Osmosis Lab – Part 1 (Potatoes)

Background Information:

Remember that all cells are surrounded by a cell membrane. The membrane allows for the exchange of materials with the environment. Materials needed by the cell, such as water and food are allowed in; while wastes, such as carbon dioxide and other products of cellular metabolism are allowed to leave. To understand how materials move into and out of the cell, you must understand the process of diffusion.

All materials, including water, are made of particles called atoms and molecules. These particles naturally travel from areas where they are crowded, to areas less crowded where they can spread out. Diffusion is the movement of these particles from an area of high concentration to an area of lower concentration. This movement can occur across cell membranes, both into or out of the cell. Cells do not need to use energy for this to occur because it happens naturally, so this is called passive transport.

Water is important to cells because it makes up so much of the cell’s matter (over 70%), and because it is “the universal solvent” that dissolves and carries many of the other chemicals the cell needs. The diffusion of water is so important that it has been given its own name - osmosis.

Osmosis is defined as the diffusion of water across a cell membrane.

It is important to understand that a slice of potato is really a collection of thousands of cells all stacked on one another. Think of the slice as a structure made up many, many tiny water balloons stuck to each other. These are plant cells but they do not have very strong cell walls. You should NOT consider the role of the cell walls when you think about the results of this lab. Keep in mind that there is also some water already found in the vacuoles of the potato cells.

Osmotic Conditions:

Additional information: When the cell needs to move particles in or out and must move them against this normal flow (that is, when the cell needs to get something from an area of low concentration to an area of an already high concentration), it must use some energy to do so (some ATP). When this happens it is called active transport because it must actively use energy to do the work.
Osmosis and Potatoes- Pass the salt, please!

Name ___________________________ Date ________

1. **Problem/Purpose:** You are trying to determine whether or not salt water will affect the “crispness” and flexibility of a potato slice.

   **Write your problem in the form of a question:**

   **Background Research:** see research document on table.

2. **Hypothesis (If I do this….then this will happen….):**

3. **Experimental Procedure:**
   1. Fill two beakers with 150 mL of water.
   2. Add 4 spoonfuls of salt to one beaker only. Stir this beaker until the salt is mostly mixed in with the water.
   3. Obtain two thin potato slices and record the original “crispness” of the potato in the data table using words like “firm” or “tender”. Also, very gently try to bend your potato slice. Record the potato’s flexibility in the data table using phrases like “not flexible at all” or “slightly flexible”.
   4. Add a potato slice to each beaker.
   5. Every seven minutes for 28 minutes, observe your potato slices. Do this by slightly lifting the potato out of the beaker. Record the crispness and the flexibility of the potato slices in your data table.

4. **Data:**

<table>
<thead>
<tr>
<th>Describe crispness of the potato (Ex: very firm, tender)</th>
<th>Original (Before Water)</th>
<th>After 7 minutes</th>
<th>After 14 minutes</th>
<th>After 21 minutes</th>
<th>After 28 minutes</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Salt </td>
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<td>Salt </td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Describe flexibility of the potato (Ex: not flexible, very flexible, slightly flexible)</th>
<th>Original (Before Water)</th>
<th>After 7 minutes</th>
<th>After 14 minutes</th>
<th>After 21 minutes</th>
<th>After 28 minutes</th>
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4. **Experimental Variables:**
   a. Which beaker would be considered the control group in this experiment?
   b. Identify the independent variable in this experiment.
   c. Identify the dependent variable in this experiment.
Analysis Questions:

5. Describe the connection between osmosis and the potato’s change in crispness/flexibility.

6. Based on the findings of this lab, if you worked in a grocery store, what would you do to keep your vegetables appearing “firm and fresh” for your customers?

7. Sketch both beakers in the space below. Use arrows to illustrate the movement of water molecules (osmosis) that occurred in this experiment.

8. Now label your beakers as hypertonic, hypotonic, or isotonic.

9. Conclusion: Remember, a good quality conclusion summarizes the data, states whether the hypothesis was supported or rejected and answers the experimental question.

10. Osmosis Lab – Part Two (Gummy Bears!)

<table>
<thead>
<tr>
<th>Day</th>
<th>Measurements:</th>
<th>Observations:</th>
</tr>
</thead>
</table>
| Day One – Original Gummy Bear | Length: _______ cm  
Width: _______ cm | |
| Day Two – Gummy Bear Soaked in H_2O | Length: _______ cm  
Width: _______ cm | |
| Day Three – Soaked Gummy Bear in Salt H_2O | Length: _______ cm  
Width: _______ cm | |

Which beaker represents a hypotonic solution? _____________________________________________

Which beaker represents a hypertonic solution? _____________________________________________