

Name: _____

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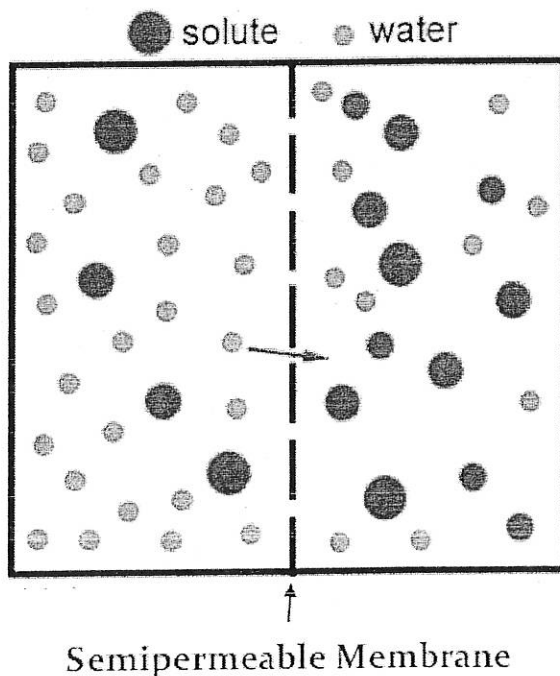
What can we learn about how osmosis works within cells by using an egg as a model?

Understanding the concept: What is osmosis?

Water is the most abundant substance in any cells as all of the chemical processes of the cell involve water in some way. Water passes into and out of a cell by **osmosis**, a passive form of transport where water or some solvent moves down a gradient of high concentration to an area of low concentration. *Osmosis is defined as the **diffusion** or movement of water through a **semipermeable membrane** down a **gradient** towards a condition of equilibrium. The water will move to dilute high concentrations of solutes by moving from an area of high water molecule concentration to an area of lower water molecule concentration.*

A living cell is a dynamic system that is constantly affected by the osmotic pressures both inside and outside the cell membrane. The **cell membrane** is a semipermeable membrane meaning it allows some substances to pass through while blocking others. The movement of water due to osmosis can be helpful for the cell or create a challenge.

A. Finish the Diagram below. Add the words... Higher Water Molecule Concentration, Lower Water Molecule Concentration and Osmosis to the diagram below in the appropriate place.



How do the conditions outside the cell affect the environment inside the cell?

Water molecules easily pass through the cell membrane because they are relatively small. If the cell is in an environment where the concentration of the water molecules as compared to solutes is greater outside the cell than it is inside, water will move through the membrane into the cell by osmosis. If the concentration of water as compared to solutes is greater inside the cell than it is outside, the water will move out of the cell by osmosis.

B. Create a diagram to illustrate the concept: Try your hand at drawing both of those scenarios and show osmosis in the space provided below.

concentration of the water molecules as compared to solutes is greater outside the cell than it is inside	concentration of water as compared to solutes is greater inside the cell than it is outside

The amount of water in the cell changes as the cell's environment changes. If too much water enters the cell by osmosis, the cell may burst. If too much water leaves the cell, the cell will shrink. In the normal environment of a cell, however, the water concentration does not undergo such radical changes.

Creating a Model: What can we learn about the process of osmosis by observing an egg in different saline solutions?

In this lab you will use a raw chicken egg with the shell removed as a model of the cell to demonstrate the process of osmosis. The egg membrane is semipermeable, as is the membrane of a cell. You will be placing the egg in a 10% salt solution bath first, then a 5% salt solution bath, and then distilled water, weighing the egg after each one and noticing how the egg changes in each environment. Be sure to dry the egg before determining the mass.

Materials:

- raw chicken egg with shell removed
- distilled water
- 5 percent salt solution
- 10 percent salt solution
- 3 beakers
- a spoon
- paper towels
- balance

The eggshell was removed by placing the egg in dilute hydrochloric acid overnight. The acid dissolved the shell, but left intact the membrane surrounding the yolk and white. If any shell remains on your egg, do not remove it. It will not interfere with the experiment. The egg is raw, so handle it **carefully**. Although the egg membrane is tough, it can break if the egg is handled roughly.

What data will you be collecting? Look carefully at the egg and record any observations that will help determine how the egg has changed. How would you determine if water has moved into or out of the egg? Brainstorm your ideas below.

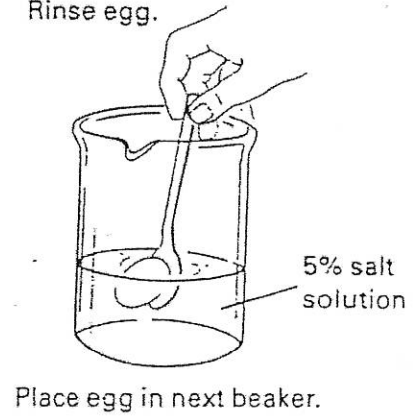
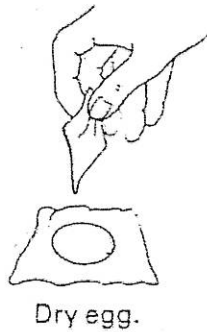
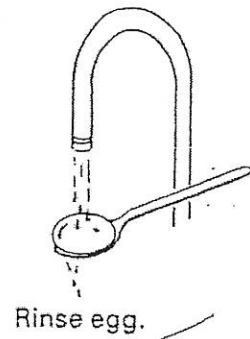
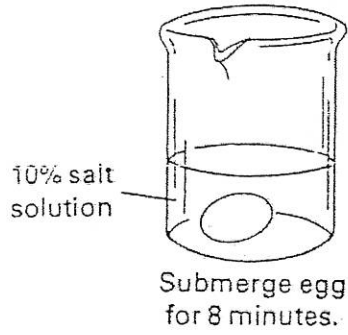
Look at the data chart after you have recorded your own ideas.

Make a Prediction... What will happen to the egg as it is submerged in the different salt solutions and distilled water, and why. *Defend your prediction with your thinking.*

In this experiment, what is the **dependent variable** and what is the **independent variable**? Explain your answer.

Procedures:

Determine the mass and observe the egg. Record all important data.



Remove the egg, rinse and dry it and determine the mass again. Record your findings.

Calculate the changes in the mass of the egg in the data table. Pool your data with the rest of the class and calculate the class averages.

Gather Data: Record all *qualitative* and *quantitative* data you may need to gather to determine how the egg has changed.

Diagram:	<hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/>
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Individual Data			
	10 % salt solution	5% salt solution	Distilled water
Starting mass			
Final mass			
Change in mass (+ or -)			
Class Data (average)			
	10 % salt solution	5% salt solution	Distilled water
Starting mass			
Final mass			
Change in mass (+ or -)			

Analysis: A strong analysis includes ...

- a summary of the data and how it relates to your research question
 - a discussion of any trends and patterns seen in the data
 - a discussion of sources of error or the limitations of your data
 - a comparison of your findings with your hypothesis/predictions
 - a discussion of the related science concepts and implications to the real world
- (In this lab focus on using your data to explain the concept of osmosis and relate your findings to what happens in a cell.)*

Include the following key words in your analysis

Osmosis hypotonic hypertonic semipermeable membrane solvent solute
concentration gradient molecules pressure internal external environment

Scientists use diagrams to explain concepts: Draw a diagram for the egg in each of the solutions. Indicate which molecules are moving and the direction of movement in each diagram.

10 % Salt Solution	5% Salt Solution	Distilled Water

How is the egg like and unlike a model of the cell? Support your answer with details.

Use your observations from this exercise to make predictions about further research.

What do you think would happen if you left the egg in distilled water overnight? Why?

What do you think would happen if you put an egg in distilled water for eight minutes and then placed it in 10 percent salt solution for eight minutes? Explain.

In the procedure, do you think that anything other than water passed between the egg and the solutions? What information would you need to have to be able to determine this experimentally?
