

Worksheets for Diffusion, Osmosis and Active transport

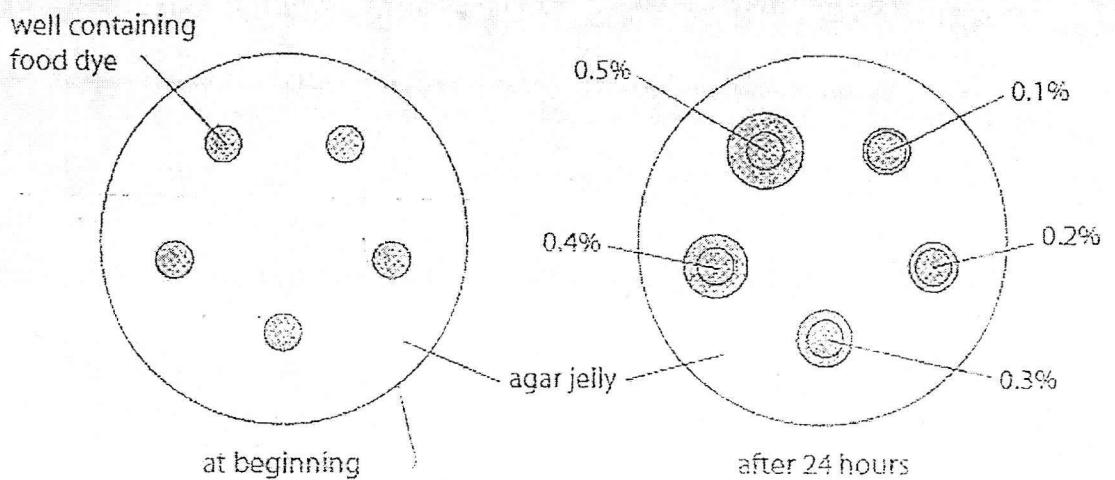
1. A student carries out an experiment to investigate the effect of different concentrations of a food dye on diffusion.

(a) Describe what is meant by the term diffusion.

(b) The student adds a different concentration of coloured food dye to each of five wells. Due to the partially permeable membrane of cell, it is the movement of molecules from area of high concentration to area of low concentration throughout the cell.

- (b) The student adds a different concentration of coloured food dye to each of five wells in an agar plate.

The diagram shows the agar plate at the beginning of the experiment and after 24 hours.



The student does the experiment using three plates.

For each plate he measures the diameter of each circle to see how far the food dye has diffused.

The table shows his results.

Concentration of food dye in well (%)	Diameter of circle in cm			
	plate 1	plate 2	plate 3	average (mean)
0.1	0.7	0.6	0.7	0.7
0.2	1.5	1.4	1.4	? 1.4
0.3	1.7	1.6	1.7	1.7
0.4	1.9	1.8	1.9	1.9
0.5	1.9	2.0	2.0	2.0

- (i) Calculate the average diameter for 0.2% concentration of food dye.

$$\frac{1.5 + 1.4 + 1.4}{3} =$$

average diameter = 1.43

- (ii) Describe the effect of food dye concentration on diffusion.

As concentration of dye increase from 0.1 - 0.3%, the average diameter of diffusion was increased from 1.07 to 2 cm.

- (iii) Explain the relationship between food dye concentration and diffusion.

Food dye diffused from high concentrated area (well) to low concentrated area (Petri Plate).

- (c) State two variables that the student should control in this experiment to ensure that the results are valid.

1. Volume of dye used

2. Temperature

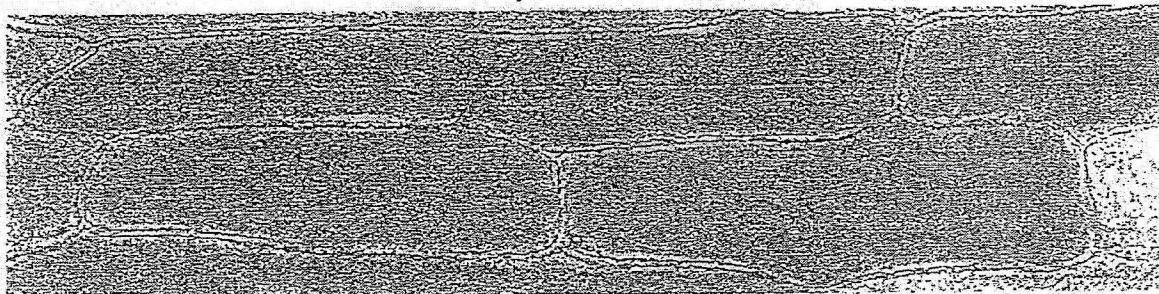
(Total for Question 9 = 9 marks)

TOP Dermis Eng? Between skin and muscle

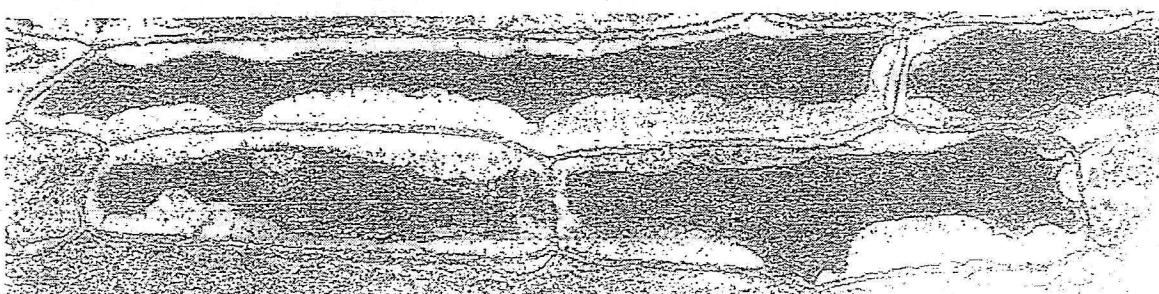
(1)

New skin

- 2) A student prepared some plant cells taken from an onion. She placed the cells in a few drops of distilled water. She then used a camera attached to a microscope to photograph the cells.
- She then added a few drops of concentrated salt solution to the cells and waited a few minutes. She then took another photograph of the same cells.



photograph of cells in distilled water



photograph of cells in concentrated salt solution

- (a) Describe the differences in the appearance of the cells in concentrated salt solution compared with the cells in distilled water.

The vacule in cell which is placed in distilled water is big
The vacule is small and the cell is flat. ^{or cell is} furgid

- (b) The student thought that the differences in the cells were caused by osmosis.

What is meant by the term osmosis?

is the movement of water of high water Potential

to area with low ~~concentr~~ water Potential down

concentration gradient through a partially

(2)

- (c) Explain what happens to the cells in concentrated salt solution to change their appearance.

(3)

water move by osmosis from area of high water potential (cell) to areas with low water Potential (Solution). Down concentration gradient throughout a semi-permeable membrane.

- (d) Another student investigated the appearance of red blood cells in distilled water and in concentrated salt solution.

Use your knowledge of osmosis and the structure of red blood cells to describe and explain what the red blood cells would look like

- (i) in distilled water

12

Blood cell will become bigg and explode because by osmosis water move from High water Potential (cell) to low water Potential (Blood cell). Down concentration gradient throughout a Permeable membrane

- (ii) in concentrated salt solution.

Blood cell become smaller and shrink because by osmosis water move from hWP (cell) to LWP (solution). Down concentration gradient throughout a Semi-permeable membrane

(Total for Question 5 = 11 marks)

HWP

↓
Water

HWP
LWP

- 3 The sweet potato plant, *Ipomoea batatas*, has fibrous roots and storage roots. Fibrous roots absorb water and ions from the soil. Storage roots store insoluble carbohydrates.

Fig. 3.1 shows the growth of these roots on a sweet potato plant.

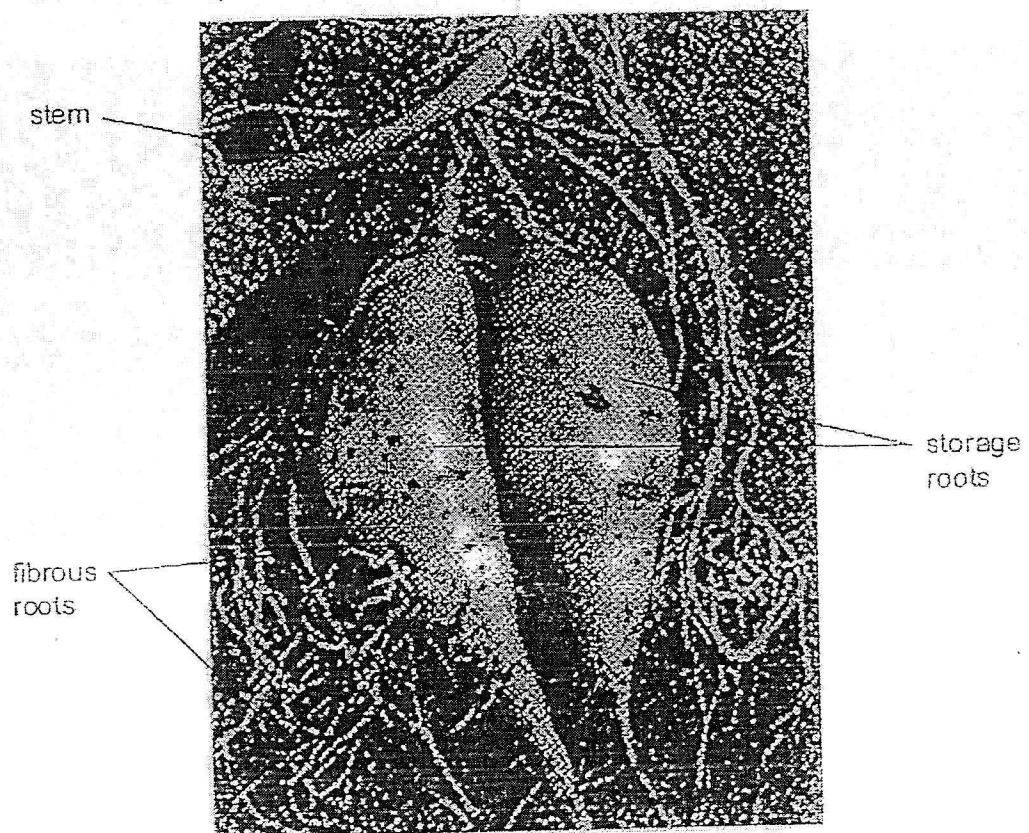


Fig. 3.1

- (a) Explain, using the term water potential, how fibrous roots absorb water.

[3]

The membranes of root hair cells contain proteins for the absorption of ions.

- (b) Describe how root hair cells are adapted for the absorption of ions.

They have long extensions to increase surface area of absorption
and very active transport.
Root hair cell absorb ions
against concentration gradient

[3]

- 4) A biologist made a slide of some epidermal cells from a scale leaf of an onion bulb.

Fig. 4.1 is a drawing that the biologist made of one of the cells.

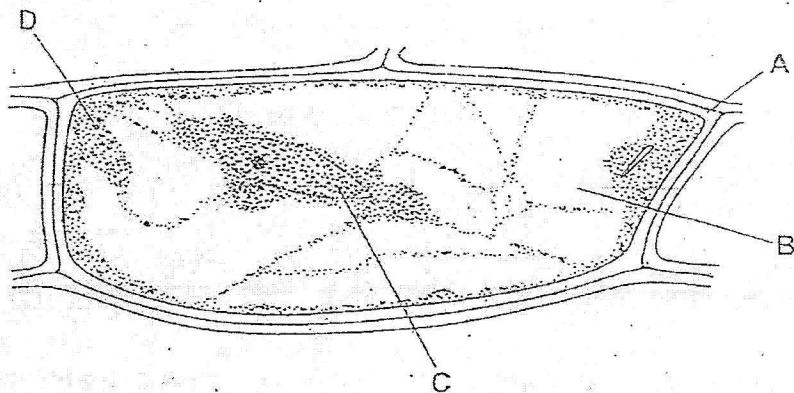


Fig. 4.1

- (a) Table 4.1 shows the functions of the structures within a plant cell.

Complete the table by:

naming the part of the cell that carries out each function

using the letters from Fig. 4.1 to identify the part of the cell named.

Table 4.1

function	letter from Fig. 4.1	name
resists the turgor pressure of the cell	A	cell wall
controls the activities of the cell	C	nucleus
site of the chemical reactions of the cell including synthesis of proteins	D	cytoplasm

[3]

- 5 (a) Complete Table 5.1 to show which statements are true for diffusion and which are true for osmosis. Use a tick (✓) if it is true or a cross (✗) if it is false.

Complete all eight boxes.

Table 5.1

statement	diffusion	osmosis
must involve a partially permeable membrane	✗	✓
involves the movement of gases and solutes	✓	✗
is a result of the random movement of particles	✓	✓
requires energy from respiration	✗	✗

[4]

- (b) Fig. 5.1 shows a small bag of coloured salts placed in a beaker of warm water.

After a few minutes, the water changes colour. This is shown in Fig. 5.1.

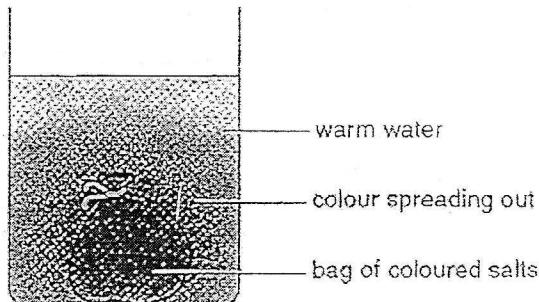


Fig. 5.1

Use Fig. 5.1 to help explain how tissues obtain oxygen from the blood.

Oxygen will diffuse down concentration gradient.

Gradient from blood capillary to tissue

Fluid and then diffuse down concentration

Gradient from tissue fluid space

[2]

[Total: 6]

- (c) Fig. 2.1 is a diagram of a protein used to move ions across membranes in root hair cells.

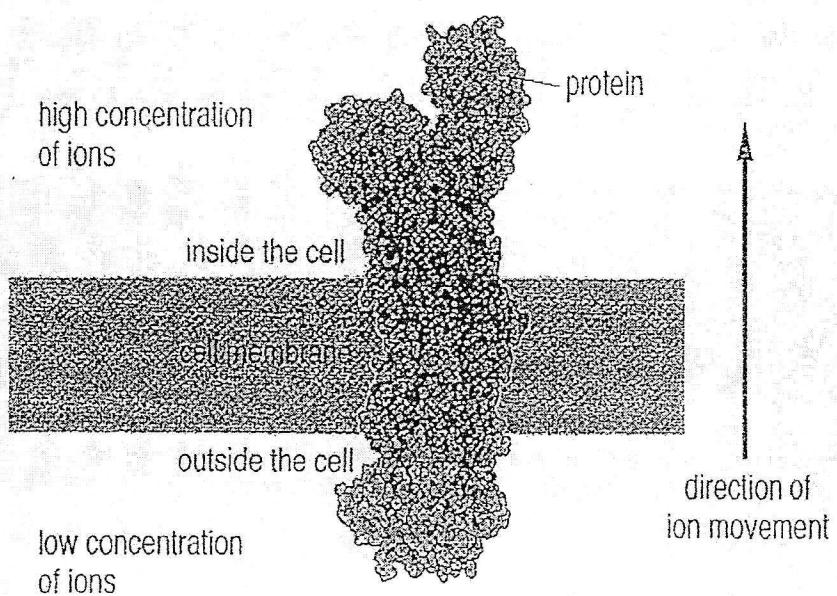


Fig. 2.1

- (i) State the name of the process that moves mineral ions into root hair cells through cell membrane proteins.

active transport [1]

- (ii) Explain how protein molecules move ions across a membrane during this process.

Transport protein binds to the ions.
This protein require ATP energy.
It changes its shape to allow
transporting ions against
concentration gradient.

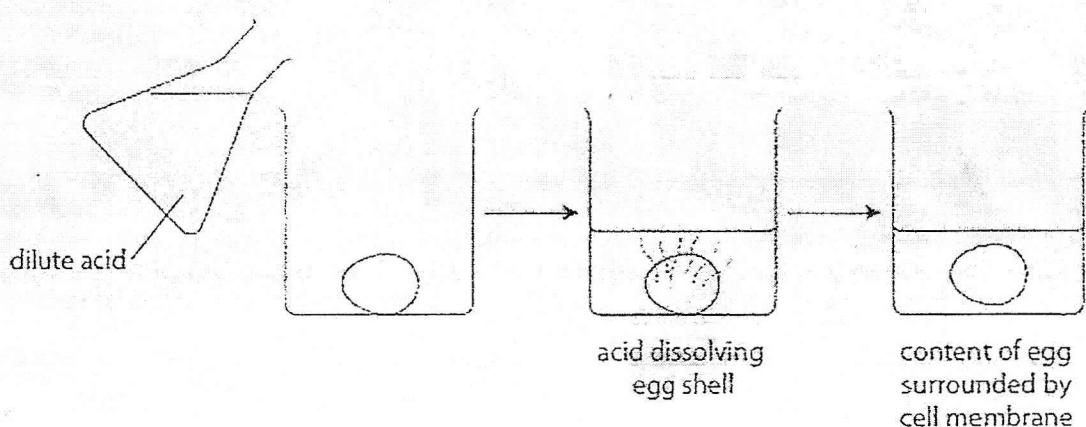
[3]

6) A chicken egg is a single cell protected by a shell on the outside.

A student puts three chicken eggs into dilute acid and leaves them for three days.

The acid dissolves the egg shells, leaving the contents of the eggs surrounded by the cell membrane.

The diagram shows the student's method.

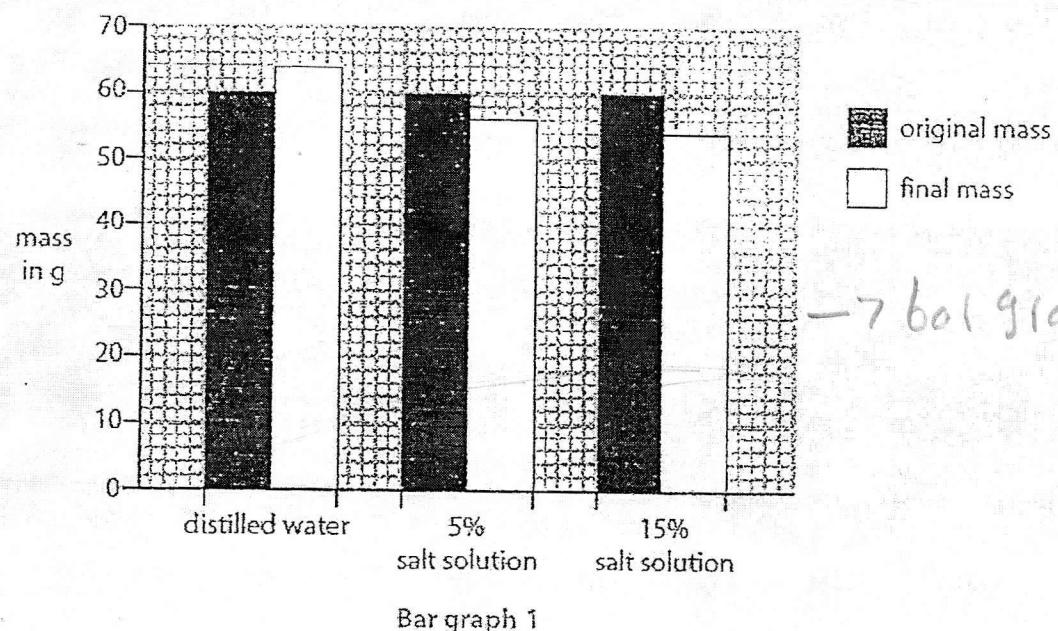


The student removes the eggs from the dilute acid and uses water to wash the surface acid away.

The student then uses the eggs for this osmosis experiment.

- he measures the mass of each egg
- he then puts one egg into a beaker containing distilled water
- he puts another egg into a beaker containing 5% salt solution
- he puts a third egg into a beaker containing 15% salt solution
- after 15 minutes he removes each egg from its beaker and measures its mass again

(a) The bar graph shows the results obtained by the student from the osmosis experiment.



(i) Name the dependent variable in this experiment.

mass in gram

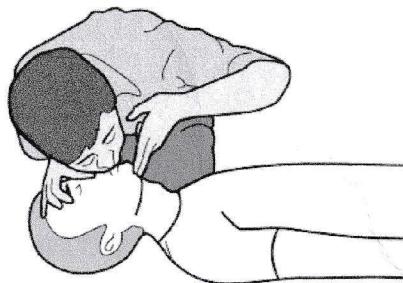
(ii) Explain the result for the egg placed in distilled water.

by osmosis water will move down
water potential through partially permeable
membrane and leading to increase in
mass of eggs

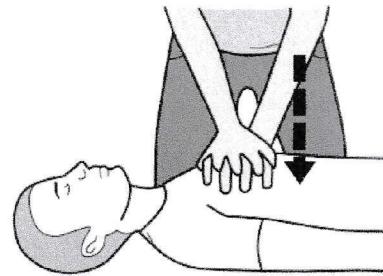
Cardiopulmonary resuscitation (CPR) is a first aid procedure.

Air is forced into a patient's lungs by another person. The heart is made to pump blood by repeated compression of the patient's chest over the heart.

A person performing CPR on a patient is shown in the diagrams.



air forced into lungs

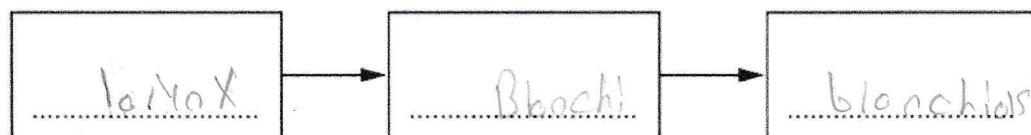


repeated compression of chest

- (a) (i) State what will be seen to happen to the patient's chest when air is forced into the lungs.

..... gets bigger at expands [1]

- (ii) Name, in the correct order, the tubes through which air will travel from the patient's mouth to the alveoli of the lungs.



[2]

- (iii) The air forced into the patient's lungs has different concentrations of gases compared to the air the patient would normally breathe in.

State **two** differences in the concentrations of gases.

high concentration of co₂ and
lower concentration of oxygen

[2]

- (b) Explain how each action of the CPR procedure will benefit the patient:

air forced into the patient's lungs

~~In order for~~
oxygen is forced to lungs from high concentration to low so heart is kept refreshed and also cells can get supplied with O_2 .
repeated compression of the patient's chest.

By keeping oxygen intake ~~is~~ is made for the heart to pump and passing air the lungs will ~~not~~ ^{expire} the ~~other~~ air can and other gases in order for cells to remove CO_2

[4]