**Chicken Egg Osmosis Lab**

**Introduction:**

The ability of cells to absorb water is dependent on the environment in which they are exposed to. The passive movement of water from one cell to another requires a concentration difference across a **semi-permeable** membrane. We call this movement of water from a high concentration to low concentration **osmosis**.

All cells require water as the **solvent** in which chemical reactions that sustain life occur. If cells are deprived of water, these chemical reactions that slow down and ultimately stop resulting in death of that cell and perhaps the entire organism. Therefore, one important way organisms maintain **homeostasis** is by attempting to insure a proper water balance in their cells.

A chicken’s egg is surrounded by a shell. Bumpy and grainy in texture, an eggshell is covered with as many as 17,000 tiny pores. Eggshell is made almost entirely of calcium carbonate (CaCO₃) crystals. It is a semi-permeable membrane, which means that air and moisture can pass through its pores. Lying between the eggshell and egg white, the egg has an inner and outer membrane. These two transparent semi-permeable membranes provide efficient defense against bacterial invasion while still allowing passage of air and moisture into the actual egg. If you give these layers a tug, you’ll find they’re surprisingly strong. They’re made partly of keratin, a protein that’s also in human hair.

**Problem:**

What is the effect of ________________ on ____________________________?

**Purpose:** The purpose of this lab investigation is to _____________________________________________________________________________________.

**Hypothesis:** If the solute concentration outside a cell ________________, then water will diffuse _______________ the cell because _____________________________________________________________________________________.

**Experimental Design:**

Independent variable: ____________________  Dependent variable:______________

Control: ____________________  Constants: ____________________

How would you “define” each of the three solutions we are using in this lab (Hypertonic, Isotonic, Hypotonic)?

DI water: ______________  Karo’s Syrup: ______________  Vinegar:______________

**Procedure:** Check off each step of the procedure as you complete it.

**Day 1**

1. Carefully place the raw egg into the container and cover the egg with vinegar.

2. Allow eggs to sit for 24 to 48 hours until the outer calcium shell is removed.

**Day 2**

3. VERY carefully remove the egg from the container, gently rinse it with water and place it onto a paper towel into a weigh boat.
4. Record the size using a ruler, describe the appearance (color) and shape of your egg in your data table.
5. Find the mass of the egg in grams using a balance and record in your data table.
6. Get a beaker and label “distilled water” on masking tape.
7. Carefully place the egg into the beaker and just cover the egg with distilled water.
8. Repeat these steps with 2 more eggs. One placed in “Vinegar” and the third placed in “karō’s syrup”.
9. Allow them to sit for at least 24 hours.

**Day 3**

10. For each egg, gently remove the egg using a spoon. BE CAREFUL not to break the egg!
11. Gently rinse it with water and place it onto a paper towel into a weigh boat.
12. Record the size using a ruler, describe the appearance (color) and shape of your egg in your data table.
13. Find the mass of the egg in grams using a balance and record in your data table.
14. Wipe down your lab area, materials and put away all lab equipment.
15. Calculate the percent change in mass for each egg using the following equation:

\[
\text{% Change in Mass} = \left( \frac{\text{Final Mass} - \text{Initial Mass}}{\text{Final Mass}} \right) \times 100
\]

**HINT:** You may have some NEGATIVE percents!

**Data**

<table>
<thead>
<tr>
<th>Table 1. Physical Characteristics of the Chicken Egg</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measure Size (in mm)</td>
</tr>
<tr>
<td>Egg 1 (DI water)</td>
</tr>
<tr>
<td>Egg 2 (Vinegar)</td>
</tr>
<tr>
<td>Egg 3 (Karō’s Syrup)</td>
</tr>
</tbody>
</table>

| Appearance (color) | Before | After |
| Egg 1 (DI water) | | |
| Egg 2 (Vinegar) | | |
| Egg 3 (Karō’s Syrup) | | |

| Describe Shape | Before | After |
| Egg 1 (DI water) | | |
| Egg 2 (Vinegar) | | |
| Egg 3 (Karō’s Syrup) | | |

<table>
<thead>
<tr>
<th>Table 2. Effect of Solution on Chicken Egg Diffusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial Mass (g)</td>
</tr>
<tr>
<td>Egg 1 (DI water)</td>
</tr>
<tr>
<td>Egg 2 (Vinegar)</td>
</tr>
<tr>
<td>Egg 3 (Karō’s Syrup)</td>
</tr>
</tbody>
</table>
Results
1. Create a bar graph which compares the percent change in mass for each solution.
   ➢ Remember the independent variable is on the x-axis and the dependent variable on the y-axis. (HINT: you will have some bars that should go in the negative direction!)

2. Use arrows to show the movement of water for each egg.
3. Identify the solutions tested as hypertonic, isotonic or hypotonic relative to the egg.
4. Describe below what happened to each egg (stayed the same, swelled, shrunk).

Distilled Water  Vinegar  Karo’s Syrup

____________________  __________________  __________________
Conclusion:
1. Define.
   - Osmosis: _______________________________________________
   - Solute: _______________________________________________
   - Solvent: _______________________________________________
   - Homeostasis: ___________________________________________
2. Which solution has the highest concentration of solute? ________________
   How do you know?
3. Which solution has the lowest concentration of solute? ________________
   How do you know?
4. Which solution has the an equal concentration of solute? ________________
   How do you know?
5. Describe the sources of error or assumptions in this lab and explain how they
   affected the lab results.
6. What type of beverages would best re-hydrate your cells? ________________
   Why?
7. What types of drinks should be avoided? ______________________________
   Why?
8. Why are fresh vegetables sprayed with water at the supermarket?
9. Roads are sometimes salted to melt ice. What does this salting do to the plants
   along roadsides and why?
10. In 3-5 meaningful sentences describe what you have learned about cell
    transport. Be sure to include important vocabulary to explain yourself.