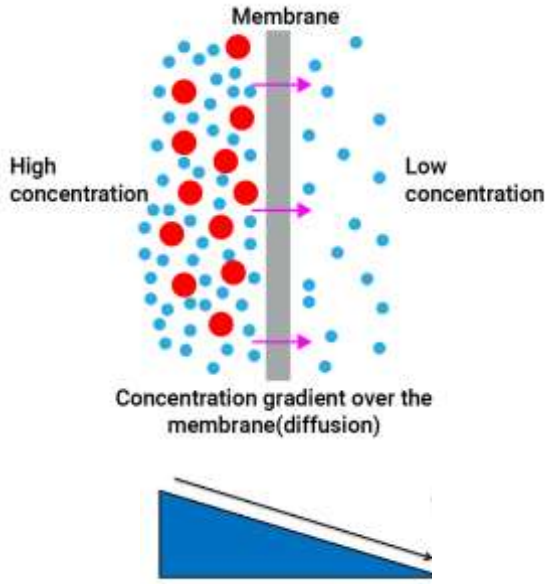
2(a) **Define diffusion as the movement of molecules from a region of their higher concentration to a region of their lower concentration, down a concentration gradient**

Diffusion:

- Movement of molecules of a substance
- down the concentration gradient.
- No energy required
- Can occur in liquids and gases.
- Can be through or not through a partially permeable membrane
- When a concentration gradient exists, diffusion will contnue until the particles are evenly distributed throughout the region

Concentration Gradient

The difference in the concentration of molecules of a substance between two regions

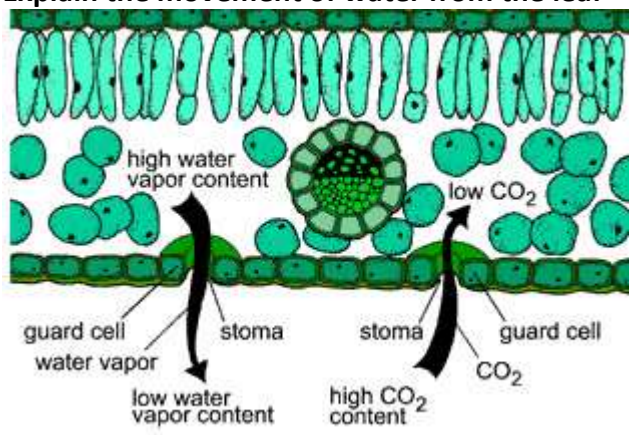


This slope is concentration gradient or diffusion gradient

When the concentration gradient is steeper, the rate of diffusion will be faster.

When the concentration gradient is less steeper the rate of diffusion will be slower

Explain the movement of water from the leaf

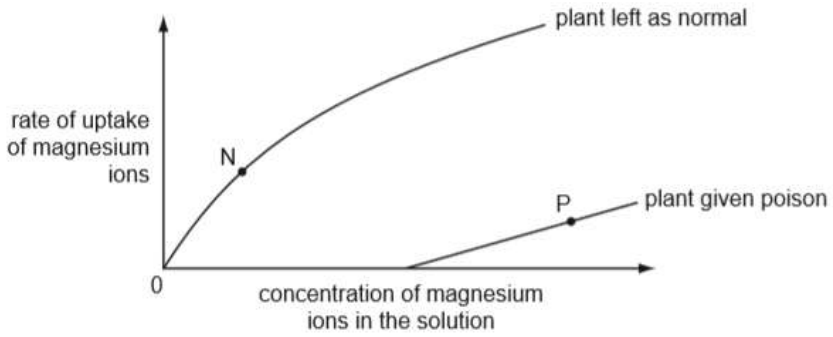


Importance of diffusion

- Gases exchange in plant leaves and surrounding
- Gases exchange between lungs and the blood in alveoli

Question 12

An experiment measured the rate at which plants take up magnesium ions from solution. One plant was given a poison that stops respiration. Another plant was left as normal. The graph shows the results.



How are the magnesium ions being absorbed by the plants at points N and P?

	point N	point P
A	active transport	active transport
B	active transport	diffusion
C	diffusion	active transport
D	diffusion	diffusion

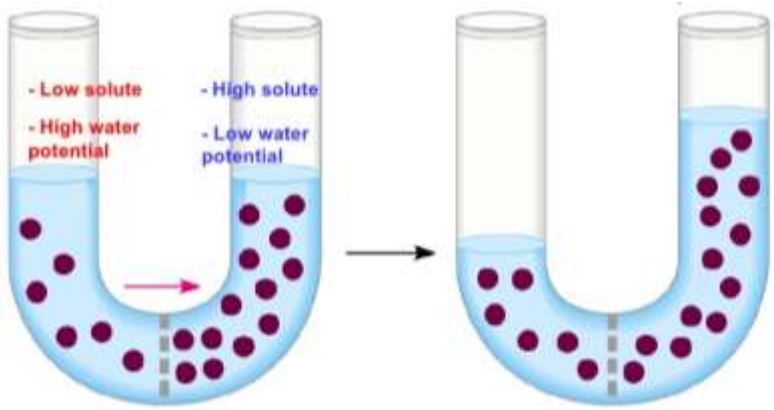
2(b) **Define osmosis as the passage of water molecules from a region of higher water potential to a region of their lower water potential through a partially permeable membrane**

Osmosis:

- Movement of water molecules (only)
- through a partially permeable membrane
- From high water potential to low water potential
- Energy is not required

Water potential

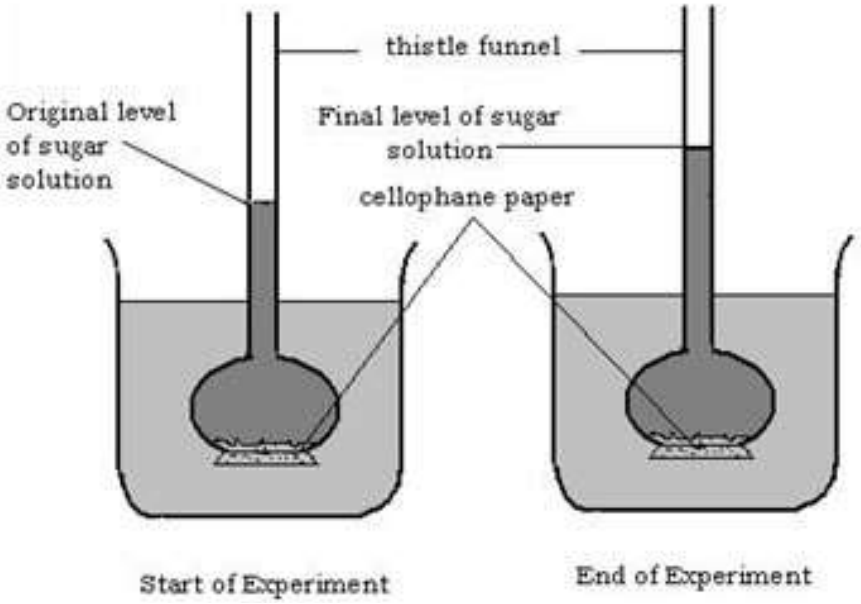
Tendency of a system to lose water molecules



Explain the movement of water

Investigate Osmosis

- Tie a visking tube at one end of a glass tube
- Fill it with 30 percent sucrose solution
- Set the apparatus as shown in fig.
- Mark the initial level of sucrose solution in the tube
- After half an hour record the change in sucrose solution level



Observations

- The level of sucrose solution rises

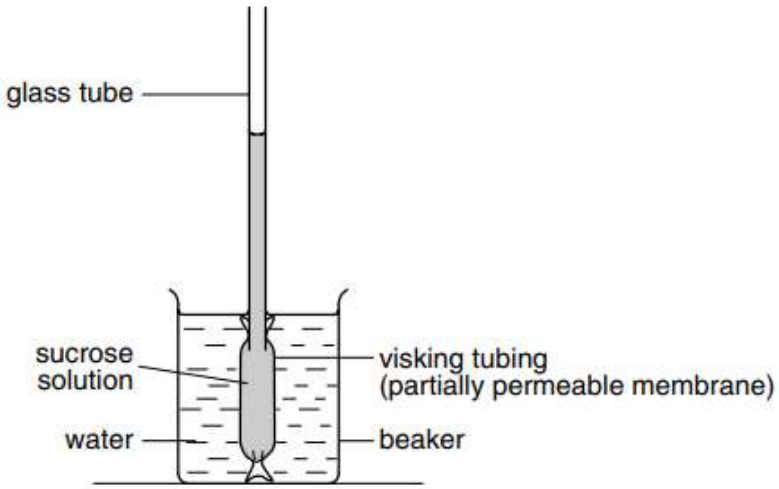
- The level of water in the beaker lowers

Explain the observations?

- Water potential outside the thistle funnel is higher than inside so
- the water molecules move into the thistle funnel
- by osmosis. so the level of sucrose solution rises in the column of thistle funnel

Experiment

The diagram shows an experiment to investigate osmosis.



Which statement about the investigation is true?

A The level of liquid in the glass tube falls.

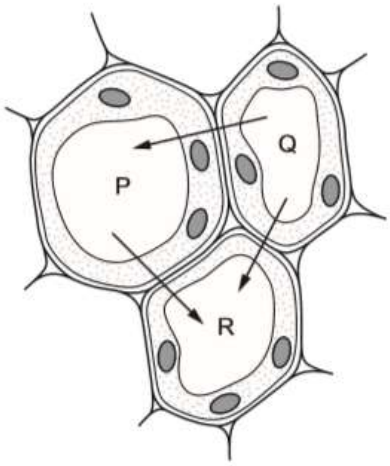
B The volume of the liquid in the Visking tubing decreases.

C The water level in the beaker falls.

D Water molecules move from low to high water concentration.

Question 13

The diagram shows three plant cells labelled P, Q and R. The arrows show the direction of water movement by osmosis.



What is the correct order of water potential in the cells, from the highest to the lowest?

	highest	middle	lowest
A	P	Q	R
B	P	R	Q
C	Q	P	R
D	R	P	Q

3 The diagrams in Fig. 3.1 show demonstrations of two simple processes.

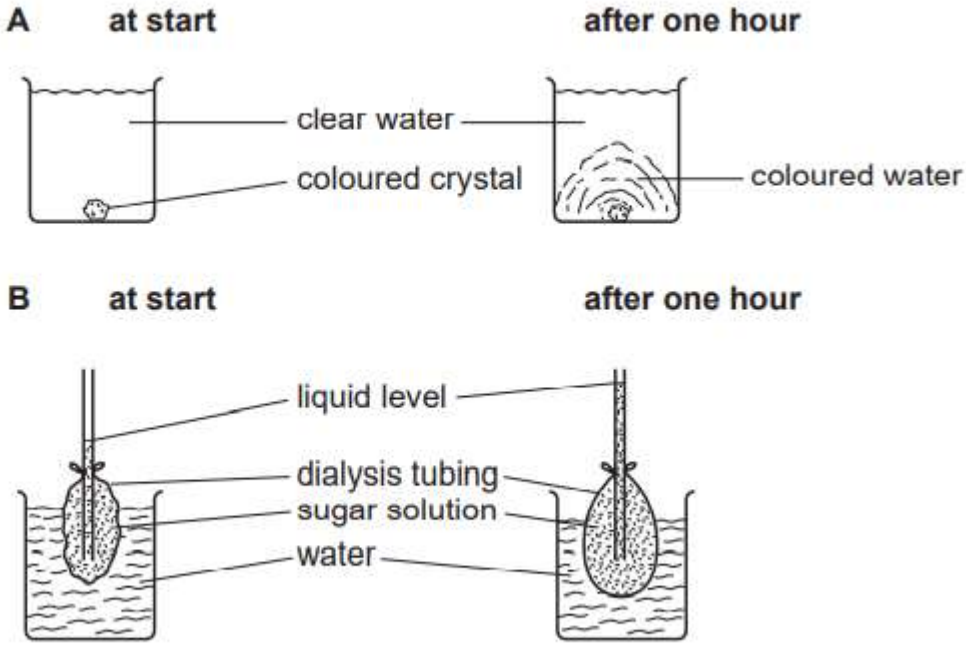


Fig. 3.1

(a) Name the processes demonstrated in Fig. 3.1 **A** and **B**.

A .....

B .....[2]

(b) **(i)** State **two** changes visible in **B** after one hour.

1. .....

2. .....[2]

(ii) Explain how the changes in **A** and **B** are brought about.

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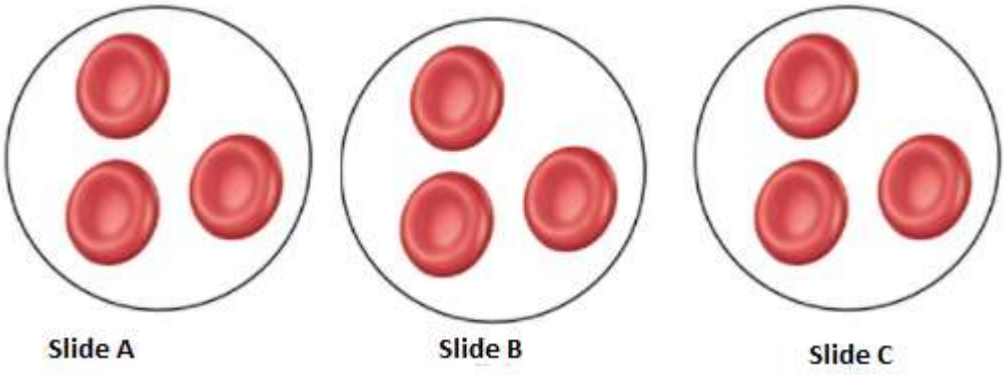
.....[4]

2(c) Describe the importance of a water potential gradient in the uptake of water by plants and the effects of osmosis on plant and animal tissues

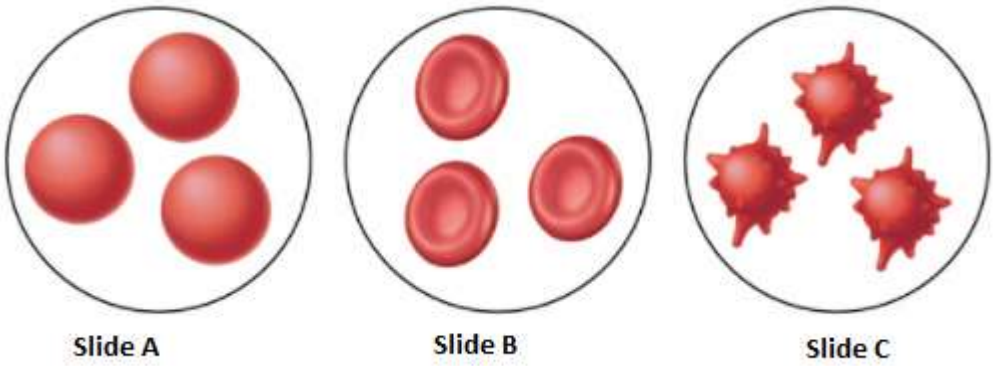
Water potential

Osmosis in an animal cell

- Take three glass slides
- Label them
  Slide A
  Slide B
  Slide C
- Take a drop of blood on each slide
- Observe red blood cells under a light microscope
- Make an outline of the Red blood cells



- Place few drops of a solution on each slide
  Few drops of distilled water on slide A
  Dilute sucrose solution on slide B
  Concentrated sucrose solution on slide C
- Wait for 5 minutes and view each slide under the same power
- **Observations**



- **Explain your observations**

- **Slide A**

- **Slide B**

- **Slide C**

5 Fig. 1 shows cells from a plant tissue which have been mounted on a slide with distilled water and viewed using a microscope.

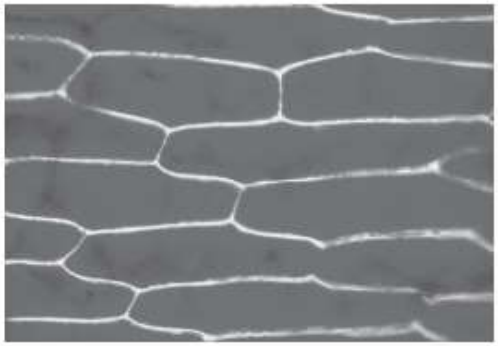


Fig. 1

Fig. 2 shows cells taken from the same plant tissue when mounted on a slide with concentrated salt solution.

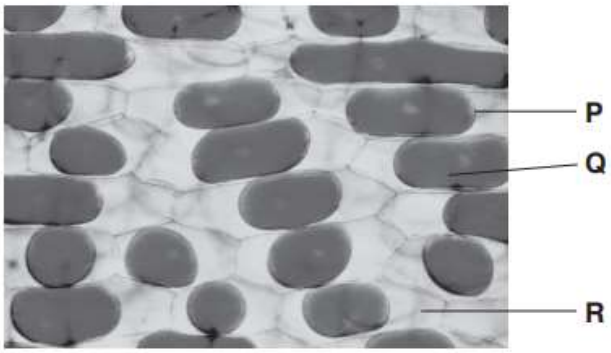


Fig. 2

(a) Explain the appearance of the cells in Fig. 2.

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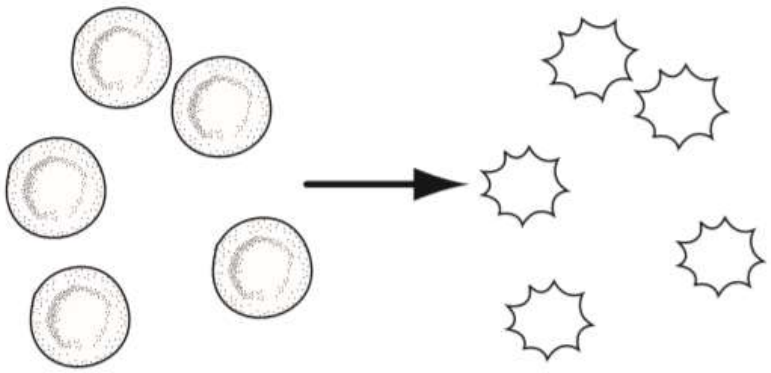
..... [4]

Question 14

The diagram shows cells in fresh blood and the same cells after the blood has been mixed with liquid **X**.



fresh blood

blood after mixing with liquid **X**

Which statement describes the water potential of liquid **X**?

A It is equal to that of pure water.

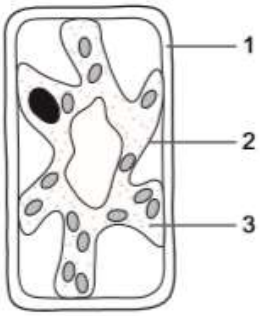
B It is equal to that of the cell cytoplasm.

C It is higher than that of the cell cytoplasm.

D It is lower than that of the cell cytoplasm.

Question 15

The diagram shows a typical plant cell after being placed in a concentrated salt solution for ten minutes.



Which numbered structures are partially permeable?

A 1 and 2 only **B** 1 and 3 only **C** 1 only **D** 2 only

Question 16

Plant cells are placed in a solution with a lower water potential than that of the cells.

Which row is correct?

	movement of water by osmosis	volume of vacuole
A	enters cells	decreases
B	enters cells	increases
C	leaves cells	decreases
D	leaves cells	increases

2(d) **Define active transport as the movement of ions into or out of a cell through the cell membrane, from a region of their lower concentration to a region of their higher concentration against a concentration gradient, using energy released during respiration**

Active Transport:

- Movement of molecule/ions
- up the concentration gradient
- Energy is required which is provided by cellular respiration
- Only can take place in living cells.
- Can not occur without partially permeable membrane

Examples

- Uptake of glucose and amino acids from ileum by villi
- Uptake of mineral ions from soil by root hairs

(c) In an investigation, two plants were grown in a solution containing mineral ions including nitrate and magnesium. Plant **A** was provided with air containing oxygen and plant **B** was provided with air from which the oxygen had been removed. Fig. 1.2 shows the plants after a period of growth in these conditions.

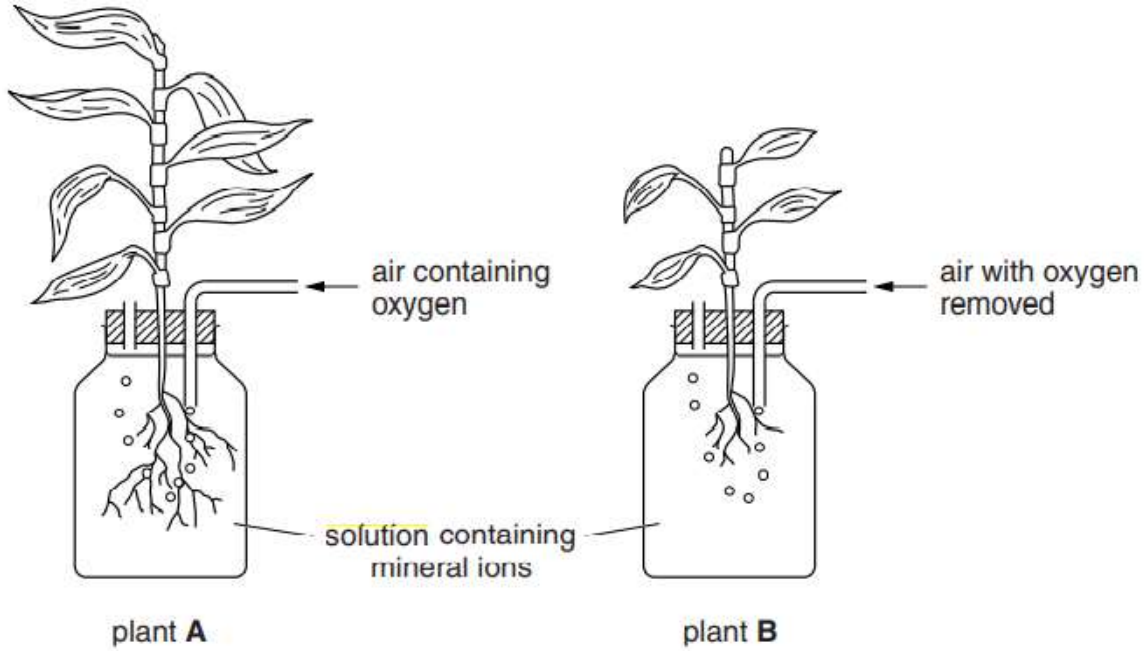


Fig. 1.2

Suggest reasons for the increased growth of the plant in the solution supplied with air containing oxygen.

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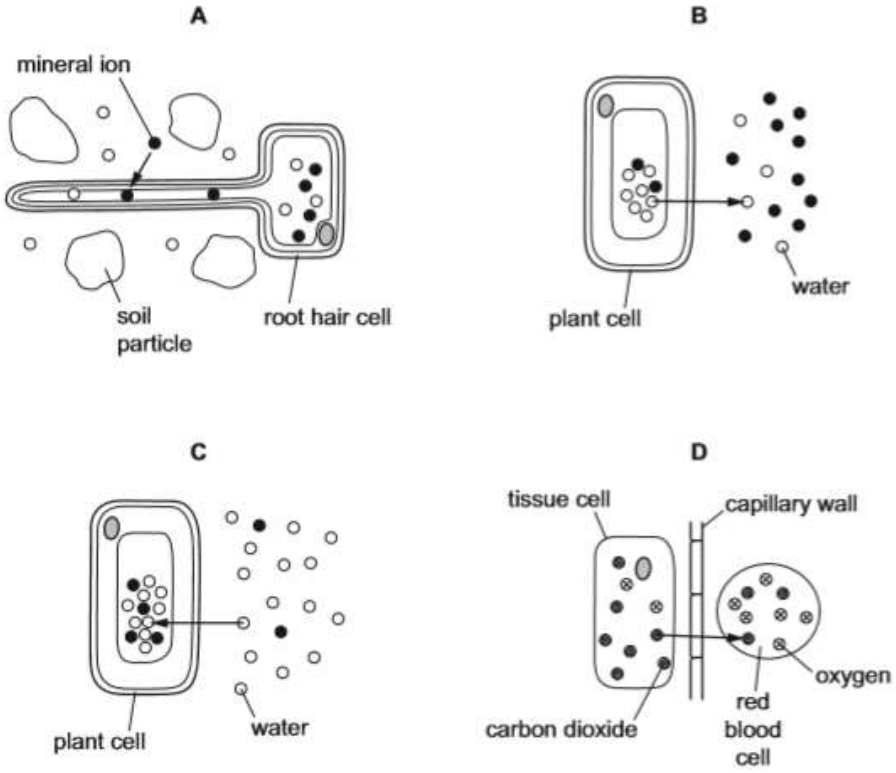
Question 17

Which diagram illustrates the process of active transport?



Question 18

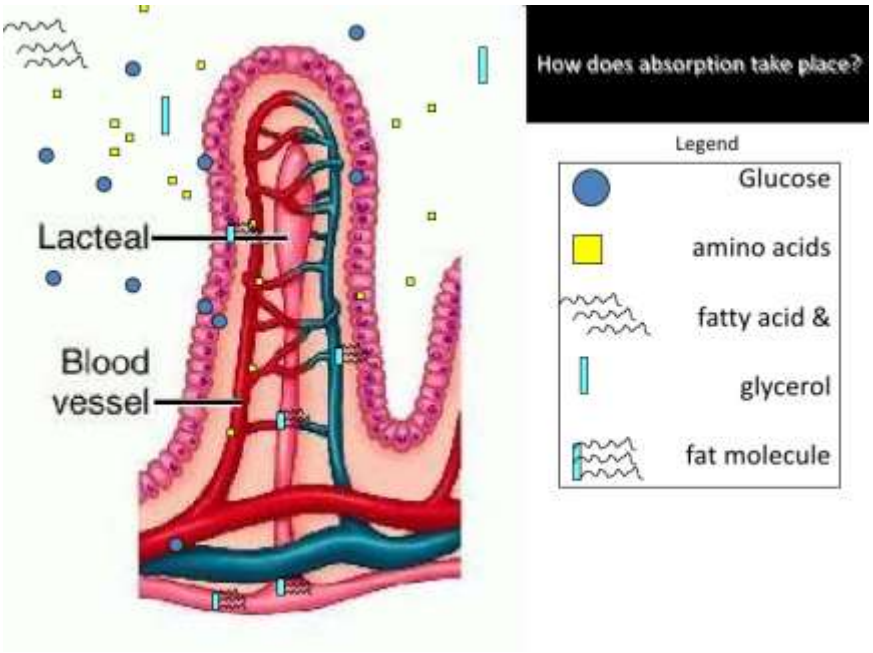
The table shows the rates of absorption of two different sugars, arabinose and glucose, in living and dead intestines. The concentrations of the sugars inside the intestines were the same in each case.

	rate of absorption (arbitrary units)	
	arabinose	glucose
living intestine	31	102
dead intestine	31	34

What are the main methods of absorption of arabinose and glucose in living intestine?

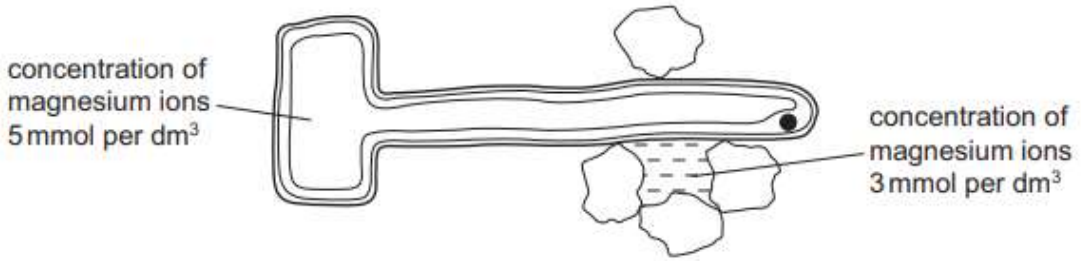
	arabinose	glucose
A	active transport	active transport
B	active transport	diffusion
C	diffusion	active transport
D	diffusion	diffusion

2(e) Discuss the importance of active transport as an energy-consuming process by which substances are transported against a concentration gradient, as in ion uptake by root hairs and glucose uptake by cells in the villi



Explain why some molecules can move into the villi by diffusion and others by Active transport

The diagram shows the concentration of magnesium ions in a healthy root hair cell of a plant and in the soil water surrounding it.



For the plant to remain healthy, how will the magnesium ions move?

A into the cell by active transport

B into the cell by diffusion

C out of the cell by active transport

D out of the cell by diffusion

Explain the role of cell membrane in maintaining the concentration gradient between inside and outside the root hair cell

Question 19

Which processes are responsible for the uptake of ions from the soil by a plant and the uptake of glucose into the villi of a human?

	uptake of ions by a plant	uptake of glucose into the villi
A	active transport	active transport
B	active transport	osmosis
C	diffusion	osmosis
D	osmosis	active transport

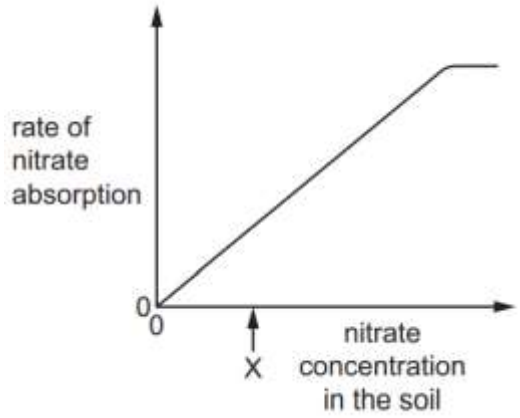
Question 20

The rate of nitrate ion absorption by a root hair cell was measured at different soil nitrate concentrations.

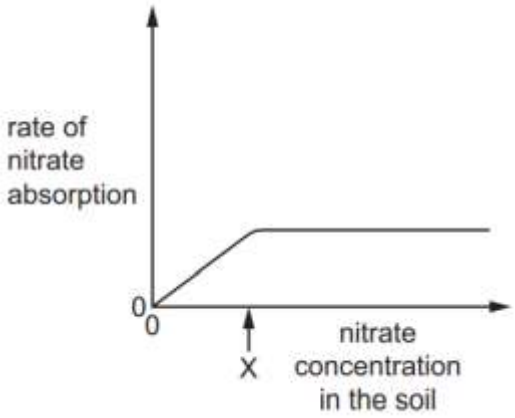
At X, the concentration of nitrate in the soil is the same as in the cell.

Which graph shows how the rate of absorption varies with nitrate concentration in the soil?

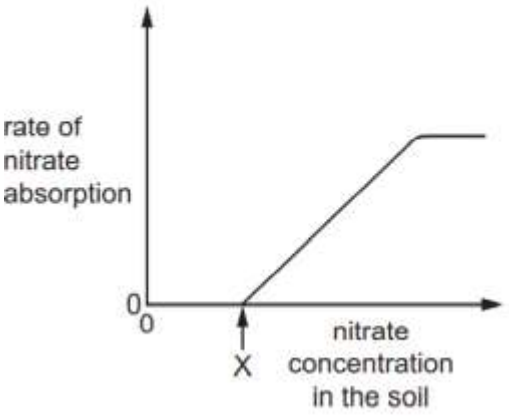
A



B



C



D