

NAME \_\_\_\_\_  
DATE \_\_\_\_\_ CLASS \_\_\_\_\_

LAB #3: MEMBRANE PERMEABILITY  
Membranes – Diffusion and the Effects of Temperature and Solvents

Before beginning your experiment, look over the title of this lab and the following instructions. Decide what question you might ask as a scientist that you would like to see this lab experiment answer. Write it below.

QUESTION: \_\_\_\_\_

**Effects of Temperature on Membranes:**

1. Have students cut 6 uniform cylinders of beet using a cork borer with a 4mm inside diameter. (If you don't have a 4mm cork borer, have students cut julienne strips about 4mm on each side and the length of the beet.) Line up the pieces, cut off the ends and make another cut to obtain 15mm long pieces (all pieces must be the same size).
2. Rinse each piece for 2 minutes in a large beaker of tap water to remove excess red dye that leaked during the cutting procedure.
3. Have 6 test tubes ready and label them 1-6 by writing the number on each. Put one piece of beet into each of the 6 test tubes, then place each tube either into a water bath or on ice (see below for instructions for each tube).

- Tube 1) frozen
- Tube 2) on ice for 15 min
- Tube 3) 25 °C for 15 min (room temperature)
- Tube 4) 37 °C for 15 min (hold in your hand)
- Tube 5) 55 °C for 15 min
- Tube 6) 80 °C for 15 min

4. After the temperature treatments, add 5ml of distilled water to each tube and let stand for 15 minutes. Invert the tubes gently several times during the 15 minutes.
5. Start with tube number 1 and pour the liquid into a clean 12 x 75mm spectrophotometer test tube, dry the outside of the tube and measure at a wavelength of 460nm in the spectrophotometer. Record the value below to be graphed with a spreadsheet in Lesson 8. Repeat this process with each of the 6 tubes.

TUBE	MEASUREMENT
1. frozen	
2. on ice	
3. 25 °C	
4. 37 °C	
5. 55 °C	
6. 80 °C	

Which temperature damaged the membranes most? The least? Why?

**Effect of Solvents on Membranes:**

1. Cut 8 uniform cylinders of beet using a cork borer with a 4mm inside diameter. Line up the pieces, cut off the ends and make another cut to obtain 15mm long pieces (all pieces must be the same size).
2. Rinse each piece for 2 minutes in a large beaker of tap water to remove excess red dye that leaked during the cutting procedure.



3. Label the 8 tubes and place a beet root into each test tube and add 5ml of the following to the corresponding tube:
  - Tube 1) 1% acetone
  - Tube 2) 25% acetone
  - Tube 3) 50% acetone
  - Tube 4) 1% ethanol
  - Tube 5) 25% ethanol
  - Tube 6) 50% ethanol
  - Tube 7) distilled water
  - Tube 8) diluted soap (1/10)
4. Keep the tubes at room temperature for 15 minutes. Gently invert the tubes several times during the 15 minutes.
5. Start with tube number 1 and pour the liquid into a clean 12 x 75mm spectrophotometer test tube, dry the outside of the tube and measure at a wavelength of 460nm in the spectrophotometer. Record the value below to be graphed with spreadsheets in Lesson 8. Repeat this process with each of the 8 tubes.

TUBE	MEASUREMENT
1. 1% acetone	
2. 25% acetone	
3. 50% acetone	
4. 1% ethanol	
5. 25% ethanol	
6. 50% ethanol	
7. distilled water	
8. diluted soap (1/10)	

Which solvents damaged the membrane the most?

If you don't have time to take the OD reading on the spectrophotometer, remove the piece of beet from the tube and store until the next day in the refrigerator. Then answer the following questions:

What would happen if you didn't remove the piece of beet?

What do you do if you don't have a spectrophotometer?

After you complete the experiment, you will be responsible for working with your group on a Lab Report. Although you may get and give help to your group members, your report should be in your own words, written individually. Reports should not look or sound alike. If they do, it will be assumed that you have plagiarized someone else's work. In which case, you both will receive an F. You will receive instructions on how to write your Lab Report in the next class.