Honors Biology
Unit 3: Cells

**Due Tuesday November 15th!**

Name: _____ Period: _____

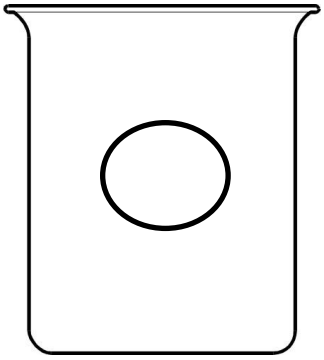
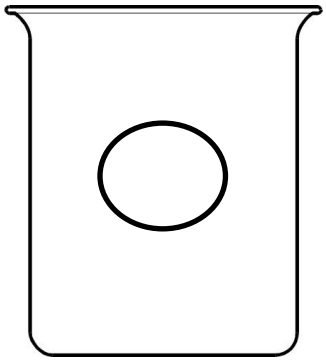
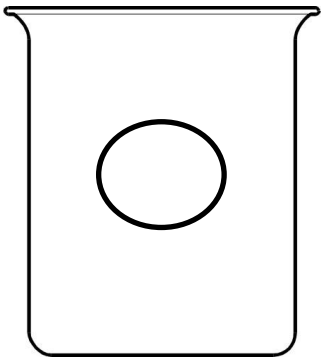
# Lab 8: Osmosis – Effect of Solute Concentration on the Cell

Background: As we have discussed in class, the cell membrane controls what moves in and out of the cell. This includes both solutes and solvents, particularly water. Water will move in and out of a cell because of the **solution the cell is immersed in**. Solutions can be labeled as hypertonic, hypotonic, and isotonic depending on the solute concentration of the solution OUTSIDE the cell compared to the solute concentration inside the cell.

## Part A:

**Pre-Lab Questions:**

1. For each solution type, in the beaker draw what the different solute concentrations (using dots to indicate solutes) would be in and out of the cell (oval floating in the beaker). Then use arrows to indicate the movement of water via osmosis. Finally, DESCRIBE why water will move in the direction you have indicated with arrows and DESCRIBE what will happen to the cell in this solution type.

| | **Isotonic** | **Hypertonic** | **Hypotonic** |
|---|---|---|---|
| **Solution Diagram** |  |  |  |
| **Why will water move?** | | | |
| **What happens to the cell?** | | | |

2. We have identified that the phospholipid membrane of the cell is semi-permeable. Describe in 1-2 sentences what this means.

**Hypotheses:**

3. Read the lab instructions. Your objective for this lab is to identify the solution in the dialysis tubing "cell". The sugar concentration inside the "cell" is unknown. You will put the "cell" in four KNOWN concentrations (you will be given the concentrations). In the table, hypothesize what will happen when you put the dialysis tubing "cell"

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in the three types of solution. Note: we are not only looking at their appearance, but also their masses. Complete this information in the table on the next page.

| **Hypotheses:** | **Then this will happen…**<br>**(identify color, mass, appearance!)** | **Because…**<br>**(give your reasoning!)** |
|---|---|---|
| If a dialysis tubing "cell" is put in a **hypertonic** solution… | | |
| If a dialysis tubing "cell" is put in a **hypotonic** solution… | | |
| If a dialysis tubing "cell" is put in an **isotonic** solution… | | |

4. In this experiment, you will make three sugar solutions with three different sugar concentrations: 0% sugar, 10% sugar, and 20% sugar. These percentages tell the amount of sugar in the volume of water. For example, 5% sugar water means that for every 100mL of water there are 5g of sugar. In your dialysis tubing "cells" there will be an unknown sugar solution. HOW will you know what concentration of sugar is inside the dialysis tubing "cells"?

**Solution Calculations:**

| **For Sugar Solution** | **Mass of Empty Beaker (g)** | **Mass of Sugar to Be Added**<br>**(Add This Mass to Empty Beaker Mass)** | **Mass of Empty + Sugar (g)** | |
|---|---|---|---|---|
| **0%** | **---** | **0g** | **---** | **Add the measured sugar to 200mL of tap water and mix until dissolved!** |
| **10%** | | **20g** | | |
| **20%** | | **40g** | | |
| **30%** | | **60g** | | |

# Part B:

**Data Collection:**

| **Sugar Solution** | **Mass of "Cell" Before (g)** | **Mass of "Cell" After (g)** | **Mass Difference (g)**<br>**(Mass Before – Mass After)**<br>**Can be negative!** | **% Change of Mass**<br>**(Mass Difference ÷ Mass Before) x 100**<br>**Can be negative!** | **Did water move in or out of the cell or both?** | **Hypo-**<br>**Hyper-**<br>**Or**<br>**Isotonic?** |
|---|---|---|---|---|---|---|
| **0%** | | | | | | |
| **10%** | | | | | | |
| **20%** | | | | | | |
| **30%** | | | | | | |

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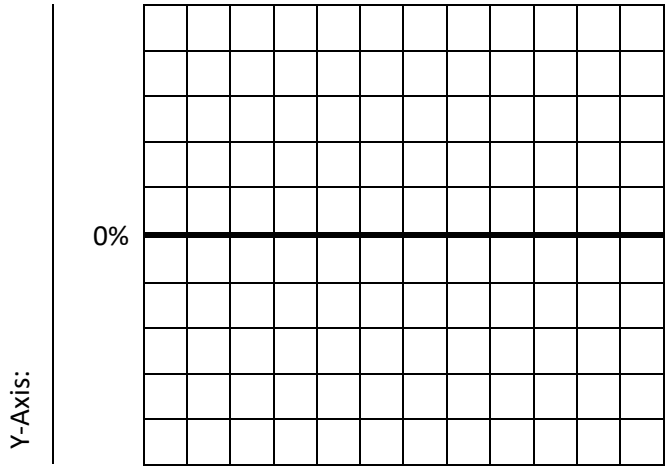
**Data Analysis:**

In this section, graph your collected data. First, this will be a LINE graph! Second, what is the independent variable on the x-axis? Third, what is the dependent variable on the y-axis? Label the axes on the graph below.




**Data Analysis:**

1. Using your graph, identify what the concentration of sugar was in the dialysis tubing "cell". Hint: what concentration is nearest 0% change? (Note: your data might not be perfect, but what is the closest possible concentration?) Describe why it isn't any of the other concentrations that you made.

2. Using your graph, hypothesize what would happen to a dialysis tubing "cell" in a 15% sugar solution?
   A. Describe would happen to a dialysis tubing "cell".

   B. Would this solution be hypotonic, hypertonic, or isotonic for the "cell" in our lab?

3. Using your graph, hypothesize what would happen to a dialysis tubing "cell" in a 35% sugar solution?
   A. Describe would happen to a dialysis tubing "cell".

   B. Would this solution be hypotonic, hypertonic, or isotonic for the "cell" in our lab?

4. The dialysis tubing is a semi-permeable membrane. Of the two molecules you worked with today (sugar and water), which one could diffuse through the membrane and which one could not? Why?

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5. Using your knowledge of osmosis and diffusion, describe what you think would happen to a plant if it were watered with salt water (normally the plant should be watered with regular, non-salty water). Describe what would happen to the individual plant cells and what would happen to the plant overall. Use the osmosis vocabulary! (Hypotonic, isotonic, hypertonic, concentration, etc.)

| **Part A** | | | | |
|---|---|---|---|---|
| **Score:** | **1** | **2** | **3** | **4** |
| **Description:** | Some or no questions are answered are attempted. Collected data may be difficult to follow or interpret. Questionable lab technique. | All questions are answered, may not be thorough, and at least 50% accurate. Collected data may be difficult to follow or interpret. Questionable lab technique. | All questions are answered thoroughly and at least 90% accurate. Collected data is neat and demonstrates proper lab technique. | All questions are answered thoroughly and 100% accurate. Collected data is neat and demonstrates proper lab technique. |

| **Part B** | | | | |
|---|---|---|---|---|
| **Score:** | **1** | **2** | **3** | **4** |
| **Description:** | Most data has been completed in the tables. Graph titles do not accurately reflect variables. Data has been drawn on the graph, but may not be completely accurate compared to data table. Graph is not neat. Some or no questions attempted; not thorough. | Graph titles attempt to accurately reflect variables. Data has been drawn on the graph, but may not be completely accurate compared to data table. Graph needs some improvement in neatness. All questions attempted, may need improvement on thoroughness. | Graph titles are accurate and reflect variables, may use some slight improvements. Data has accurately been drawn on the graph. Graph is neat, but may need some slight improvements. All questions answered accurately, may need improvement on thoroughness. | All data has been completed in the tables. Graph titles are accurate and reflect variables. Data has accurately been drawn on the graph. Graph is neat and needs no improvements. All questions answered accurately and thoroughly. |