four disk shaped slices by cutting as represented in the

following diagram:

2. Using the potato corer, drill out four cores from each potato slice, place them in one of the plastic cups and cover. **DO NOT INCLUDE ANY SKIN** on the cores. This should result in 16 approximately equal sized potato cores.

3. Label the 4 cups to match each of the four solutions as labeled (A-D). *The solution concentrations will NOT be given until the conclusion of the lab!!!.* Label your cups so that your lab group will recognize them. Using a graduated cylinder, measure 25 ml of each solution into the appropriate cup.

4. Determine the mass of each set of 4 potato cores using the digital scale and weigh boat. DO NOT PUT THEM IN THE SOLUTIONS until you have taken the initial mass measurements. Record the initial mass for each set in Data Table 2. After weighing each set, place them in one of the four solutions, cover and allow them to sit overnight.

5. The next day, remove the cores from the cups, blot them gently on a paper towel until just dry and determine the mass again for each set of cores. Record this information in data Table 2.

6. Calculate the mass difference and % change in mass for each set of cores, and add these numbers to Data Table 2.

7. Collect data from your classmates and record in Table 3. Calculate the average % change in mass from this class data for each solution, and record this information in Data Table 3.

**DATA:**

*Quantitative Observations:*

**DATA TABLE 1**

|  |  |
| --- | --- |
| **Solution** | **Sucrose Concentration** |
| A | ??? |
| B | ??? |
| C | ??? |
| D | ??? |

**DATA TABLE 2 (Lab Group Data)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Solution** | **Initial Mass (g)** | **Final Mass** | **Mass Difference** | **% Change in mass** |
| A |  |  |  |  |
| B |  |  |  |  |
| C |  |  |  |  |
| D |  |  |  |  |

**DATA TABLE 3 (% Change in Mass) – Class Data**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Solution** | **Group 1** | **Group 2** | **Group 3** | **Group 4** | **Group 5** | **Group 6** | **Group 7** | **Class Average** |
| A |  |  |  |  |  |  |  |  |
| B |  |  |  |  |  |  |  |  |
| C |  |  |  |  |  |  |  |  |
| D |  |  |  |  |  |  |  |  |

*Qualitative Observations:*

**CONCLUSION:**

1. Which Solution (A-D) contained the distilled water? How do you know?

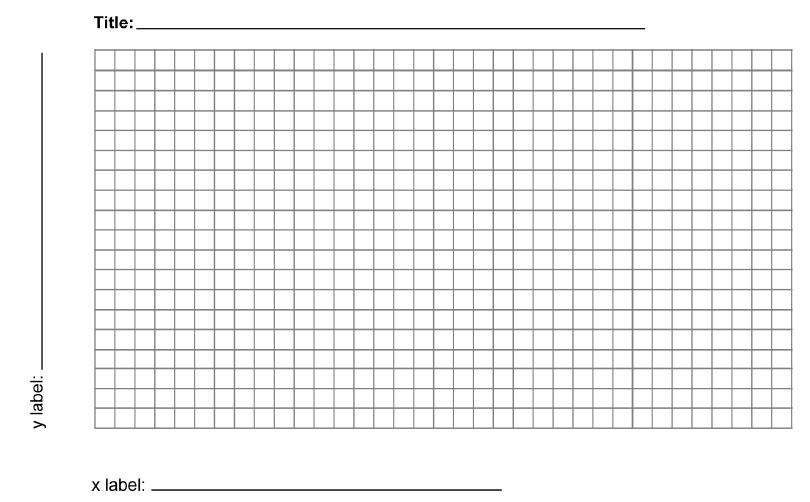
2. Based on your results, rank the four solutions *from* ***lowest*** *to* ***highest***

sugar concentrations:

**3. Putting it all together:** Summarize how you were able to rank the order in #2. In your summary, be sure to include what happened to each set of potato cores in each of the different solutions. **Make sure to *use* and *underline the following terms in your answer:* osmosis, concentration gradient, hypotonic, hypertonic, isotonic)**

4. Now obtain the actual sugar concentrations for the four solutions, and record in Table 1. On the following page, create a graph showing the relationship between sucrose concentration and the % change in mass for each solution ***using the class average data (Table 3).*** NOTE: A zero line has been placed on your graph since you have both positive and negative values. Label your graph, and include a best fit line model. Based on the plot of your data, what can you conclude about the actual concentration of sugar in the potato cells at the beginning of the experiment? (HINT: Think about equilibrium)

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5. Using your graph, predict what data you would have obtained if you had placed four potato cores in a 200 g/L solution. What % mass change would you have observed?

6. Using your graph, predict what data you would have obtained if you had placed four potato cores in a 500 g/L solution. What % mass change would you have observed?

7. According to the scientific method, an experiment is designed to support or disprove a hypothesis. Was your hypothesis confirmed or refuted? Explain.