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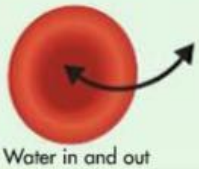
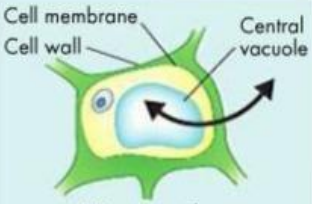
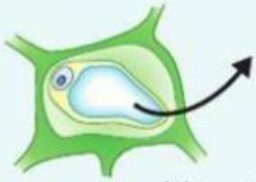
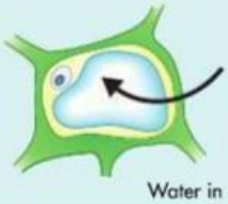
Osmosis and Cells

In **plant cells**, osmosis helps water move from the soil into the roots. This keeps the plant firm and healthy. If a plant doesn't get enough water, it can wilt and look droopy.

In **animal cells**, like the ones in our bodies, osmosis helps keep the right balance of water. For example, if too much water enters an animal cell, it can swell. If too much water leaves, it can shrink.

Osmosis is very important because it helps plant and animal cells stay healthy and work properly. But osmosis affects animal and plant cells in slightly different ways as seen in the table below.

The Effects of Osmosis on Cells

Solution	If either cell is placed in a solution that is the same as the solution inside the cell, water molecules move in and out. The cells remain the same.	If either cell is placed in a solution that has LESS water than inside the cell, water leaves the cell and the cell gets smaller.	If either cell is placed in a solution that has MORE water than inside the cell, water enters the cell. Animals swell and burst. Plant cells swell but do not burst becuase of the cell wall.
Animal Cell	 Water in and out	 Water out	 Water in
Plant Cell	 Water in and out	 Water out	 Water in

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Student's Work

Complete the paragraph using the words below.

turgid | diluted | burst | overall | same | solution | gain | not | wall | leaves | osmosis | cellulose | cytoplasm

Plant and animal cells respond differently to the _____ and loss of water. This is because plant cells have a cell _____ made of _____. Animal cells do _____ have this. When cells are placed in a _____ solution they gain water via _____. Plant cells will swell and become _____. Animal cells will swell and _____ open. When cells are placed in a concentrated _____, water _____ the cell via osmosis. Plant cells experience plasmolysis as the _____ pulls away from the cell wall. Animal cells shrivel up. When cells are placed in an equal solution, the water concentration is the _____ inside and outside of the cell. There is no _____ (net) change in water levels and the appearance of the cells.

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Student's Work

A. Write whether **DIFFUSION** or **OSMOSIS** is occurring in the pictures below.

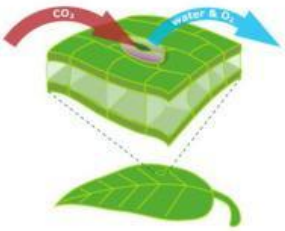
1 

2 

3 

4 

5 

6 

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B. Which type/s or transfer do the statements below refer? Write YES and NO in the boxes.

	Diffusion	Osmosis
A substance moves from an area of low concentration to an area of high concentration.		
Can happen in living cells.		
A substance moves and becomes more evenly spread out.		
The movement does not use energy and is caused by the random movement of individual particles.		
The movement requires energy from respiration.		
Only water is involved in this type of movement.		
Water moves from a less concentrated solution to a more concentrated solution.		

C. Write TRUE or FALSE after each statement below.

a. Osmosis is the movement of water and sugars. _____

b. Diffusion is the movement of substance from a high concentration. _____

c. Both diffusion and osmosis need lots of energy to occur. _____

d. Osmosis requires a partially permeable membrane. _____

e. A partially permeable membrane lets all size substances through. _____

D. Do the following statements refer to DIFFUSION or OSMOSIS?

a. Shaun's plant looked dead but when he watered it, it sprang right back up. _____

b. The girl sitting two rows ahead of you put on too much perfume this morning. _____

c. Yum! Something smells good. The neighbours are cooking on the grill! _____

d. You put raisins in a glass of water, and they plump up. _____

e. Ronald has his stinky shoes off again, and you can tell from the next room. _____

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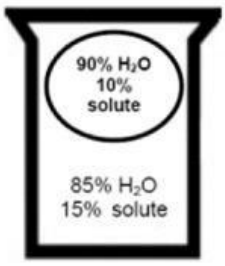
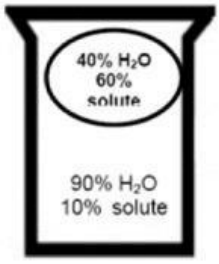
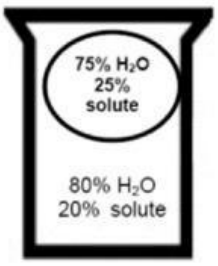
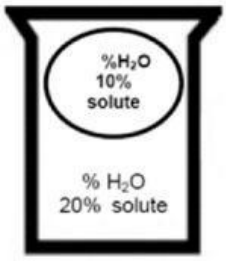
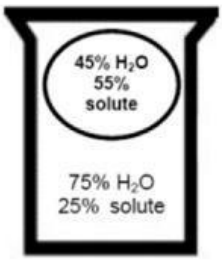
E. Indicate whether the **solution in the beaker** in HYPERTONIC, HYPOTONIC or ISOTONIC with respect to the solution in the oval-shaped "cells". Then state whether **water** will move into the cell, out of the cell or no net movement of water (in AND out).

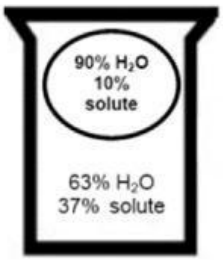


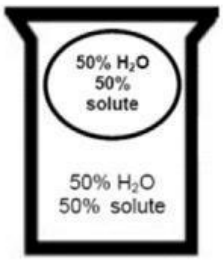


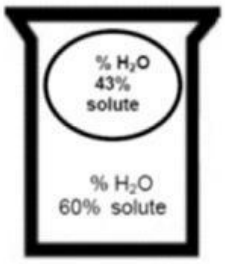


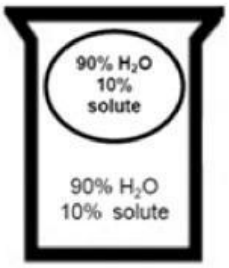


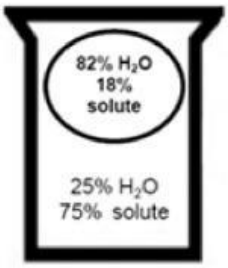


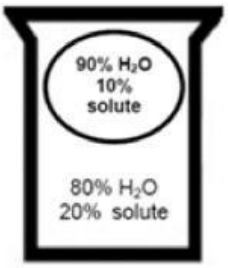












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Experiment Time

Osmosis Experiment

You will need an Irish potato, two halves of a petri dish, a knife, a spatula, water and sugar for this experiment, so please be prepared.

1. Peel an Irish potato and cut it into two equal halves.
2. Cut off the rounded ends of each half to allow it to sit on a flat surface.
3. Scoop out the middle of the halves.
4. Place each into a Petri dish with water.
5. Put a teaspoon of sugar into one of the potato cups and leave the other one empty. Leave the potato cups in the Petri dishes for 30 minutes
6. Record your observations with the aid of annotated before and after diagrams. Include these observations in a properly written laboratory report.

Include the responses to the following questions and passage in your discussion.

1. What happened to the potato cup in which sugar was placed?

_____

2. What happened in the potato cup in which no sugar was placed?

_____

3. Fill in the blank spaces below in order to explain your observations from 1 and 2 above.

control	**diffuse**	**gradient**
higher	**lower**	**membrane**
osmosis	**partially**	**solution**
sugar	**water**	

The _____ permeable cell _____ of the potato cells will allow _____ molecules, which are small, to pass through but not the _____ molecules, which are too large. The water in the Petri dish represents an

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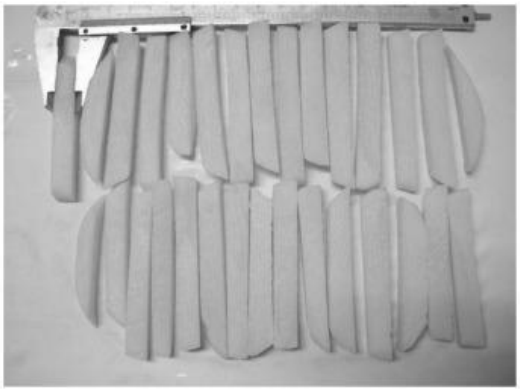
area of _____ concentration of water molecules while the sugar inside the potato cup represents a _____ concentration of water molecules. Therefore, water molecules will _____ from the Petri dish into the potato cup along a concentration _____ forming a _____ of sugar and water. The potato cup that has no sugar in it is the _____ used for the experiment. In this potato cup, there is a much smaller concentration gradient, therefore, _____ will not occur. [11 marks]

Experiment Time

Osmosis Experiment #2

You are presented with two thin strips of potato or slices of cucumber, two unknown solutions, a ruler (to measure the length in centimetres) and a balance (to measure the mass in grams).

Without tasting, how can you use the potato strips or cucumber slices and the balance to determine which of the unknown solutions is pure water and which is water with a solute in it (solution e.g. salt water)?



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Students from Science class performed the experiment and their results are given below.

TABLE SHOWING HOW THE STRIPS OF POTATO FELT BEFORE AND AFTER THE EXPERIMENT

Unknown solution	Initial texture of potato	Final texture of potato
A	Flexible	Stiff and rigid.
B	Flexible	Soft and extremely flexible.

TABLE SHOWING CHANGES IN MASS OF THE POTATO STRIPS

Unknown solution	Initial mass of potato (g)	Final mass of potato (g)	Difference in mass (g)
A	1.0	1.3	0.3 (increase)
B	1.0	0.8	0.2 (decrease)

TABLE SHOWING CHANGES IN LENGTH OF THE POTATO STRIPS

Unknown solution	Initial length of potato (mm)	Final length of potato (mm)	Difference in length (mm)
A	5	5.5	0.5 (increase)
B	5	4.6	0.4 (decrease)

Use the information given to make your conclusions below.

Unknown solution A is _____ because it caused _____

_____

_____

Unknown solution B is _____ because it caused_____

_____

_____

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ACTIVE TRANSPORT

Let's relate Science to life. Imagine all the students in your class were distributed evenly in a room the size of a small closet and your teacher wanted you to bundle up even closer together in a corner of the room. You all would not only be very unwilling, but you would probably think that she/he was mad. Each of you may have to use up a lot of energy by shouting and pushing while trying to actually force yourselves into the corner because it would not be something that you all would want to do or find appealing. This is the basis behind active transport.

Definition of Active Transport

Active transport is the movement of dissolved substance from an area of low concentration to an area of high concentration against a concentration gradient with the use of energy.

An example of active transport in plants nature is the way in which mineral enter into roots from the soil. Although roots contain more stored mineral than found in the soil directly around them, they are able to take in more minerals by this process since energy is involved. An example of active transport in humans (animals) is the way in which glucose molecules enter red blood cells.

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Student's Work

Now that we have learned about the three processes diffusion, osmosis and active transport that assist substances to enter and leave cells, complete the summary table below. Feel free to use the notes to help you. [21 marks]

QUESTIONS	PROCESS		
	DIFFUSION	OSMOSIS	ACTIVE TRANSPORT
Does the process require energy?			
What types of substances move during this process?			
In which direction do the particles move?			
Is a partially permeable membrane involved?			
How is the concentration gradient involved?			
State an example of the process occurring in plants.			
State an example of the process occurring in animals.			