

# Cell Membranes and Transport

## Question Paper 2

<b>Level</b>	International A Level
<b>Subject</b>	Biology
<b>Exam Board</b>	CIE
<b>Topic</b>	Cell Membranes and Transport
<b>Sub Topic</b>	
<b>Booklet</b>	Multiple Choice
<b>Paper Type</b>	Question Paper 2

**Time Allowed :** 56 minutes

**Score :** / 46

**Percentage :** /100

**Grade Boundaries:**

A*	A	B	C	D	E	U
>85%	'77.5%	70%	62.5%	57.5%	45%	<45%

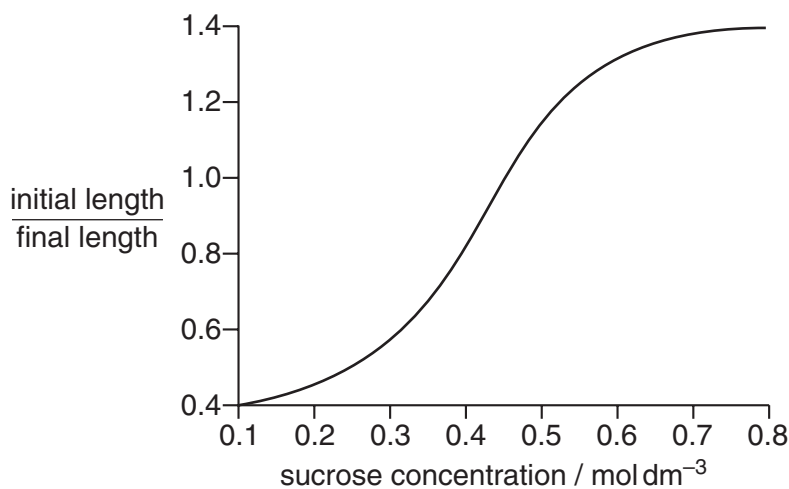
- 1 A plant cell is placed in a solution with a less negative (higher) water potential than the cell contents.

Which change occurs in the cell and what causes the change?

	change	cause
<b>A</b>	cell becomes more flaccid	solution diffuses out of the cell
<b>B</b>	cell becomes more flaccid	water diffuses out of the cell
<b>C</b>	cell becomes more turgid	solution diffuses into cell
<b>D</b>	cell becomes more turgid	water diffuses into cell

- 2 Strips of plant tissue were immersed in a range of sucrose solutions of different concentrations. Their lengths were measured before immersion and after 30 minutes in the different solutions.

The graph shows the ratio of initial length to final length.



Which concentration of sucrose solution, in mol dm<sup>-3</sup>, has the same water potential as the cell sap before immersion?

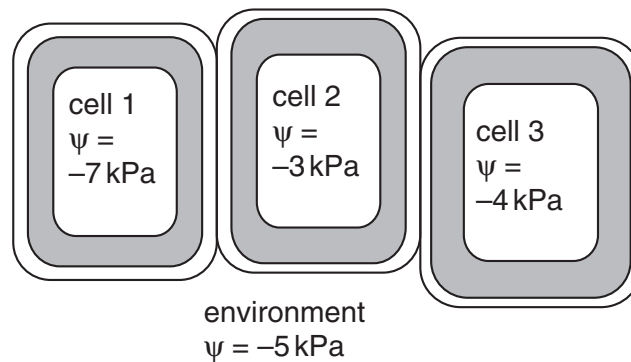
- A** 0.1      **B** 0.25      **C** 0.45      **D** 0.8

- 3 Many fresh water animals possess vacuoles which contract regularly, expelling excess water.

Why do plants living in fresh water **not** require such vacuoles?

- A Plant cell sap has a much lower concentration of dissolved solutes than animal cytoplasm.
- B Plant cell walls are impermeable to water.
- C The water potential is the same inside and outside the plant cells.
- D Water movement into plants is controlled by their roots.

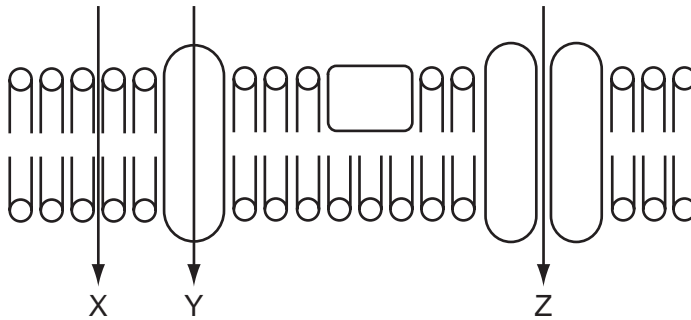
- 4 The diagram shows the water potential ( $\psi$ ) in some plant cells and in their environment.



Which statement describes the movement of water between these cells and between them and their environment?

- A All three cells are turgid, so no water moves.
- B Water moves from cell 1, cell 3 and the environment into cell 2.
- C Water moves from cell 3 to the environment, and from the environment to cell 1.
- D Water moves from the environment into cells 1, 2 and 3.

- 5 The diagram shows three routes, X, Y and Z, through which substances can pass across a cell surface membrane.



Which correctly shows the routes for vitamin D, which is fat soluble, and vitamin C, which is water soluble?

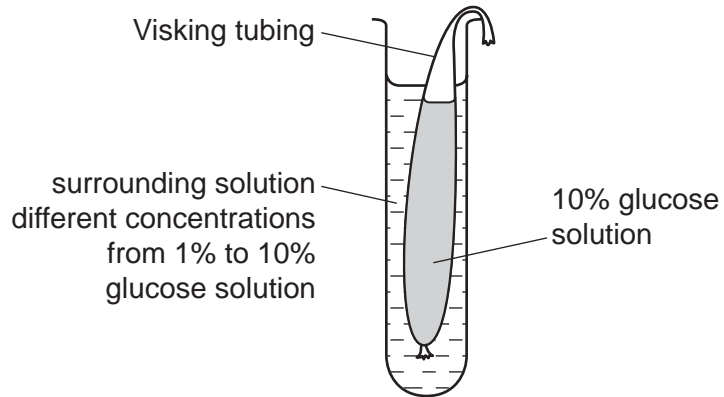
	vitamin D	vitamin C
<b>A</b>	Y	X
<b>B</b>	X	Y
<b>C</b>	X	Z
<b>D</b>	Z	Y

- 6 In plants adapted to cold conditions, their cell surface membranes change as the weather gets colder, allowing the plants to carry out exocytosis.

Which change occurs in their cell surface membranes?

- A** a decrease in the ratio of proteins to saturated phospholipids
- B** a decrease in the ratio of unsaturated phospholipids to saturated phospholipids
- C** an increase in the ratio of proteins to unsaturated phospholipids
- D** an increase in the ratio of unsaturated phospholipids to saturated phospholipids

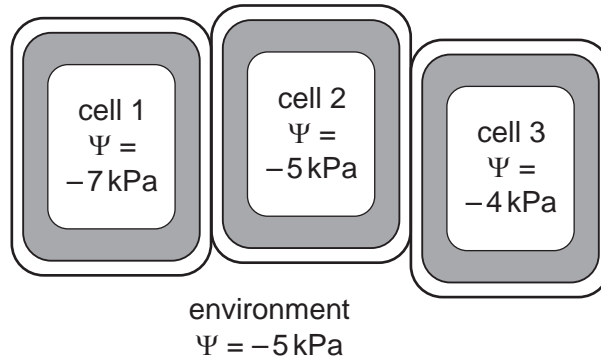
- 7 The diagram shows apparatus set up to investigate the effect of changing the concentration of glucose in the surrounding solution on the movement of molecules through a selectively permeable membrane (Visking tubing) in 15 minutes.



As the concentration of glucose solution in the surrounding solution increases, which statements are correct?

- 1 Net diffusion of water increases.
  - 2 Glucose molecules reach an equilibrium quicker.
  - 3 There is less change in the volume of surrounding solution.
  - 4 Net diffusion of glucose increases.
- A** 1, 2, 3  
**B** 1, 2 and 4  
**C** 1 and 3 only  
**D** 2 and 3 only

8 The diagram shows the water potential ( $\Psi$ ) in some plant cells and in their environment.



Which statements are correct?

- 1 Water moves into and out of all three cells.
- 2 There is a net movement of water into cell 1.
- 3 There is no movement of water from the environment to cell 2.
- 4 Water moves out of cell 1 so it becomes plasmolysed.

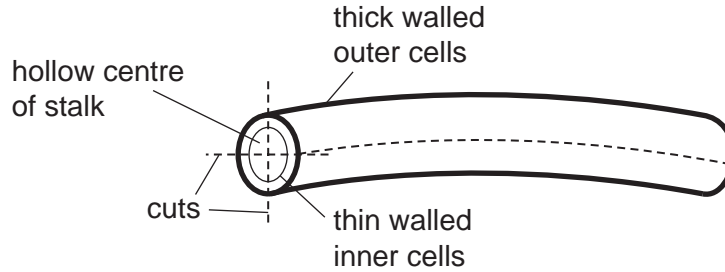
**A** 1 and 2      **B** 1 and 3      **C** 3 and 4      **D** 4 only

9 What are the features of facilitated diffusion?

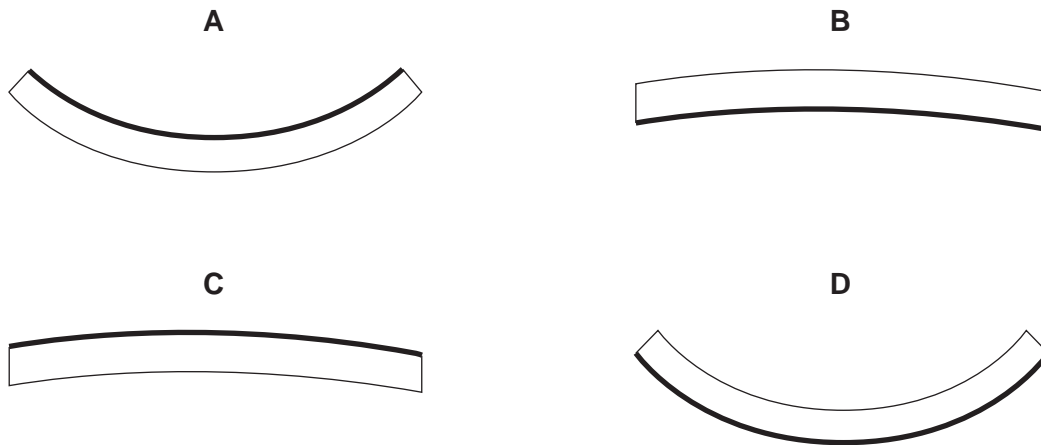
	uses proteins in membrane	uses ATP	molecules move down a concentration gradient
<b>A</b>	✓	✓	✓
<b>B</b>	x	✓	✓
<b>C</b>	✓	x	✓
<b>D</b>	✓	✓	x

key:  
 ✓ correct  
 x incorrect

- 10 The stalk of a dandelion flower is a hollow tube. Pieces of the stalk are cut as shown and placed in sucrose solutions of different water potentials.



Which diagram shows the piece that is placed in the sucrose solution with the highest water potential?



- 11 What happens to an animal cell when it is placed in a solution with a more negative water potential?

- A It loses solutes to the solution and swells.
- B It loses water by osmosis and shrinks.
- C It takes in solutes and swells.
- D It takes in water by osmosis and bursts.

- 12 A method called freeze-fracture can be used to study the structure of cell membranes. The membrane is frozen and then split down the middle, separating the two layers of phospholipids from each other. Any proteins contained within one layer remain in that layer. Proteins which span the membrane can be found in either layer after freeze-fracture, depending on the protein's properties.

Which statement(s) about the results of freeze-fracture studies are correct?

- 1 It provides evidence for the bilayer nature of membranes.
- 2 It provides evidence for the arrangement of proteins.
- 3 It shows that the proteins in the membrane do not contribute to its strength.

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

- 13 Which statements are descriptions of **both** facilitated diffusion and active transport?

- 1 moves substances against a concentration gradient
- 2 requires ATP
- 3 transports charged ions across the cell surface membrane
- 4 uses proteins

**A** 1, 2  
**B** 1, 2 a  
**C** 2 and 3 only  
**D** 3 and 4 only



- 14 Which processes that contribute to transport across cell surface membranes are active or passive?

	endocytosis	exocytosis	facilitated diffusion	osmosis
<b>A</b>	✓	✓	x	x
<b>B</b>	✓	x	✓	x
<b>C</b>	x	✓	x	✓
<b>D</b>	x	x	✓	✓

key

✓ = active

x = passive

- 15 In an investigation, four sucrose solutions were separated from each other by partially permeable membranes.

solution 1      1.1 mol dm<sup>-3</sup>

solution 2      0.8 mol dm<sup>-3</sup>

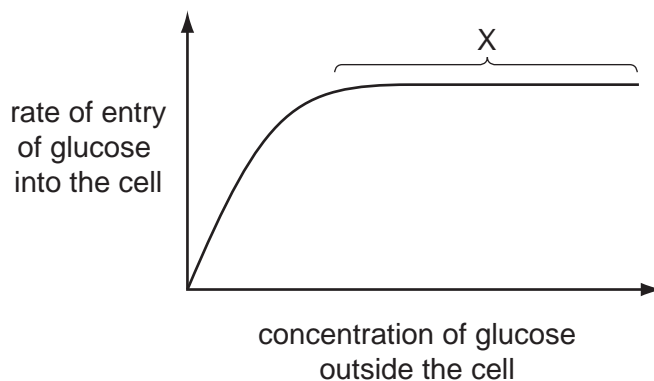
solution 3      0.5 mol dm<sup>-3</sup>

solution 4      0.1 mol dm<sup>-3</sup>

Which shows the direction in which water will move between the solutions?

- A** from 1 and 2 to 3 and 4
- B** from 2, 3 and 4 to 1
- C** from 1 to 3 to 2 and 4
- D** from 1, 2 and 3 to 4

- 16 The graph shows how the rate of entry of glucose into a cell changes as the concentration of glucose outside the cell changes.



What is the cause of the plateau at X?

- A All the carrier proteins are saturated with glucose.
  - B The carrier proteins are denatured and no longer able to function.
  - C The cell has used up its supply of ATP.
  - D The concentrations of glucose inside and outside the cell are equal.
- 17 A molecule can enter a cell by two different passive processes.

Which process would increase the rate at which this molecule enters the cells?

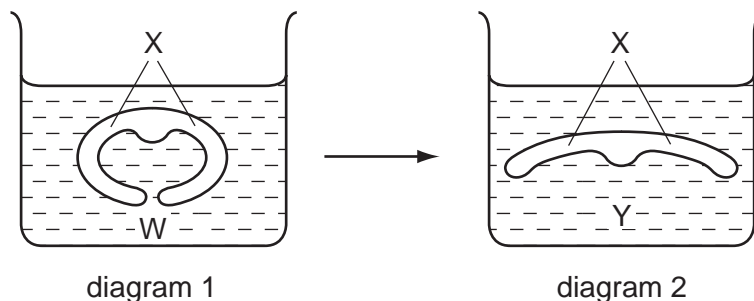
- A diffusion
- B endocytosis
- C facilitated diffusion
- D osmosis

18 Which processes that move substances across cell surface membranes result in an equilibrium?

- 1 active transport
- 2 diffusion
- 3 facilitated diffusion
- 4 osmosis

- A** 1, 2 and 3 only
- B** 1, 2 and 4 only
- C** 1, 3 and 4 only
- D** 2, 3 and 4 only

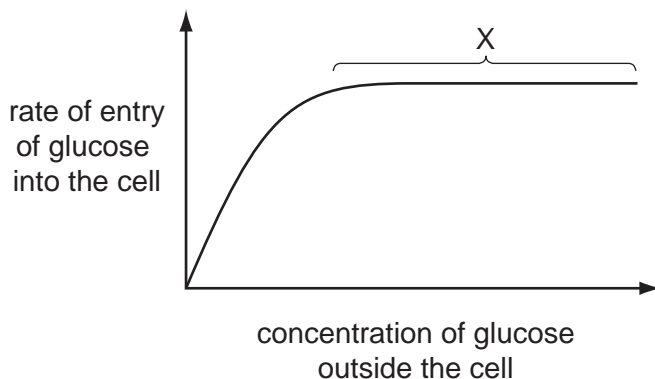
19 Diagrams 1 and 2 show how the transverse section through a leaf changes when moved from one solution W to a different solution Y.



How has the water potential changed in diagram 2?

	difference in cells at X in solution Y compared to the same cells in solution W	difference in solution Y compared to solution W
<b>A</b>	less negative	less negative
<b>B</b>	less negative	more negative
<b>C</b>	more negative	less negative
<b>D</b>	more negative	more negative

- 20 The graph shows how the rate of entry of glucose into a cell changes as the concentration of glucose outside the cell changes.



What is the cause of the plateau at X?

- 1 All the carrier proteins are saturated with glucose.
  - 2 The cell has used up its supply of ATP.
  - 3 The concentrations of glucose inside and outside the cell are equal.
- A** 1 only  
**B** 3 only  
**C** 1 and 2 only  
**D** 2 and 3 only
- 21 The following are all processes by which substances can enter cells.

- 1 phagocytosis
- 2 active transport
- 3 facilitated diffusion

Which processes require ATP?

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

22 Which correctly matches the structure and function of sieve tube elements?

	structure	function
<b>A</b>	cellulose cell wall with no lignin	to prevent loss of water
<b>B</b>	end walls modified to form sieve plates	slow down the rate of transport of solutes
<b>C</b>	elongated cells joined end to end	form a tube to transport dissolved mineral ions and water
<b>D</b>	peripheral cytoplasm with no nucleus	to provide as little resistance to flow as possible

23 Which statement defines active transport?

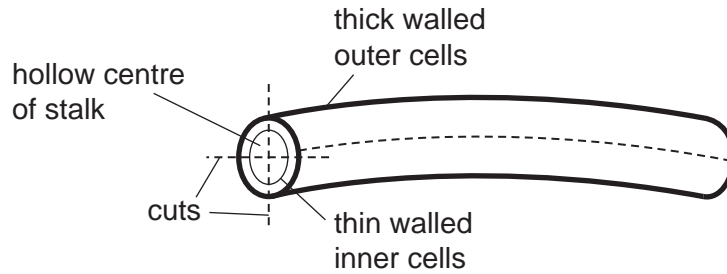
- A** movement of large molecules through the cell surface membrane into the cytoplasm of a cell
- B** movement of molecules or ions from where they are in a low concentration to where they are in a higher concentration
- C** movement of molecules or ions from where they are in a high concentration to where they are in a lower concentration
- D** net movement of water molecules across a partially permeable membrane from a region of higher water potential to one of lower water potential

24 Which statements about the components of the cell surface membrane are correct?

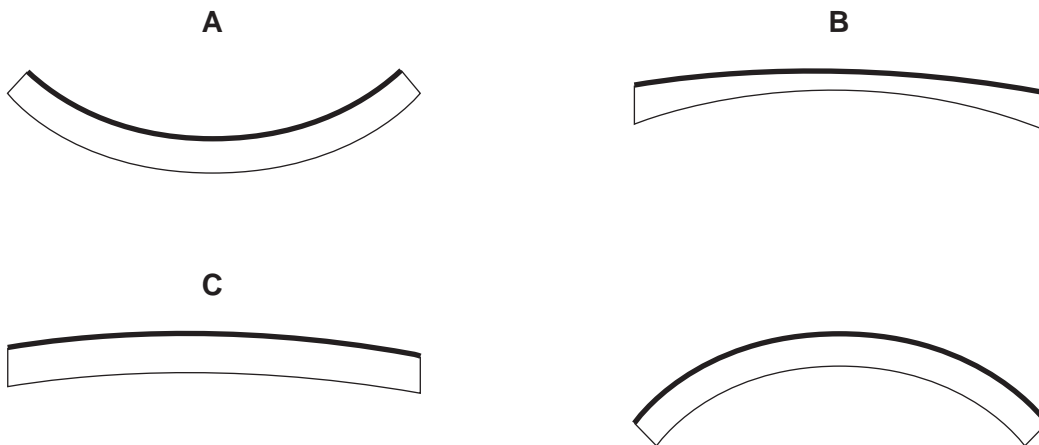
- 1 Diffusion can take place through lipids and protein pores.
- 2 Endocytosis only involves lipids.
- 3 Facilitated diffusion only involves proteins.
- 4 Osmosis only involves proteins.

- A** 1, 2 and 3
- B** 1, 3 and 4
- C** 1 and 3 only
- D** 2 and 4 only

- 25 The stalk of a dandelion is a hollow tube. Pieces of the stalk are cut as shown and placed in sucrose solutions of different water potentials.



Which diagram shows the piece that is placed in the sucrose solution with the highest water potential?



- 26 In an investigation, four sucrose solutions were separated from each other by partially permeable membranes.

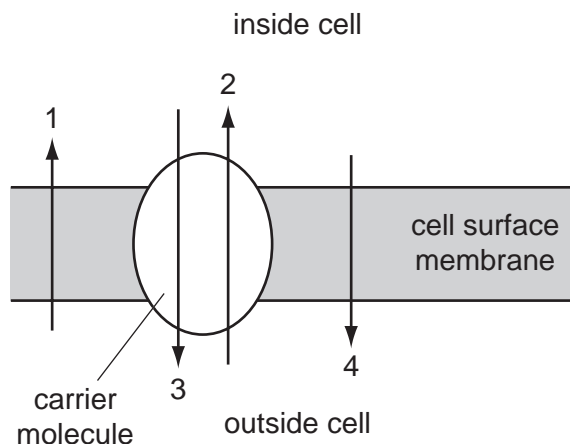
- 1  $1.1 \text{ mol dm}^{-3}$
- 2  $0.8 \text{ mol dm}^{-3}$
- 3  $0.5 \text{ mol dm}^{-3}$
- 4  $0.1 \text{ mol dm}^{-3}$

Which shows the direction in which water will move between the solutions?

- A from 1 and 2 to 3 and 4
- B from 2 and 3 to 1
- C from 1 to 3
- D from 2 to 4

- 27 The diagram shows the transport of ions across the cell surface membrane. Inside the cell there is a low concentration of sodium ions ( $\text{Na}^+$ ) and a high concentration of potassium ions ( $\text{K}^+$ ). Outside the cell there is a low concentration of  $\text{K}^+$  and a high concentration of  $\text{Na}^+$ .

The carrier molecule is a pump which exchanges  $\text{Na}^+$  for  $\text{K}^+$  ions.



Which ionic movements are represented by the arrows?

	active transport of $\text{K}^+$	active transport of $\text{Na}^+$	diffusion of $\text{Na}^+$	diffusion of $\text{K}^+$
<b>A</b>	2	3	1	4
<b>B</b>	2	3	4	1
<b>C</b>	3	2	1	4
<b>D</b>	3	2	4	1

- 28 Plant cells were immersed in solutions of different water potential and left for one hour.

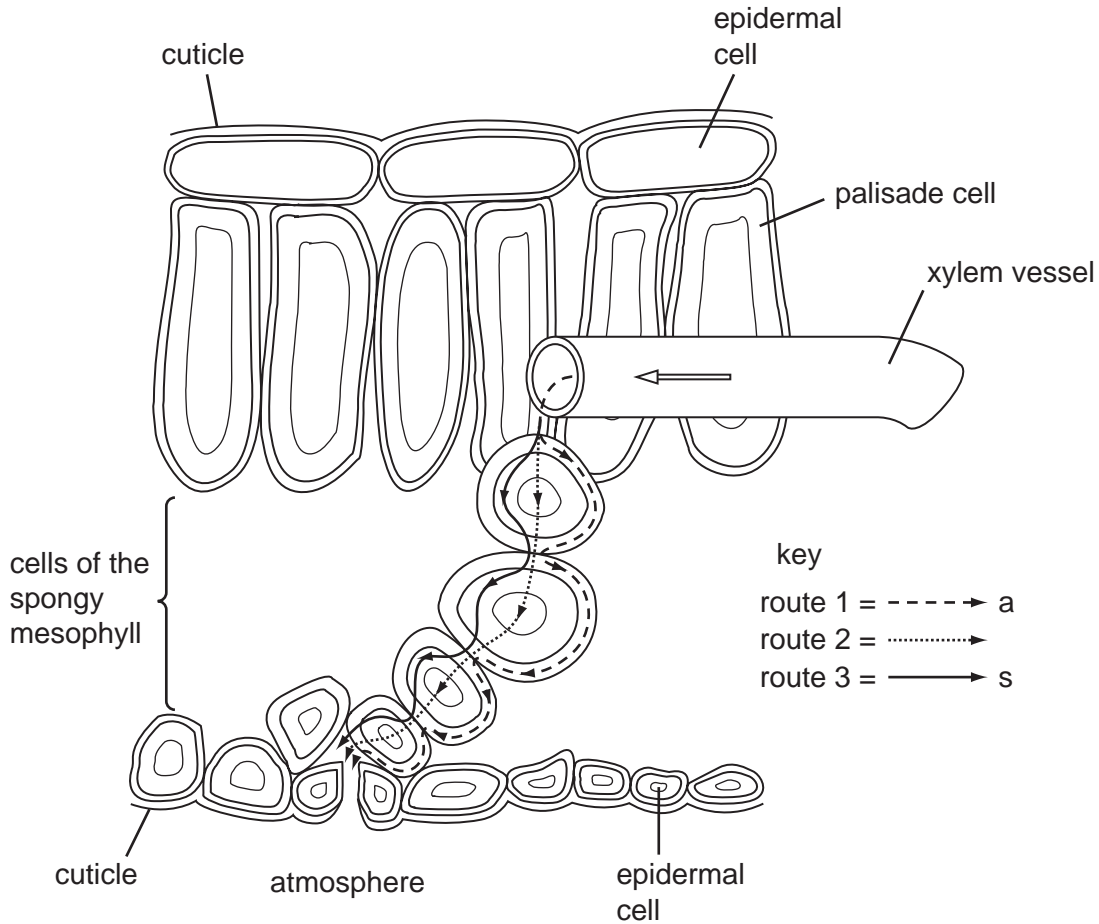
Which row shows the effect of the different solutions on the plant cells?

	water potential of solution compared to plant cells		
	less negative	equal	more negative
<b>A</b>	flaccid	turgid	unchanged
<b>B</b>	flaccid	unchanged	turgid
<b>C</b>	turgid	unchanged	flaccid
<b>D</b>	unchanged	flaccid	turgid

29 Water passes across leaf tissues by different routes as a result of

- differences in water potential
- the pull transmitted by cohesive forces between water molecules.

The diagram shows three routes by which water can travel.

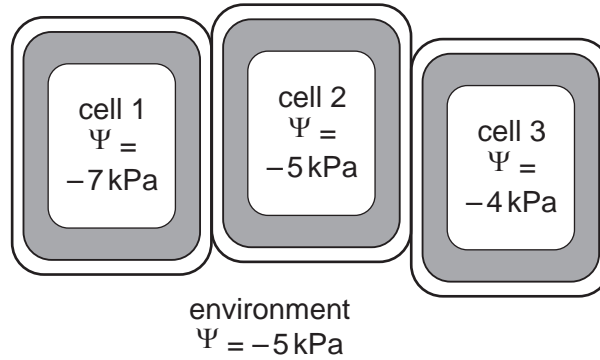


Which row correctly identifies why water passes across leaf tissues by the different routes?

	differences in water potential	pull transmitted by cohesive forces
<b>A</b>	route 1	routes 2 and 3
<b>B</b>	routes 1 and 3	route 2
<b>C</b>	route 2	routes 1 and 3
<b>D</b>	routes 2 and 3	route 1



30 The diagram shows the water potential ( $\Psi$ ) in some plant cells and in their environment.

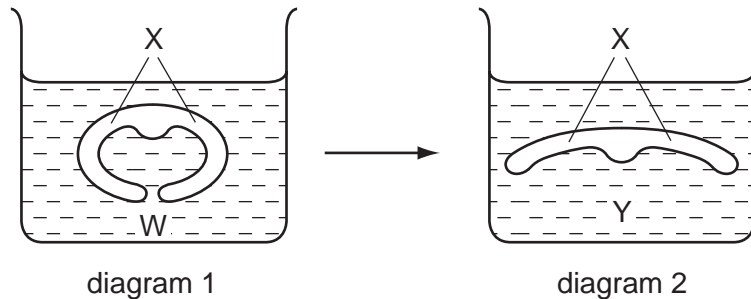


Which statements are correct for this situation?

- 1 Water moves into and out of all three cells.
- 2 There is a net movement of water into cell 1.
- 3 There is no movement of water from the environment to cell 2.
- 4 Water moves out of cell 3 so it becomes plasmolysed.

**A** 1 and 2      **B** 1 and 3      **C** 2 and 4      **D** 3 and 4

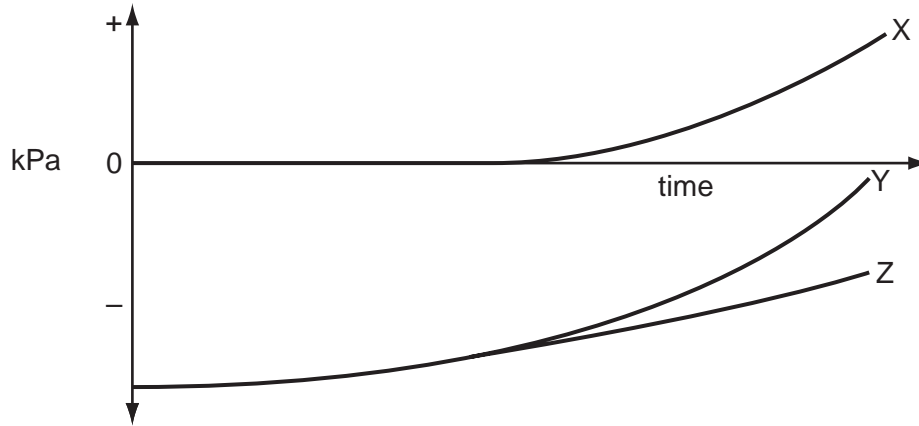
31 Diagrams 1 and 2 show how the transverse section through a leaf changes when moved from one solution W to a different solution Y.



How has the water potential changed in diagram 2?

	difference in cells at X in solution Y compared to the same cells in solution W	difference in solution Y compared to solution W
<b>A</b>	less negative	less negative
<b>B</b>	less negative	more negative
<b>C</b>	more negative	less negative
<b>D</b>	more negative	more negative

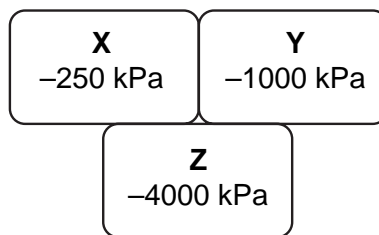
32 The diagram shows the changes in pressure potential ( $\Psi_P$ ), solute potential ( $\Psi_S$ ) and water potential ( $\Psi$ ) when a plasmolysed plant cell is placed in pure water.



Which shows the correct curves for each potential?

	X	Y	Z
<b>A</b>	$\Psi$	$\Psi_P$	$\Psi_S$
<b>B</b>	$\Psi_P$	$\Psi_S$	$\Psi$
<b>C</b>	$\Psi_S$	$\Psi$	$\Psi_P$
<b>D</b>	$\Psi_P$	$\Psi$	$\Psi_S$

33 The water potential of three adjacent plant cells is shown.



In which direction will water move?

- A** from cell X to cell Y and then cell Z only
- B** from cell X to both cells Y and Z
- C** from cell Z to cell Y and then cell X only
- D** from cell Z to both cells Y and X

34 The table shows three processes that contribute to transport across cell surface membranes.

Which processes are the result of random movement of molecules?

	diffusion	endocytosis	osmosis	
<b>A</b>	x	x	x	key ✓ = random x = non random
<b>B</b>	x	✓	✓	
<b>C</b>	✓	x	✓	
<b>D</b>	✓	✓	x	

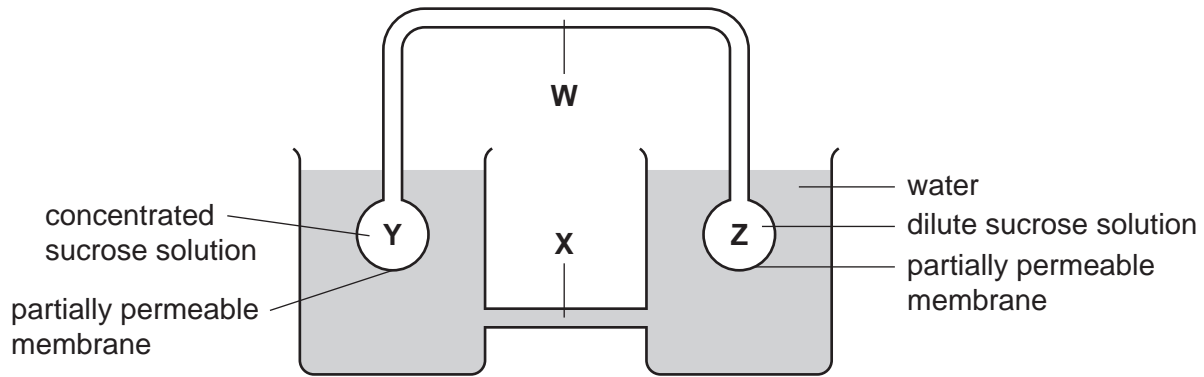
35 Four solutions, with different water potentials are listed.

- 1 endodermal cell solution
- 2 root hair cell solution
- 3 soil water solution
- 4 solution in a xylem vessel

Which list has the solutions in order from the highest (least negative) water potential to the lowest (most negative) water potential?

	highest	→	lowest
<b>A</b>	1	2	3 4
<b>B</b>	2	4	1 3
<b>C</b>	3	2	1 4
<b>D</b>	4	1	3 2

36 The diagram shows a model to demonstrate the mass-flow hypothesis of translocation.

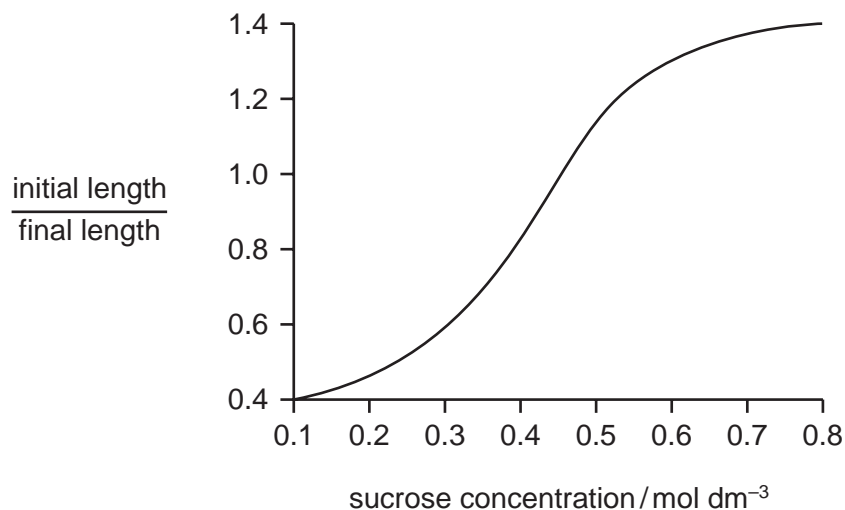


In a plant, what are the structures **W**, **X**, **Y** and **Z** and what is the direction of flow of solution along **W**?

	phloem	xylem	roots	leaves	direction of flow along <b>W</b>
<b>A</b>	<b>W</b>	<b>X</b>	<b>Y</b>	<b>Z</b>	From <b>Z</b> to <b>Y</b>
<b>B</b>	<b>W</b>	<b>X</b>	<b>Z</b>	<b>Y</b>	From <b>Y</b> to <b>Z</b>
<b>C</b>	<b>X</b>	<b>W</b>	<b>Y</b>	<b>Z</b>	From <b>Y</b> to <b>Z</b>
<b>D</b>	<b>X</b>	<b>W</b>	<b>Z</b>	<b>Y</b>	From <b>Z</b> to <b>Y</b>

- 37 Strips of plant tissue were immersed in a range of sucrose solutions of different concentrations. Their lengths were measured before immersion and after 30 minutes.

The graph shows the ratio of initial length to final length.



What is a correct description of the change in the cells and in their water potential as the sucrose concentration increases?

	change in the cells	change in the water potential
<b>A</b>	more turgid	less negative
<b>B</b>	less turgid	more negative
<b>C</b>	more turgid	more negative
<b>D</b>	less turgid	less negative

- 38 The graph shows rates of simple diffusion and facilitated diffusion, of substance X across a cell surface membrane, as the concentration of substance X increases.



Why does the rate of facilitated diffusion level off whereas the rate of simple diffusion does not?

- A Facilitated diffusion is limited by the number of protein channels in the membrane.
  - B Facilitated diffusion is limited by the number of protein pumps in the membrane.
  - C Facilitated diffusion requires ATP which will eventually be used up.
  - D Only facilitated diffusion is affected by the kinetic energy of the molecules that are diffusing.
- 39 Translocation in plants moves sucrose from sources to sinks.

Which of the following can be a source and which a sink?

	source	sink
A	germinating seeds	green leaves
B	green leaves	storage roots
C	phloem	germinating seeds
D	storage roots	phloem

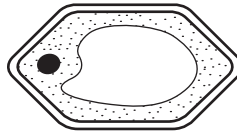
- 40 Which process would allow the movement of large protein molecules **out** of the cell?
- A active transport
  - B exocytosis
  - C facilitated diffusion
  - D phagocytosis

41 A water potential gradient causes water to move through xylem.

Which process is mainly responsible for this water potential gradient?

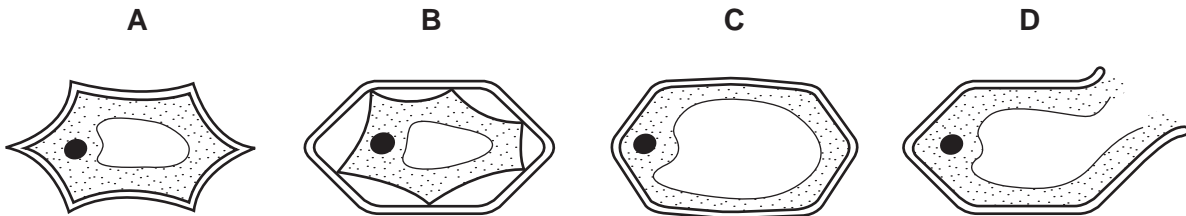
- A capillarity
- B osmosis
- C translocation
- D transpiration

42 The diagram shows a plant cell.



The plant cell is put into a solution with a water potential less negative (higher) than the cell contents.

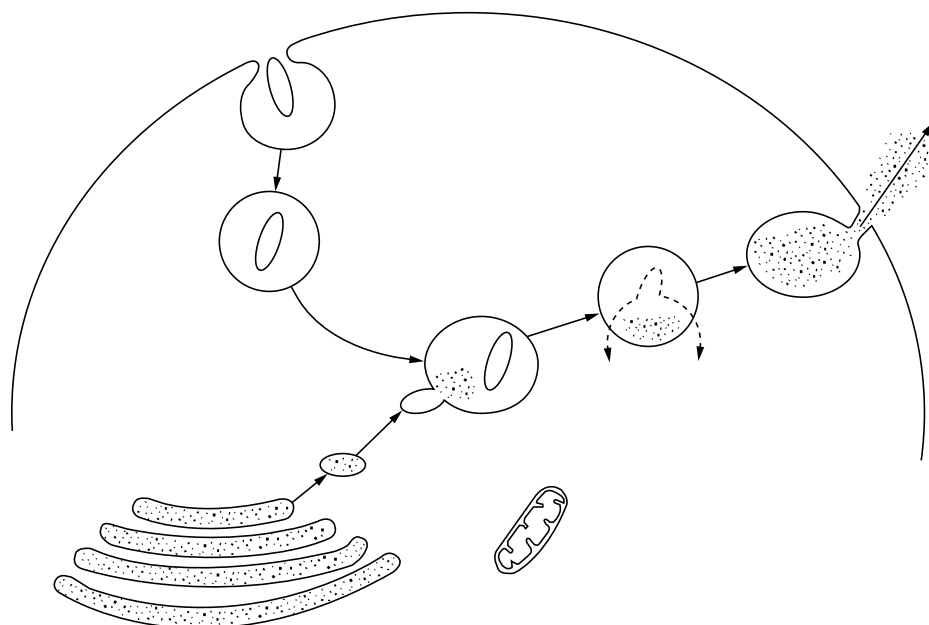
What will happen to the appearance of the cell?



43 Which structures are present in large numbers at sites of active transport?

- A Golgi bodies
- B lysosomes
- C mitochondria
- D rough endoplasmic reticulum

44 The diagram shows several processes taking place in a cell.



Which processes are shown in the diagram and involve the cell surface membrane of the cell?

- A active transport and diffusion
- B diffusion and osmosis
- C endocytosis and exocytosis
- D endocytosis and osmosis

45 A water potential gradient causes water to move through xylem.

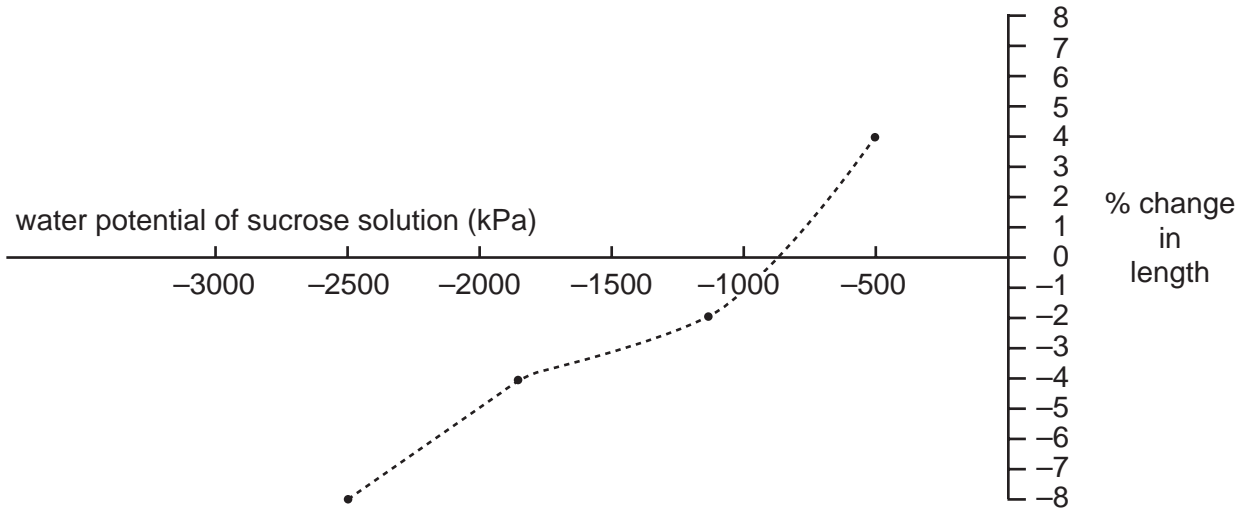
Which process is mainly responsible for this water potential gradient?

- A active transport
- B osmosis
- C root pressure
- D transpiration



- 46 Freshly cut potato chips are immersed for 30 minutes in four sucrose solutions of varying water potentials.

The graph shows the percentage change in their length.



What is the water potential of the potato cells in the freshly cut chips?

- A 0 kPa
- B -525 kPa
- C -875 kPa
- D -2500 kPa