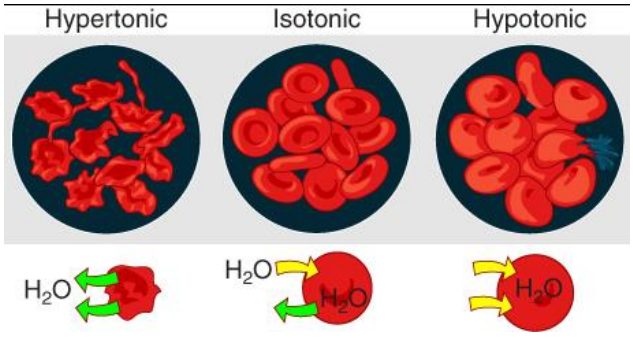
OSMOSIS AND DIFFUSION

Introduction

The plasma membrane is present in all types of cells and is **semi-permeable**, meaning that it allows some molecules passage through the membrane but blocks others. Movement across the cell can either be by **active transport** which requires energy (ATP) or **passive transport**, where energy is not required for movement but *is* dependent on permeability. Two important types of passive transport are osmosis and diffusion.

Diffusion is the movement of molecules from a region of higher concentration to one of lower concentration. This gradual change from high to low concentration is known as moving down a concentration gradient. **Osmosis** is the movement of *water* molecules across a semi-permeable membrane. Much like diffusion, the water molecules move down a concentration gradient.

The net movement of the water, be it in or out of the cell, is dependent on the cell's environment. The **hypertonic environment** is when there is a greater concentration of solute outside the cell, making the water inside the cell flow into the solute causing the cell to shrink. The **hypotonic environment** is when the solute concentration is greater inside the cell then outside, making the water flow into the cell causing swelling or bursting. The **isotonic environment** occurs when the solute and water concentration are the same both inside and outside of the cell so diffusion occurs at an equal rate.



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Indicators are used to determine whether or not a specific substance is found in a solution. Iodine is used to determine if there is starch. It will turn the solution blue/purple if there are starch molecules present. This specific indicator is used in this experiment in order to determine what substances are diffusing across the membrane.

Purpose

The purpose of this lab experiment is for students to observe osmosis and diffusion under different conditions.

Materials

- 1 x Baggie
- 1 x 400mL Beaker
- 3 x 500mL Beaker
- 3 x 150mL Beaker
- 4 x 100mL Graduated Cylinder
- Stirring rod
- Pipette
- Weighing boats
- Weighing Scale
- Corer
- Knife
- Timer
- Tablespoon
- Ruler
- String
- Scoopula
- Clothespin
- 3 eggs
- 1 Potato
- Vinegar
- Distilled Water
- Corn Syrup
- Corn Starch
- Iodine
- Salt

Notes on materials

Diffusion: Make sure the baggies used are semi-permeable first! If not, it can be replaced with dialysis tubing. The iodine solution can be made by the students or the teacher/lab technician can create it ahead of time and separate the batch for the specific number of groups.

Osmosis: Eggs will be required to soak in vinegar until the shells have been dissolved, which usually takes around 24 hours. If there is no corn syrup, pancake syrup can be used as an alternative. Students can core their own potatoes or it can be prepared before hand by the teacher or lab technician.

Hypothesis

What is your prediction concerning the movement of the iodine and starch through the baggie?

_____

_____

What is your hypothesis concerning what will happen to the eggs and the potatoes once placed in their respective solutions:

_____

_____

Procedure

Part 1: Osmosis with Eggs

1. Determine the initial mass and circumference of each egg.

2. Record data.

3. Label three 500mL beakers: vinegar (control sample), corn syrup, distilled water

4. Carefully place 1 egg in each beaker.

5. In the vinegar beaker, add 200mL of vinegar.

6. In the corn syrup beaker, add 200mL of corn syrup.

7. In the distilled water, add 200mL of distilled water.

7. Wait 1 hour.

8. Remove eggs from their respective solutions and determine mass and circumference.

9. Record data.

Part 2: Osmosis with Potatoes

1. Label three 150mL beakers as: air (control sample), distilled water, salt water

2. Add 100mL of distilled water to the distilled water and salt water beakers.

4. Add 5g of salt to the salt water beaker and stir to dissolve.

5. Core potatoes to obtain 3 strips.

6. Using a ruler and knife, make sure each strip is of equal length (approximately 6cm).

7. Determine mass of each strip.

8. Record data.

9. Place one potato strip in each beaker.

10. Wait 20 minutes.

11. Remove strips.

12. Record Data.

Part 3: Diffusion

1. Add 250mL of tap water to a 400mL beaker.

3. Use a pipette to drop iodine into the beaker until it becomes an amber colour.

4. Add 1 tablespoon of starch to baggie.

6. Using the 100mL graduated cylinder, add 50mL of water to the baggie.

7. Close the baggie and clip it to the beaker making sure the starch solution is submerged.

8. Wait 20 minutes.

9. Record observations.

Data

Osmosis of Eggs

Solution	Initial mass (g)	Initial Circumference (cm)	Mass after 1 hour (g)	Circumference after 1 hour (cm)
Vinegar (control)				
Corn Syrup				
Distilled Water				

Vinegar (control)	Corn Syrup	Distilled Water
Qualitative observations at Initial Stage	Qualitative observations at Initial Stage	Qualitative observations at Initial Stage
Qualitative observations after 1 hour	Qualitative observations after 1 hour	Qualitative observations after 1 hour

Osmosis of potatoes

Solution	Initial Mass (g)	Final Mass (g)	Change in Mass (%)
Air (control sample)			
Distilled Water			
Salt Water			

Air (control sample)	Distilled Water	Salt Water
Qualitative observations at Initial Stage	Qualitative observations at Initial Stage	Qualitative observations at Initial Stage
Qualitative observations after 20 minutes	Qualitative observations after 20 minutes	Qualitative observations after 20 minutes

Diffusion

Solution in Beaker	Solution in Baggie
Initial Colour	Initial Colour
Colour after 20 minutes	Colour after 20 minutes

Results

Osmosis of eggs

1. What happened to the water inside the egg when it was placed in the distilled water beaker after one hour? Explain the movement of the molecules.

_____

_____

2. What happened to the water inside the egg after one hour inside the beaker containing corn syrup? Explain the movement of the molecules.

_____

_____

3. What type of solution (hypotonic, hypertonic, isotonic) is:

Distilled water: _____

Corn syrup: _____

Osmosis of Potatoes

1. What happened to the water inside the potato when it was placed in the *distilled water* beaker after twenty minutes? Explain the movement of the molecules.

_____

_____

2. What happened to the water inside the potato after twenty minutes inside the beaker containing the *salt so*lution? Explain the movement of the molecules.

_____

_____

3. What type of solution (hypotonic, hypertonic, isotonic) is:

Distilled water: _____

Salt water: _____

4. Graph your results

Diffusion

1. From your experiment, determine which substance(s) diffused in and out of the bag. Explain your answer using the experimental data collected.

_____

_____

_____

2. With the movement of the molecules that occurred, is the baggie permeable or semi-permeable? Explain your reasoning.

_____

_____

_____

4. Circle your answer:

Which solution is more concentrated in starch	Baggie	Beaker
Which solution is more concentrated in iodine	Baggie	Beaker
The beaker, in relation to starch is	Hypertonic	Hypotonic
The baggie, in relation to iodine is	Hypertonic	Hypotonic