Name _____ Class _____ Date _____

OBSERVING OSMOSIS

BACKGROUND INFORMATION

A cell is surrounded by a membrane. In some ways, the cell membrane is like a window screen. It allows certain things to pass through it while keeping other things out. A cell's membrane is buffeted continuously by molecules on all sides. Most molecules bounce off the membrane, but some molecules enter through pores. Certain molecules inside the cell leave in much the same way. Most of the molecules that lie on both sides of the cell membrane are water. The odds are great that most of the molecules that enter and leave the cell will be water molecules. At any given moment, the largest number of water molecules will move from areas of high concentration to areas of lower concentration. The movement of water down its concentration gradient through a semipermeable membrane is called osmosis. In this laboratory investigation you will examine the factors that influence the osmosis of water into and out of a cell.

PROBLEM

How can the process of osmosis be observed?

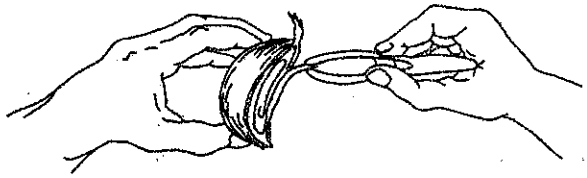
MATERIALS *(per group)*

glass-marking pencil	forceps
2 100-mL beakers	medicine dropper
50 mL water	2 glass slides
50 mL saturated sodium nitrate solution	teasing needle
scalpel	Lugol solution
small onion	2 coverslips
small potato	microscope

PROCEDURE

1. Using the glass-marking pencil, label one beaker "water" and the other "sodium nitrate." Add the water and sodium nitrate to the appropriately labeled beaker.
2. Using a scalpel, carefully cut the onion into quarters. **CAUTION:** *Be very careful when using a scalpel.* Each quarter will separate neatly into layers. Cut one layer into two pieces of equal size.
3. Again using the scalpel, carefully cut two slices from the potato. The slices should be about 2 to 3 mm in thickness. To determine the flexibility of the pieces of onion and potato, bend them back and forth a few times. Note their flexibility. (Record Mass of each sli
4. Place one piece of onion and one slice of potato in each beaker. Allow them to remain undisturbed in the beakers for 30 minutes.

5. After 30 minutes, remove the onion pieces and potato slices from the beakers with forceps. Note the degree of flexibility of each. Record your observations in the data table. (DRY + Record mass of each slice)
6. Return each onion piece and potato slice to its respective beaker.
7. Using a medicine dropper, place a drop of water in the center of a clean glass slide.
8. With the forceps, remove the onion piece from the beaker marked "sodium nitrate." Remove the thin membrane from the inner surface of the onion by bending the onion inward and lifting the membrane with the forceps. Then place the thin onion membrane in the drop of water on the glass slide.



9. Using the teasing needle, try to flatten the onion membrane as much as you can. Add a drop of Lugol solution to the onion membrane and water. Cover with a coverslip.
10. Observe the onion membrane under the low power of the microscope. Then observe the membrane under high power. Note the appearance of cytoplasm. Record your observations in the data table. Draw a labeled diagram of a few onion cells in the space provided.
11. Repeat steps 7 through 10 using the piece of onion from the beaker marked "water."

OBSERVATIONS

Data Table MASS (AT TIME ZERO)

	water	sodium nitrate solution
onion		
potato		

(MASS AT 30 MIN)

	Water	Sodium nitrate
onion		
potato		

FLEXIBILITY

	original	30 min sodium nitrate	30 min distilled H_2O
onion			
potato			

NOTE AS:
- NOT FLEXIBLE
- FLEXIBLE
- VERY FLEXIBLE

1. What was the degree of flexibility of the onion and potato before they were placed in water and in the sodium nitrate solution?

Name _____ Class _____ Date _____

2. What was the degree of flexibility of the onion and potato after 30 minutes in water? After 30 minutes in the sodium nitrate solution?

3. Describe the differences between the cells of the onion membrane that were placed in water and the cells that were placed in the sodium nitrate solution.

ANALYSIS AND CONCLUSIONS

1. What is the purpose of the Lugol solution?

2. Which beaker contained the higher concentration of water?

3. Relate the degrees of flexibility of the potato and the onion dry, in water, and in the sodium nitrate solution to the process of osmosis.

4. Relate the differences in degrees of flexibility of the onion to the appearance of the cells observed under the microscope.

CRITICAL THINKING AND APPLICATION

1. Which substance moves across the cell membrane faster, water or sodium nitrate? How can you tell?

2. Why do many single-celled organisms that live in water have contractile vacuoles?

3. Predict what would happen to freshwater algae if they were placed in the ocean? Why?

4. Explain why plants become limp when they are not watered. Describe the sequence of events that occurs after a limp plant is watered.

5. Identify the types of solutions the plants were place in, and the result of each type of solution on the cells:

	Solution	Result
plain water		
sodium nitrate solution		
distilled water		

DATA: Make a drawing of the onion cells under each of these conditions.

Dry **Sodium Nitrate** **Distilled Water**