

LABORATORY INVESTIGATION: OSMOSIS AND PLASMOLYSIS

Grade level/subject: high school biology

PART A: OSMOSIS

In this investigation you will use a fresh hen's egg to determine what happens in osmosis. You will be measuring the amount of water that passes through the membrane lining the shell of the egg.

MATERIALS (per group): fresh egg in shell, wax pencil, 200 mL graduated cylinder, 3 jars with covers (peanut butter or mayonnaise jars work well), white vinegar, clear sugar syrup (Karo, for example), distilled water

DAY 1 PROCEDURE:

1. With the wax pencil, label the three jars: vinegar, syrup, water. Also put the number of your group on each jar.
2. Using the graduated cylinder, measure out 200 mL of vinegar. Put it in the jar labeled "vinegar".
3. Place the egg in the jar. The vinegar should cover the egg. Cover the jar with the lid but do not screw it on tightly.
4. Put the jar in the plastic tray and allow it to stand for 24 hours.

DAY 2 PROCEDURE:

5. Observe what has happened to your egg. Record in Figure 1 of the data sheet.
6. Using the graduated cylinder, measure 200 mL of syrup and pour it into the correct jar.
7. Carefully remove the egg from the vinegar. It is quite fragile now as the shell is dissolved. Very gently rinse the egg in water and place it in the syrup jar. Put the cover on loosely.
8. Using the graduated cylinder, measure the amount of vinegar left in the vinegar jar. (If any vinegar has overflowed into the tray, include it in the measurement.) Record the volume of remaining vinegar in Figure 1 on the data sheet.

DAY 3 PROCEDURE:

9. Measure 200 mL of water and add it to the water jar.
10. Carefully remove the egg from the syrup jar. Record your observations of the egg's appearance in Figure 1 on the data sheet.
11. Place the egg in the water jar. Cover loosely. Allow to stand for 24 hours.
12. Measure the volume of liquid that remains in the syrup jar. (If any has spilled out, include it in the measurement.)

Day 4 PROCEDURE:

13. Remove the egg from the water and record your observations of its appearance. Discard the egg in the container provided.
14. Measure the amount of water that is left in the jar. Record in the data table.

Fig. 1: RESULTS OF OSMOSIS

	JAR VOLUME BEFORE EGG WAS ADDED	VOLUME AFTER EGG WAS ADDED	OBSERVATIONS OF EGG
VINEGAR			
SYRUP			
WATER			

QUESTIONS:

1. When the egg was placed in the water, in which direction did the water molecules move?
2. On what evidence do you base this?
3. How do you explain the volume of liquid remaining when the egg was removed from the syrup?
4. When the egg was placed in the water after being removed from the syrup, in which direction did the water move?

PART B: PLASMOLYSIS

The purpose of this activity is to investigate the effects of a hypertonic solution on the cells of the red onion.

MATERIALS (per student): red onion epidermis, forceps, dropper, distilled water, 5% Sodium Chloride (table salt) solution, paper towels, microscope, slide, and cover slip

PROCEDURE:

1. Make a wet mount of the red onion epidermis.
2. Examine under 100X. When you have a clear view of several cells, switch to 430X. Make a colored drawing, properly labeled in the first circle on the data sheet (Fig. 2). of your cover slip while placing a small piece of paper towel along the opposite edge of the cover slip. The paper should draw out the water and draw in the salt solution.
4. Observe the effects of the solution on the onion cells. Make a properly labeled, colored drawing of the cells' appearance in the second circle on the data sheet (fig. 3).
5. Replace the sodium chloride solution with distilled water in the same way that the salt solution was added. Make a properly labeled, colored drawing of the cells' appearance in the third circle on the data sheet (Fig. 4).
6. Answer the questions on the data sheet.

DATA SHEET

Fig. 2 Onion Cells in water	Fig. 3 Onion Cells 5% salt solution	Fig.4 Onion Cells in distilled water

QUESTIONS:

1. Which of the two liquids was hypotonic?
2. On what evidence do you base this?
3. Which of the two liquids was hypertonic?
4. On what evidence do you base this?

APPLICATIONS: Using concepts developed from the two experiments, Answer the questions of application.

1. Why do grocery store owners spray fresh fruits and vegetables with water?
2. Roads are sometimes salted to melt ice. What does this do to plants around the roadside and why?
3. If a shipwrecked crew drinks sea water, they will probably die. Why?
4. If a bowl of fresh strawberries is sprinkled with sugar, a few minutes later the berries will be covered with juice. Why?