3. Movement into and out of cells

3.1 Diffusion

Paper 3 and 4

Question Paper

Paper 3

Questions are applicable for both core and extended candidates

1 **(a)** Complete the sentences about movement into and out of cells.

Diffusion is the net movement of particles down a concentration gradient.

The energy for diffusion comes from the ..... energy of random movement of molecules and ions.

Factors that influence diffusion include concentration gradient, ..., and ..... .

Osmosis is the movement of water by diffusion through a ..... permeable membrane.

The movement of particles through a cell membrane against a concentration gradient using energy from ..... is called ..... .

[6]

2 **(a)** A student investigated how surface area affected the rate of diffusion.

The student started with four agar cubes that each had a volume of 1 cm^3.

The agar cubes were dyed with a red indicator.

The red indicator turned yellow when exposed to acid.

The student cut the cubes into different numbers of blocks to increase the surface area.

The blocks were placed in acid, as shown in Fig. 3.1.

The student recorded the time taken for all of the agar blocks in each test-tube to turn yellow.

The student repeated the investigation twice and calculated a mean.

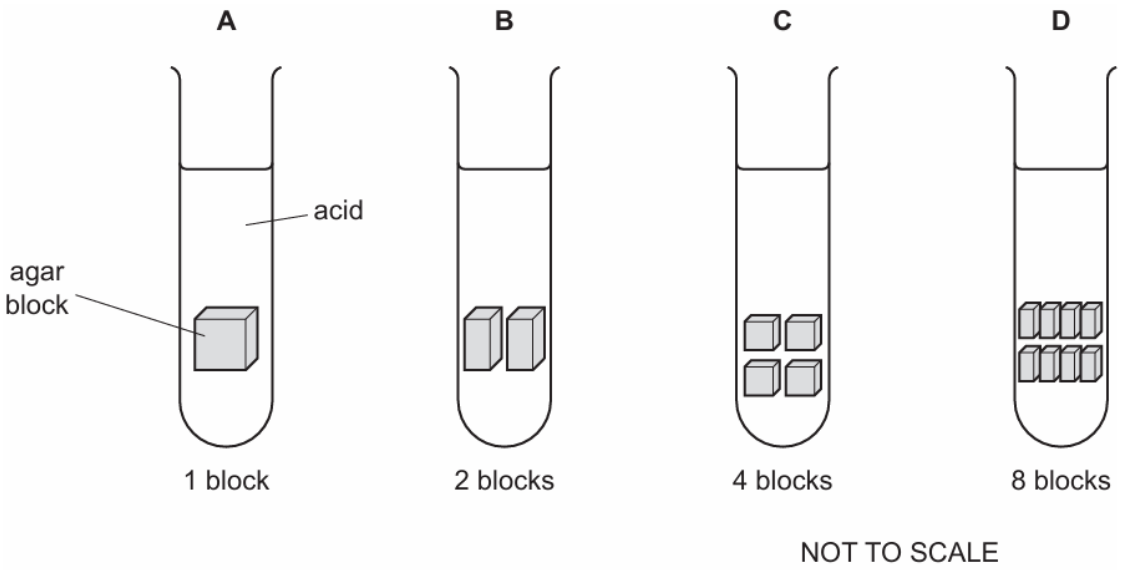


Fig. 3.1

Table 3.1 shows the results.

Table 3.1

test-tube	number of agar blocks in the test-tube	total surface area of the agar blocks / cm^2	time taken for all the blocks to turn yellow / s			mean time for all the blocks to turn yellow / s
			trial 1	trial 2	trial 3	
A	1	6	278	240	255	258
B	2	8	112	120	98	110
C	4	10	79	85	81	
D	8	12	56	48	52	52

(i) Calculate the mean time for all the blocks to turn yellow in test-tube **C**.

Give your answer to the nearest whole number.

Space for working.

.....

[2]

(ii) Using the results shown in Table 3.1, describe the effect of surface area on diffusion.

.....

.....

..... [1]

(iii) State **one** factor, **other than** surface area, that could affect diffusion in this investigation.

..... [1]

(iv) Complete the sentences to describe how the acid particles diffuse to cause the colour change.

The acid particles move from the acid solution into the .....,

down a ..... gradient.

The energy for this process comes from the ..... energy of random movement of the acid particles.

[3]

3 **(a)** Fig. 6.1 is a diagram of a section through a plant leaf.

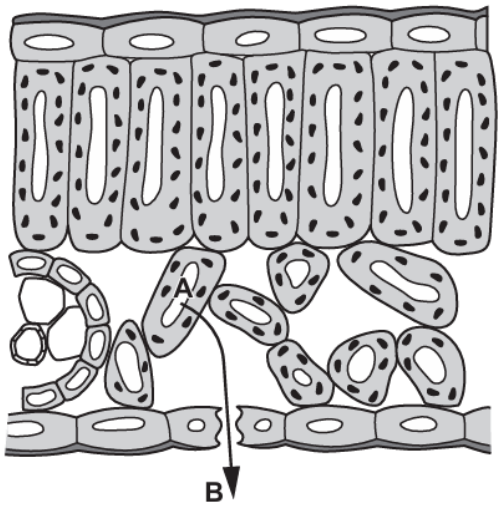


Fig. 6.1

(i) Draw a label line and a label to identify:

- a palisade mesophyll cell
- a vacuole.

[2]

(ii) Complete the sentence about the diffusion of gases.

Gases diffuse between the leaf and the surrounding air from a .....

concentration to a ..... concentration by .....

movement of particles.

[2]

(iii) State the name of the main gas that will diffuse from inside cell **A** to position **B** in Fig. 6.1 on a **sunny**, humid day.

..... [1]

(iv) State the name of the **cell** component through which substances diffuse as they enter or leave the cell.

..... [1]

4 **(a)** Some substances move into cells by the process of diffusion.

State the name of the outer part of an animal cell that substances move through during diffusion.

..... [1]

(b) Substances can also move by osmosis and active transport.

Table 1.1 shows some of the features of diffusion, osmosis and active transport.

Complete Table 1.1 by placing **one** tick (✓) in each row to show the features of diffusion, osmosis and active transport.

One has been done for you.

Table 1.1

feature	diffusion	osmosis	active transport
involves movement of water only		✓	
always involves movement across a partially permeable membrane			
movement is from a higher solute concentration to a lower solute concentration			
requires energy from respiration			
involves the movement of both gases and solutes			

[4]

5 **(c)** Carbon dioxide enters plant cells by diffusion.

The word diffusion on the left can be joined to two boxes on the right to make two correct statements about diffusion.

Draw **two** straight lines from diffusion to the boxes to complete the two statements.

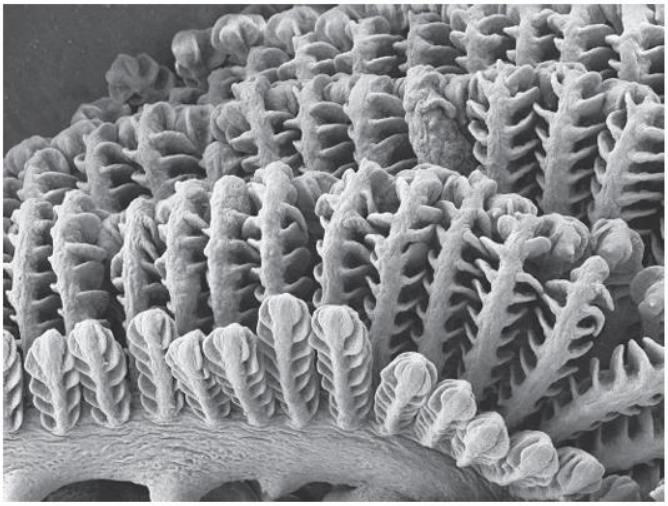
	involves a genetic change.
	is the movement of particles from high concentration to low concentration.
	is the movement of particles from low concentration to high concentration.
Diffusion	occurs due to the random movement of particles.
	only occurs in plant cells.
	requires a partially permeable membrane.
	requires energy.

[2]

Paper 4

Questions are applicable for both core and extended candidates

6 **(b)** Fig. 1.1 is a micrograph of part of some fish gills.



magnification ×110

Fig. 1.1

Fish gills are adapted for gas exchange by diffusion.

(i) Define the term diffusion.

.....

.....

.....

.....

..... [2]

(ii) Suggest **one** adaptation, visible in Fig. 1.1, that shows that fish gills are efficient structures for gas exchange by diffusion.

.....

.....

..... [1]

7 **(a)** Dialysis tubing is an artificial membrane, which is similar to the lining of the intestine.

A student investigated the diffusion of glucose through dialysis tubing by using the apparatus shown in Fig. 3.1.

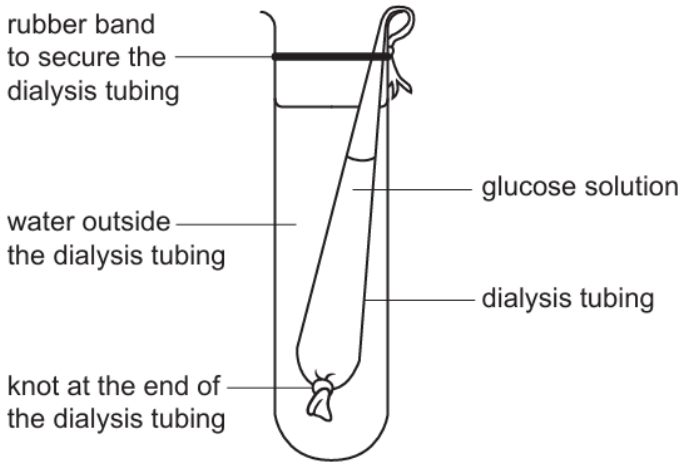


Fig. 3.1

The student took samples of the water outside the dialysis tubing at 5 minute intervals and tested the samples with Benedict's solution.

The results are shown in Table 3.1.

Table 3.1

time / minutes	results of the Benedict's tests on the water outside the dialysis tubing
0	blue
5	green
10	yellow
15	red

(i) Describe and explain the results shown in Table 3.1.

.....

.....

.....

.....

.....

.....

..... [3]

(ii) The student repeated the investigation with a higher concentration of glucose in the dialysis tubing.

Predict the results that the student would observe.

.....

.....

..... [1]