

Prelab Information

Purpose	Explore how materials move across a semipermeable membrane.
Time	Approximately 45 minutes
Question	What is the effect of the molecule size of a material on its ability to diffuse across a semipermeable membrane?
Hypothesis	If molecules are small enough, then they will diffuse across a semipermeable membrane because they will be able to pass through its tiny openings.
Summary	You will try to diffuse both glucose and starch across dialysis tubing, a semipermeable membrane with similarities to the membrane around a cell.
Variables	<i>Independent variable:</i> the molecule size of the material (Glucose is a smaller molecule than starch.) <i>Dependent variable:</i> the ability to diffuse across a semipermeable membrane

Safety

- Always wear safety goggles and a lab coat when performing an experiment.
- Keep behavior in the lab purposeful. Use caution when working with chemicals.
- Check glassware, such as test tubes and beakers, for cracks and chips prior to use.
- Use the right tools, such as tongs, when handling hot objects.
- Report all accidents—no matter how big or small—to your teacher.

Lab Procedure

Step 1: Gather Materials

- Droppers
- Stirring rod
- Seven test tubes
- Two 500 mL beakers
- Hot plate
- Distilled water
- Two lengths of dialysis tubing, each 15 cm long
- String
- Starch solution
- Lugol's solution (starch indicator)
- Glucose solution
- Benedict's solution (glucose indicator)

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Steps 2-4: Test Whether Starch Passes through the Semipermeable Membrane

Step 2: Verify Lugol's Solution as an Indicator for the Presence of Starch

- Label three test tubes "Water," "Starch," and "Glucose." Add ten drops of water, ten drops of glucose solution, and ten drops of starch solution respectively.
- Put ten drops of Lugol's solution into each of the test tubes.
- Gently swirl the contents of all three test tubes.
- In your data table, record any color changes, which indicate that starch is present. (If the indicator solution works properly, only the test tube with the starch solution should show a change.) Keep these test tubes for reference during Step 5.

Step 3: Prepare a "Membrane" for Testing Starch Solution

- Tie a knot in one end of a length of dialysis tubing.
- Hold the tubing with the knotted end down. Carefully fill the tubing with starch solution so that the tube is half full.
- Tie a knot in the top end of the tubing.
- Rinse the tubing with water. (It is best to use distilled water, at least for the final rinse.)

Step 4: Test for Diffusion of Starch through the Membrane

- Fill a 250 mL beaker with 150 mL of distilled water. Add ten drops of Lugol's solution to the beaker, and mix with a stirring rod.
- Place the tubing into the beaker. Observe the solution in the beaker and the dialysis tube; record your observations in the data table.
- Wait 15 minutes. Note the color of the solution in the beaker and the dialysis tube; record the results in the data table.
- Did starch diffuse through the membrane? Record your answer and reason in the data table.

Steps 5-7: Test Whether Glucose Passes through the Semipermeable Membrane

Step 5: Verify Benedict's Solution as an Indicator for the Presence of Glucose

- Label three test tubes "Water," "Starch," and "Glucose." Add ten drops of water, ten drops of glucose solution, and ten drops of starch solution respectively.
- Put ten drops of Benedict's solution into each of the test tubes.
- Place the test tubes in a water bath on the hot plate. Heat for five minutes.

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- d. In your data table, record any color changes, which indicate that glucose is present. (If the indicator solution works properly, only the test tube with glucose solution should show a change.) Keep these test tubes for reference during step 7.

Step 6: Prepare a “Membrane” for Testing Glucose Solution

Repeat steps 3a through 3d exactly except with the glucose solution.

Step 7: Test for Diffusion of Glucose through the Membrane

- a. Fill a 250 mL beaker with 150 mL of distilled water. Add ten drops of Benedict’s solution to the beaker and mix with a stirring rod.
- b. Place the tubing into the beaker. Observe the solution in the beaker and the dialysis tube. Record your observations in the data table.
- c. Wait fifteen minutes. Transfer ten drops of the solution in the beaker to a test tube.
- d. Place the test tube in a hot water bath, and wait for five minutes. Note the color of the solution in the test tube taken from the beaker. Record the results in the data table.
- e. Did glucose diffuse through the membrane? Record your answer and reason in the data table.

Step 8: Dispose of all materials and tools according to your teacher’s directions.

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Data

Record your data either in your lab notebook or in the space below. For Data table 1 (Lugol's test), record the color of the liquid after the addition of Lugol's solution. For Data table 1 (Benedict's test), record the color of the liquid after the addition of Benedict's solution.

Table 1: Indicator Tests

Liquid in the test tube	Step 2: Color of the liquid after the addition of Lugol's solution (starch indicator)	Step 5: Color of the liquid after the addition of Benedict's solution (glucose indicator)
Distilled Water		
Starch Solution		
Glucose Solution		

Table 2: Diffusion Tests

Description	Step 4: Test for Diffusion of Starch	Step 7: Test for Diffusion of Glucose
Color of Solution in Dialysis Tube	Initial Color: Color After 15 Minutes:	[Not Observed]
Color of Solution in Beaker	Initial Color: Color After 15 Minutes:	Initial Color: Color After 5 Minutes of boiling:
Was there diffusion?	Y / N Reason:	Y / N Reason: