

Topic: Dialysis Lab

Summary: Students will learn about how the cell membrane can be semi-permeable.

Goals & Objectives: Students will be able to see how a membrane can be selectively permeable. Students will be able to test for carbohydrates: sugars and starches.

Standards: CA Biology *1a*. Students know cells are enclosed within semi-permeable membranes that regulate their interaction with their surroundings.

Time Length: 90 minutes

Prerequisite Knowledge: Osmosis, color changes when testing with Benedicts and Lugol's solutions.

Materials:

- Dialysis tubing 30 cm
- String
- Clips – paper clips can work
- 100, 25 and 10 mL graduated cylinders
- 100 mL beakers
- Test tubes and test tube holders
- Hot plate
- Water
- Starch solution
- Glucose solution
- Benedicts solution
- Lugol's solution (Iodine)
- Safety goggles

Lab Setup:

Pre-soak the dialysis tubes for 24 hours. This will enable the tubes to be opened easily. At each lab table, place one 100 mL beaker, one 100 mL graduated cylinder, one 25 mL graduated cylinder, and one 10 mL graduated cylinder. Set up a high traffic station for the hot plates that are well ventilated. Have the dialysis tubes soaking in a large beaker and place paper clips there for student to bring to their desks. If you are going to have students work for two days, clear away an area for students to place their beakers. Make sure this area is not hit by sunlight since water will evaporate quickly.

Procedures:

1. Students are to work in groups of two. Please read the procedures listed in the student handout. Students need to wear safety goggles when using the hot plate.

Accommodations: Students with an IEP can take the handout home if they need extra time. Students who need help with lab procedures can work with a lab group who can perform the lab instructions. Students with an IEP may also only answer questions 1-7.

Evaluation:

The data table completed in the experiment section is worth 3 points. Each question in the analysis section is worth 3 points each for a total of 24 points. The conclusion is worth 3 points. This assignment is worth a total of 30 points.

Dialysis Lab

Problem Statement:

In this lab, you will model how the cell membrane is semi-permeable using dialysis tubing. The glucose/starch solution will act as the cytoplasm of the cell and the tube will act as the cell membrane.

Hypothesis:

If I place different size molecules into a dialysis tube then the tube will determine which size of molecules can diffuse through.

Materials:

- 30 cm dialysis tubing
- String
- Clips – paper clips can work
- 100, 25 and 10 mL graduated cylinders
- 100 mL beakers
- Test tubes and test tube holders
- Water
- Starch solution
- Glucose solution
- Benedict's solution
- Lugol's solution (Iodine)
- Hot plate

Procedures:

1. You and your lab partner will work together to set up the lab. One student will measure 64 mL of water with a graduated cylinder and pour it into a beaker. Measure 1 mL of Lugol's solution and pour into the beaker. Record the color and total volume in data table.
2. The other student then takes the pre-soaked dialysis tubing and closes off one side of the bag. Tie a knot with string so not liquid can leak out. To open the other side of the tube, rub the opening between your fingers.
3. Measure 10 mL of starch solution and pour into the tube. Measure 5 mL of glucose solution and pour into tube. Be careful not to let any of the solutions to get on the outside of the bag. If you think there is a possibility, wash the outside of the bag with tap water. Record the color and total volume in data table.
4. With out letting any solution leak out, fold over the top of the bag allowing plenty of space for fluid transfer. Close the tube with your clip (paperclip). Place the bag; clip up, into the beaker. Clip the bag to the rim of the beaker.
5. Label your beaker and observe any changes for the next 40 minutes or place the beaker where the teacher tells you to be stored for the next class period.
6. Measure the volume of the fluid in the beaker. Record final volume and color into data table.

7. Measure the volume of the fluid in the dialysis tube. Record final volume and color into data table.

8. Test the beaker water for glucose. Pipette of 10 drops of the beaker water and 3 drops of Benedict's solution into a test tube. Place the test tube into boiling water for one minute. Record the color in data table.

9. Clean test tube and pour some of the liquid in the dialysis tube into the test tube and put 3 drops of the of Benedict's solution into a test tube. Place the test tube into boiling water for one minute. Record the color in data table.

Experiment:

	Initial Volume	Initial Color	Final Volume	Final Color	Glucose Test Color
Bag					
Beaker					

Analysis:

1. Did the iodine turn a different color in the beaker to a dark blue? _____
2. Did the solution in the dialysis tube change a color? How and from what? _____

3. Was there any starch found in the beaker water? _____
4. Was there any sugar found in the beaker water? How did it get there? _____

5. What was the difference in volume of the beaker _____ dialysis tube _____
6. What moved into the dialysis tube? _____
7. What moved out of the dialysis tube? _____
8. Of the four liquids (water, glucose, starch, iodine), which could pass through the dialysis membrane? _____

Conclusion:

Is the dialysis tube totally permeable or semi permeable? Explain with evidence of how you came to your conclusion? _____
