# Pre-Lab Information

Purpose To understand the permeability of the cell membrane and examine osmosis and diffusion in artificial cells

Time Approximately 60 minutes

Question Will starch and glucose move across a cell membrane?

**Hypothesis**

**Variables** *Independent Variable*:

*Dependent Variable*:

Summary In this lab, you will use dialysis tubing as an artificial cell membrane. It is a good tool for modeling the cell membrane because it only allows certain substances to pass through it. Small ions and molecules can pass through the dialysis tubing but large molecules cannot. We will use two molecules in this experiment: glucose and starch. Starch is a carbohydrate made up of many glucose molecules bonded together. In this lab, you will set up four models, two with starch and two with glucose to determine their movement through the dialysis tubing.

# Safety

* Behavior in the lab needs to be purposeful.
* Tie back long hair, roll up sleeves, and secure loose articles of clothing.
* Handle materials carefully. If something breaks, report it to your teacher immediately.
* Wipe up any spills when it is safe to do so.
* Report all accidents—no matter how big or small—to your teacher.

# Lab Procedure

1. **Gather materials.**

|  |  |
| --- | --- |
| * 4 pieces of dialysis tubing * Glucose solution * Starch solution * Benedict’s reagent * AP bio formula sheet | * 4 Beakers (200 mL) * Iodine * Tap Water * Access to the internet * Timer or stopwatch |

1. **Conduct background research.**
   1. Use the internet to find 2–3 purposes for dialysis tubing, including use in experimental settings.
   2. Write a hypothesis based on what you know and have researched. There is a space for you to write your hypothesis in the Pre-Lab section of this document.
2. **Identify variables.**
   1. Identify the independent and dependent variables in this lab. Write your answers in the appropriate area in the Pre-Lab section of this document.
3. **Set up your experiment.**
   1. Obtain your materials from your teacher.
   2. Take one piece of dialysis tubing. Tie a knot at one end.
   3. Fill the tube with 10 mL of tap water. Knot the other end.
   4. Place the tube in a beaker filled with the glucose solution. The solution should cover the dialysis tube completely.
   5. Repeat with a second piece of dialysis tubing, but this time, fill the tube with 10 mL of glucose solution. Fill the beaker with tap water.
   6. Repeat with a third piece of dialysis tubing, but this time, fill the tube with 10 mL of starch solution. Fill the beaker with tap water.
   7. Repeat with a third piece of dialysis tubing, but this time, fill the tube with 10 mL of tap water. Fill the beaker with starch water.
   8. Record your experimental setup and label all beakers.
4. **Gather data.**
   1. Wait 15 minutes. Carefully pull out the tubing you tested and place it on a paper towel.
   2. Record your observations.
   3. Add one drop of Benedict’s solution to the beakers that had glucose solution. Record any color change.
   4. Carefully empty the contents of the tubing into clean beakers. Add one drop of Benedict’s solution to the beakers that had glucose solution. Record any color change.
   5. For the starch beakers, repeat the same procedure but add one drop of iodine instead of Benedict’s solution. Record any color change.
   6. Benedict’s solution will change color in the presence of glucose. Iodine will turn dark blue or purple in the presence of starch. Record in your data table where you see each molecule.
5. **Clean up your area.** 
   1. Return unused materials and dispose of any trash according to your teacher’s directions.

# Experimental Setup and Data

**A. Sketch and describe your experimental setup below.**

**B. Record your data either in your lab notebook or in the table below.**

**Experimental Results**

|  |  |  |  |
| --- | --- | --- | --- |
| **Beaker Solution** | **Solution inside the Dialysis Tubing** | **Observations after Adding Benedict’s or Iodine** | **Did the molecule move through the tubing?** |
| Tap water | Glucose |  |  |
| Glucose | Tap water |  |  |
| Starch | Tap water |  |  |
| Tap water | Starch |  |  |

# Follow-Up Questions

Answer the following questions:

1. What do your observations tell you about the movement of starch and glucose through the tubing? Justify your answer with observations.
2. Is the dialysis tubing selectively permeable? Why do you think this is?
3. Compare the model you created with the dialysis tubing to an actual cell membrane.