Cell Membranes and Transport

Question Paper 1

Level	International A Level
Subject	Biology
Exam Board	CIE
Topic	Cell Membranes and Transport
Sub Topic	
Booklet	Multiple Choice
Paper Type	Question Paper 1

Time Allowed : **54 minutes**

Score : **/ 45**

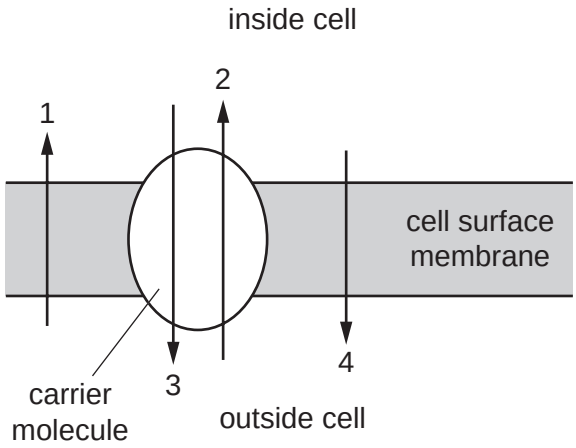
Percentage : **/100**

Grade Boundaries:

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

1 The diagram shows the transport of ions across the cell surface membrane. Inside the cell there is a low concentration of sodium ions (Na^+) and a high concentration of potassium ions (K^+). Outside the cell there is a low concentration of K^+ and a high concentration of Na^+.

The carrier molecule is a pump which exchanges Na^+ for K^+.



Which ionic movements are represented by the arrows?

	active transport of K^+	active transport of Na^+	diffusion of Na^+	diffusion of K^+
A	2	3	1	4
B	2	3	4	1
C	3	2	1	4
D	3	2	4	1

2 What is the sequence of events in the translocation of sucrose?

A active loading of sucrose into sieve elements at the source, increased hydrostatic pressure, mass flow, unloading at the sink

B hydrolysis of storage compounds in sinks, lowered water potential, unloading of sucrose from sieve elements, mass flow from the source

C lowered pressure in sieve elements at the source, movement of sucrose down the pressure gradient, mass flow down a diffusion gradient to the sink

D mass flow of dissolved sucrose into the sieve element at the source, lowered hydrostatic pressure, diffusion of sucrose to sink, active unloading

3 What supports the view that a membrane protein is involved in active transport?

A It allows movement of molecules across a membrane if concentration differences exist.

B It can only function if mitochondria are supplied with sufficient oxygen.

C It has a tertiary structure with a binding site with a specific shape.

D It is found in the cell surface membranes and the mitochondrial membranes.

4 Which is correct for facilitated diffusion **and** active transport?

A both depend on the solubility of the transported molecule in the lipid bilayer

B both increase as the concentration of the transported molecule increases

C both require the use of ATP

D both require the use of membrane proteins

5 Which features increase the efficiency of ion uptake by a root hair cell?

1 many mitochondria in the cell

2 high concentration of ions in the vacuole

3 protein carriers in the cell surface membrane

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

6 What are the features of facilitated diffusion?

1 It uses protein channels in the membrane and is driven by the energy from ATP.

2 It moves molecules from regions of higher concentration to lower concentration and is driven by the kinetic energy of the molecules which are diffusing.

3 It uses protein channels in the membrane, and the maximum rate of diffusion depends on the number of these channels.

A 1 and 2 only

B 1 and 3 only

C 2 and 3 only

D **1,** 2 and 3

7 Which process allows the movement of molecules that are too large to **enter** through a cell surface membrane?

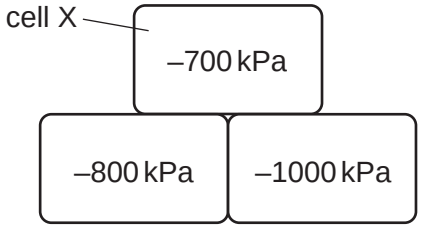
A active transport

B endocytosis

C exocytosis

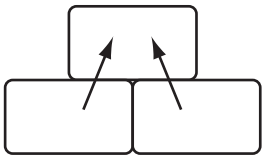
D facilitated diffusion

8 The diagram shows the water potential of three cells.



In which directions will there be net movement of water by osmosis to or from cell X?

A



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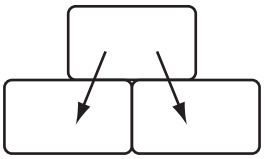
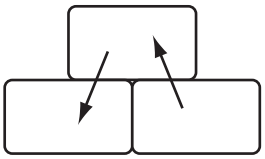
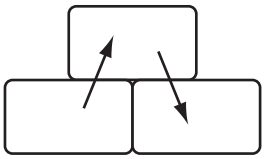


C



D



9 The loading of sucrose into companion cells involves a number of processes listed below.

Which is an active process?

A the movement of H^+ ions from companion cells

B the movement of H^+ ions into companion cells

C the movement of sucrose from companion cells

D the movement of sucrose into companion cells

10 Which statement concerning transpiration is correct?

A On a humid day, the water potential gradient between the intercellular air space and the external atmosphere increases to stimulate water loss by evaporation.

B Water arriving at the spongy mesophyll cells via the symplast pathway must move by osmosis through the cell surface membrane before evaporation from the surface of the cells.

C Water diffuses down the water potential gradient from the saturated air space through the guard cells before evaporating from the surface of the cells into the atmosphere.

D Water moves up the xylem in the apoplast pathway and can continue on this pathway by osmosis to reach the spongy mesophyll cells before evaporating into the intercellular air space.

11 Halophytes are plants that can survive in regions where they are regularly exposed to sea water. Sea water has a water potential of approximately –2500 kPa.

What adaptations would you expect halophytes to show?

1 root hair cells that maintain a more negative water potential than sea water

2 root hair cells that accumulate salts and other solutes

3 stomata that are open most of the time

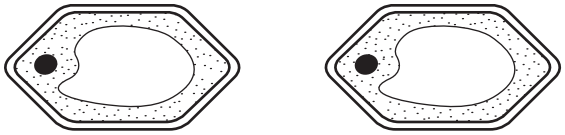
A 1 and 2 only

B 1 and 3 only

C 2 and 3 only

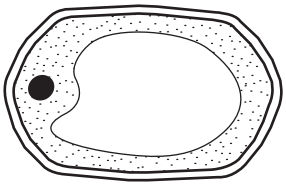
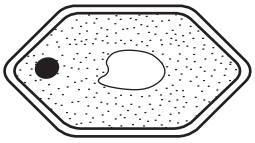
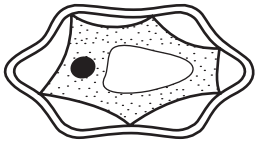
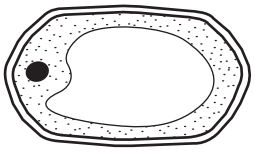
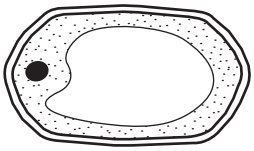
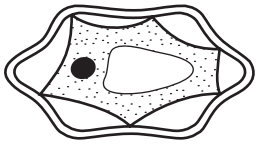
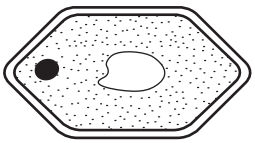
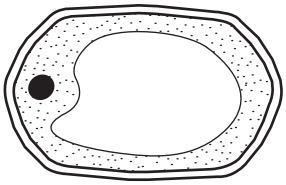
D 1, 2 and 3

12 The diagram shows two identical plant cells.



One plant cell is put into a solution with a water potential less negative than the cell contents. The other is put into a solution with a water potential more negative than the cell contents.

What will happen to the appearance of each cell?

	water potential of solution surrounding cell less negative than cell contents	water potential of solution surrounding cell more negative than cell contents
A		
B		
C		
D		

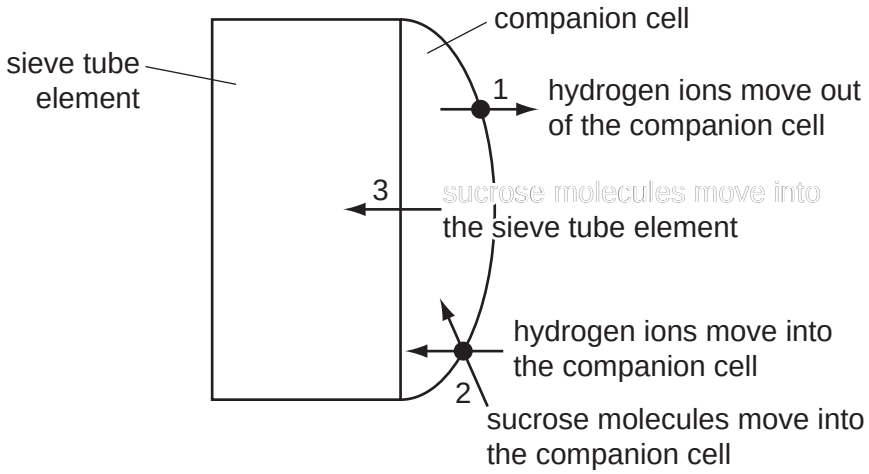
13 Chromosome telomeres are essential for DNA replication and are **not** completely replaced during mitosis.

A substance **X** is known that completely replaces telomeres during mitosis.

What will be the effect of growing cells with and without substance **X**?

	with substance **X**	without substance **X**
A	cells divide continually	cell division eventually slows and stops
B	cells divide more rapidly	cells divide continually
C	cell division eventually slows and stops	cell division stops immediately
D	cell division stops immediately	cells divide continually

14 The diagram shows how sucrose is loaded into a sieve tube element.



What type of transport is used to move the substances in steps 1, 2 and 3?

	1	2	3
A	active transport	active transport	diffusion
B	active transport	facilitated diffusion	diffusion
C	facilitated diffusion	active transport	active transport
D	facilitated diffusion	facilitated diffusion	active transport

15 A number of different tissues occur in the walls of major blood vessels.

Which row correctly identifies the main tissues found in the three layers of the wall of an artery?

	outer layer (tunica externa)	middle layer (tunica media)	inner layer (tunica intima)
A	collagen	elastic	endothelium
B	collagen	muscle	elastic
C	elastic	collagen	endothelium
D	elastic	collagen	muscle

16 Which process would allow the movement of large protein molecules **out** of the cell?

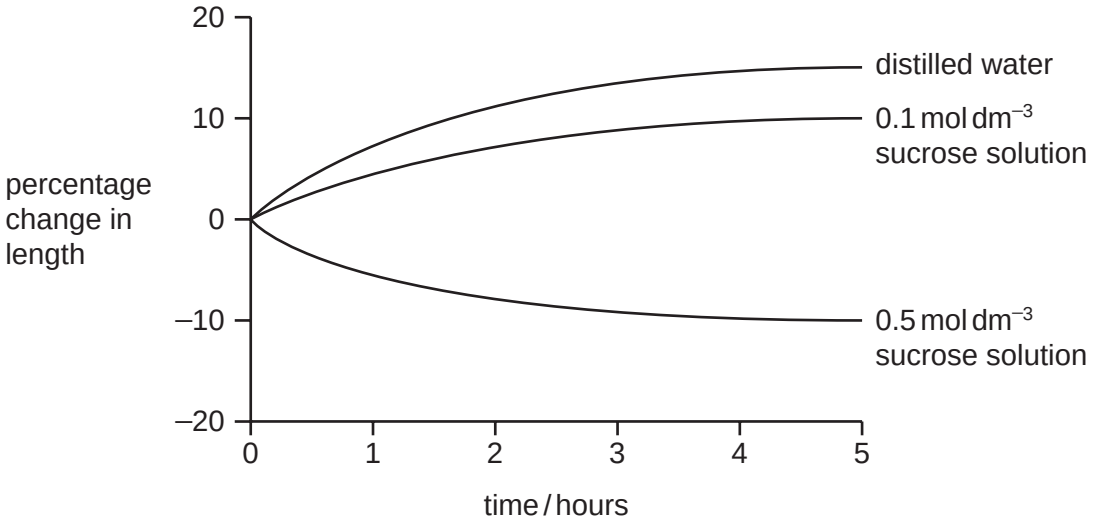
A active transport

B exocytosis

C facilitated diffusion

D phagocytosis

17 Strips of potato tissue were immersed in distilled water or in sucrose solutions of different concentrations. The graph shows the percentage change in length of the potato tissue over time.



Which row correctly shows how the water potentials of the distilled water and sucrose solutions differ from the initial water potential of the potato tissue?

	distilled water	0.1 mol dm^{-3} sucrose solution	0.5 mol dm^{-3} sucrose solution
A	less negative	less negative	more negative
B	less negative	more negative	more negative
C	more negative	less negative	less negative
D	more negative	more negative	less negative

18 Three solutions, with different water potentials (ψ) are listed.

1 cortex cell solution

2 endodermal cell solution

3 root hair cell solution

Which row has the solutions in order from the least negative ψ to the most negative ψ?

	highest ψ	⟶	lowest ψ
A	1	2	3
B	2	1	3
C	3	2	1
D	3	1	2

19 Which of the following ways of moving substances across cell surface membranes allows movement in both directions?

1 active transport

2 diffusion

3 facilitated diffusion

4 osmosis

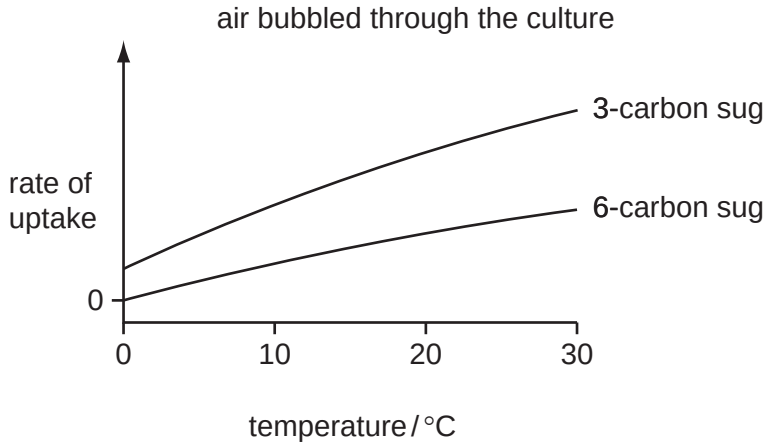
A 2 only

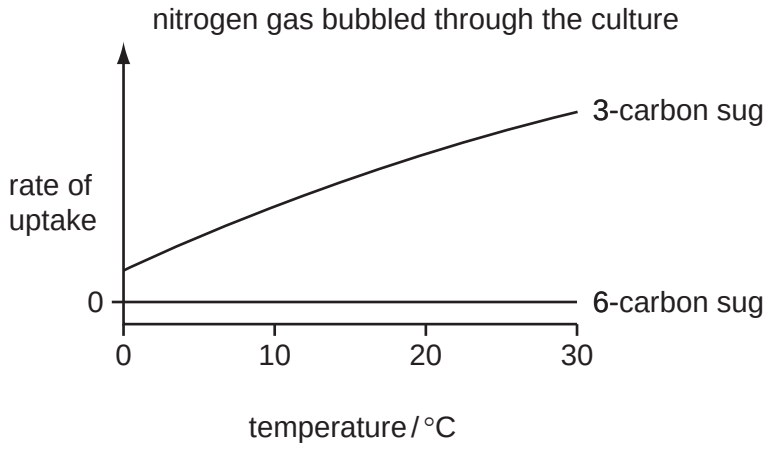
B 1 and 4 only

C 2 and 3 only

D **1**, 2 and 3

20 The graphs show the rate of uptake of sugars by a culture of animal cells, under different conditions.





How are the sugars taken up by the cells when air is bubbled through the culture?

	3-carbon sugar	6-carbon sugar
A	active transport	active transport
B	active transport	diffusion
C	diffusion	active transport
D	diffusion	diffusion

21 The following are all processes by which substances can enter a cell.

1 endocytosis

2 facilitated diffusion

3 osmosis

Which processes are passive?

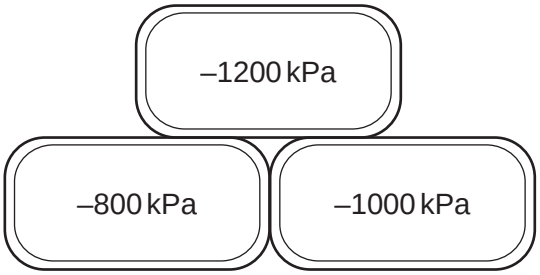
A 2 only

B 3 only

C 2 and 3 only

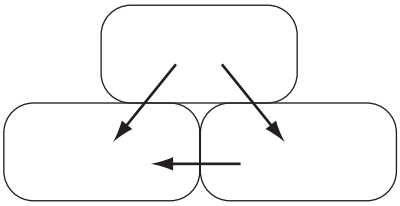
D **1**, 2 and 3

22 The diagram shows the water potential of three adjacent plant cells.

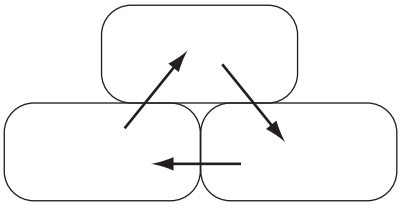


In which directions will there be net movement of water by osmosis?

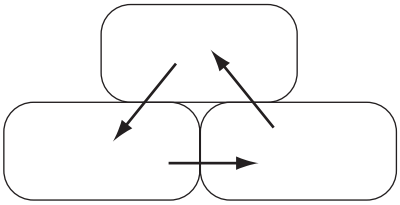
A



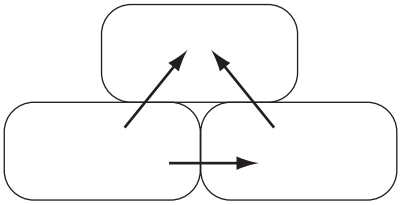
B



C



D



23 What supports the view that a membrane protein is involved in active transport?

A It allows movement of molecules across a membrane if concentration differences exist.

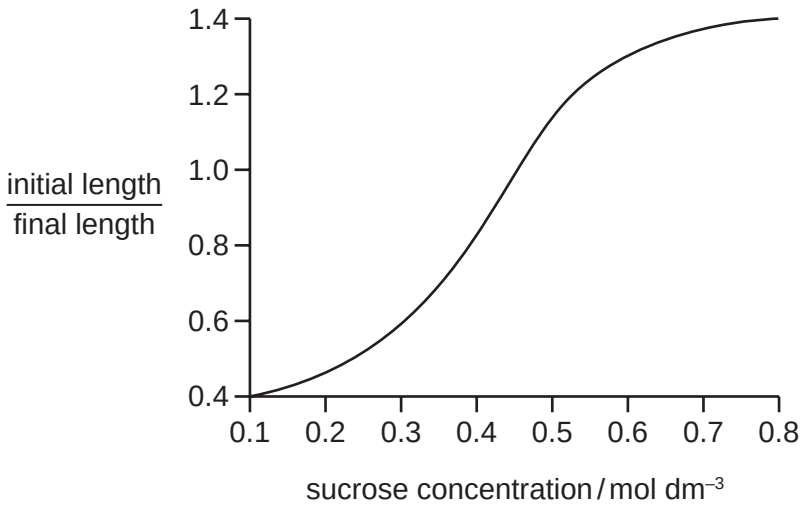
B It can only function if mitochondria are supplied with sufficient oxygen.

C It has a tertiary structure with a binding site with a specific shape.

D It is found in the cell surface membranes and the mitochondrial membranes.

24 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.



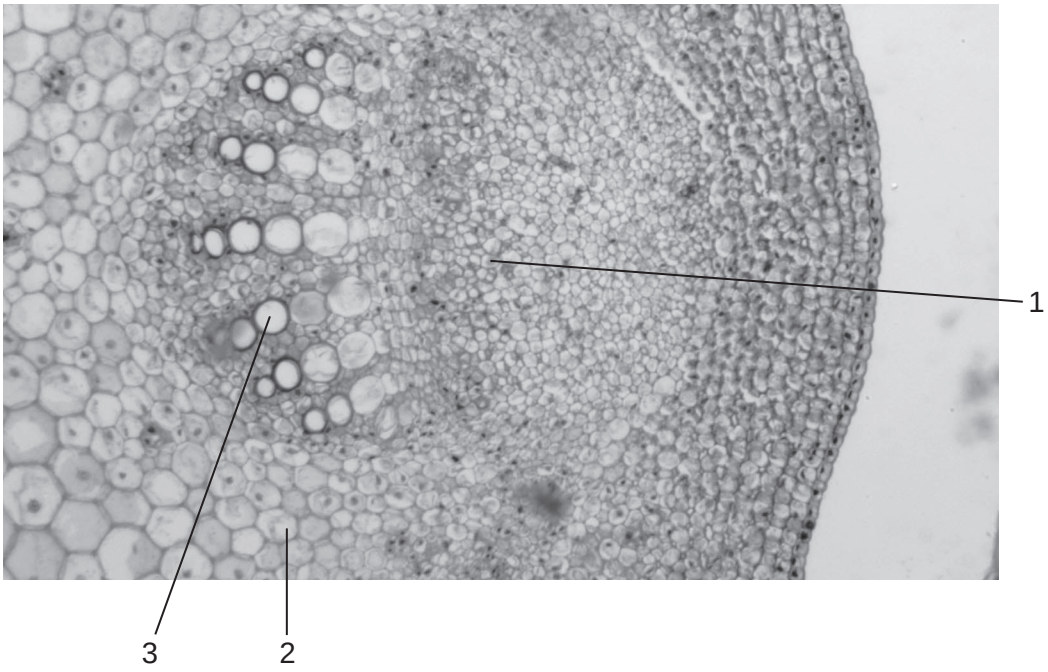
What is a correct description of the change in the cells and in their water potential as the sucrose concentration increases?

	change in the cells	change in the water potential
A	less turgid	more negative
B	less turgid	less negative
C	more turgid	less negative
D	more turgid	more negative

25 In an animal cell, which process is dependent upon cell surface area and which process is dependent upon cell volume?

	cell surface area	cell volume
A	carbon dioxide produced	oxygen used
B	glucose absorbed	hormones detected
C	hormones detected	carbon dioxide produced
D	oxygen used	glucose absorbed

26 The photomicrograph shows a vascular bundle.



Which describes the relationship of water potential in the labelled cells?

A cell 3 less negative than cell 1

B cell 2 less negative than cell 3

C cell 3 more negative than cells 1 and 2

D cells 1, 2 and 3 have the same water potential

27 When cylinders of potato tissue were immersed in a 0.35 mol dm^{-3} sucrose solution, they showed no change in mass.

What will happen when cylinders are immersed in a 0.1 mol dm^{-3} sucrose solution?

A The pressure potential of the cells will become more positive.

B The solute potential of the cell will become more negative.

C The water potential of the cells will become more negative.

D The water potential of the solution will become less negative.

28 Which processes allow movement into and out of a cell?

1 active transport

2 diffusion

3 facilitated diffusion

4 osmosis

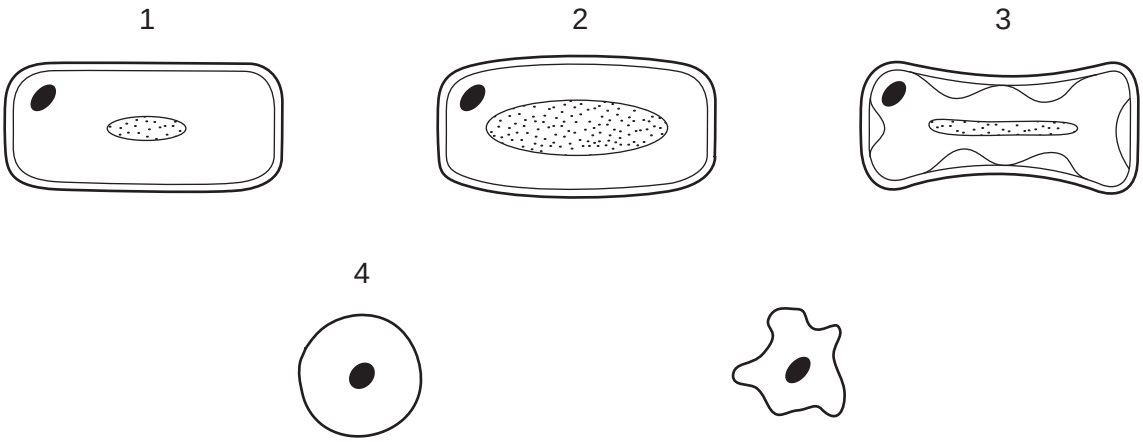
A 2 and 4 only

B 1, 2 and 3 only

C 1, 3 and 4 only

D 1, 2, 3 and 4

29 Some plant and animal cells were placed in different solutions and the results are shown.



Which cells were placed in which solution?

	1.0 mol dm^{-3} sucrose	0.1 mol dm^{-3} salt solution
A	1 and 2	3 and 5
B	1 and 4	3
C	2 and 4	1 and 3
D	3 and 5	2 and 4

30 Which pair of factors is inversely proportional to the rate of diffusion?

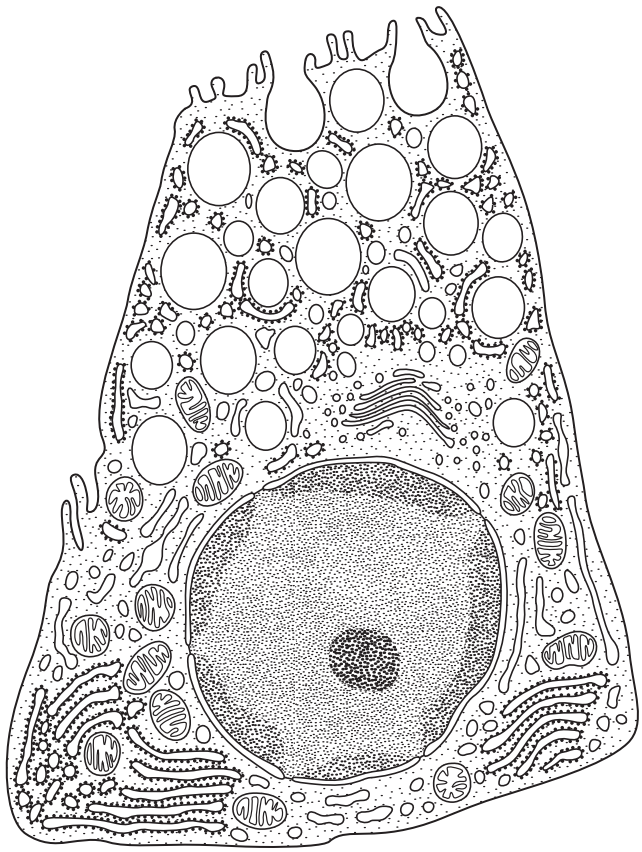
A concentration gradient and surface area over which diffusion occurs

B distance over which diffusion occurs and size of diffusing molecule

C size of diffusing molecule and concentration gradient

D surface area over which diffusion occurs and distance over which diffusion occurs

31 The diagram shows a cell from the gut. The cell produces protease enzymes.

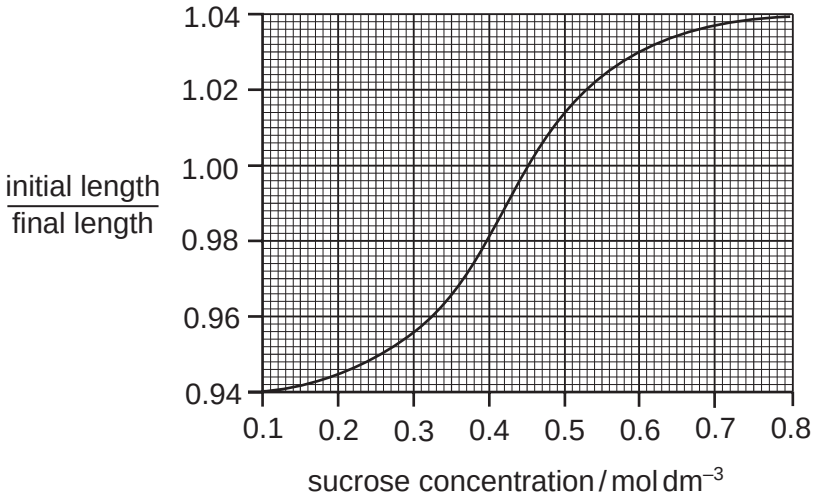


What is correct?

	enzymes released by	ATP needed
A	endocytosis	no
B	endocytosis	yes
C	exocytosis	no
D	exocytosis	yes

32 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.

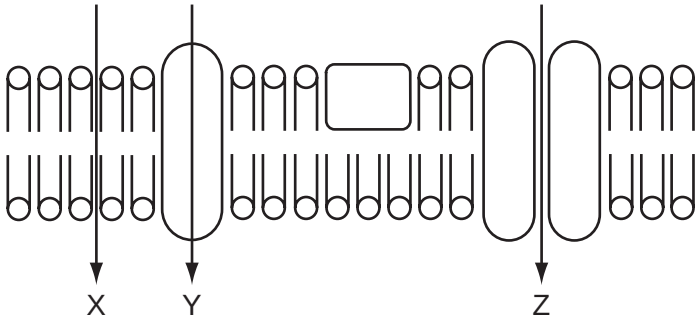
The graph shows the ratio of initial length to final length.



Which concentration of sucrose solution, in mol dm^{-3}, has the same water potential as the cell sap before immersion?

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

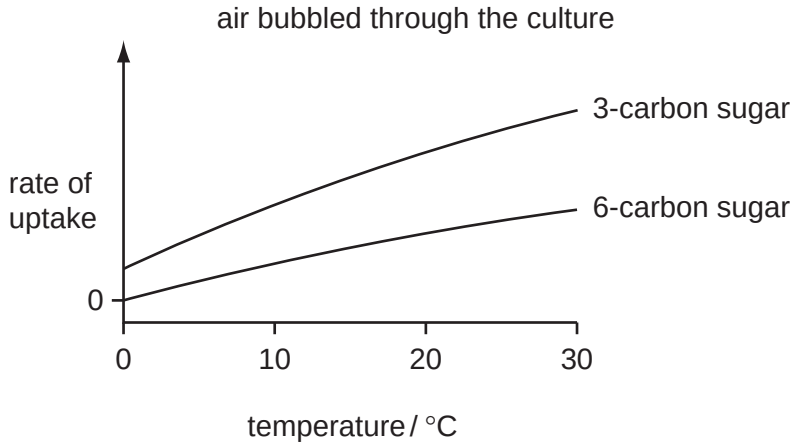
33 The diagram shows three routes through which substances can pass across a cell membrane.

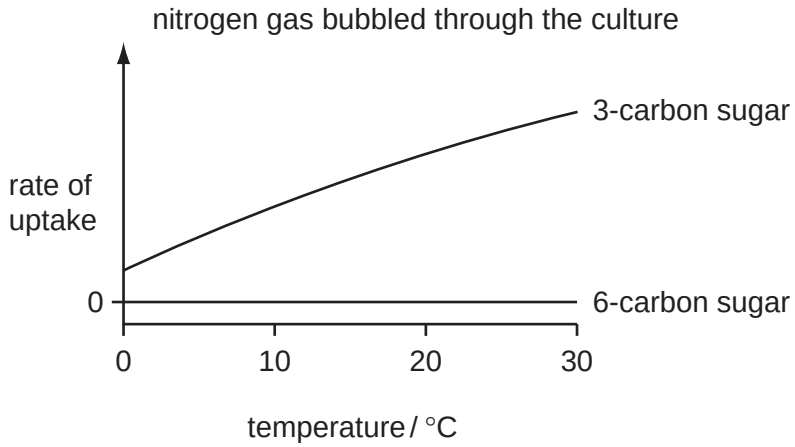


Which correctly shows the routes for vitamin D, which is fat soluble, and vitamin C, which is water soluble?

	vitamin D	vitamin C
A	Y	X
B	X	Z
C	X	Y
D	Z	Y

34 The graphs show the rate of uptake of sugars by a culture of animal cells, under different conditions.





How are the sugars taken up by the cells when air is bubbled through the culture?

	3-carbon sugar	6-carbon sugar
A	active transport	active transport
B	active transport	diffusion
C	diffusion	active transport
D	diffusion	diffusion

35 Which process allows the movement of molecules that are too large to pass **in** through a cell surface membrane?

A active transport

B endocytosis

C exocytosis

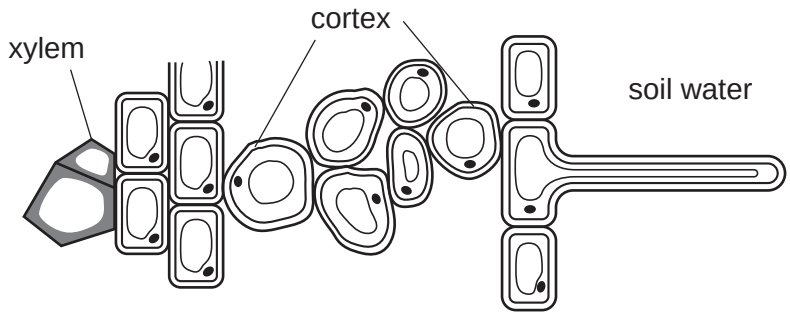
D facilitated diffusion

36 In an animal cell, which process is dependent upon cell surface area and which process is dependent upon cell volume?

	cell surface area	cell volume
A	carbon dioxide produced	oxygen used
B	glucose absorbed	hormones detected
C	hormones detected	carbon dioxide produced
D	oxygen used	glucose absorbed

37 Land flooded by the sea is not suitable for growing plants long after the salty flood water has drained away.

The diagram represents a transverse section through a part of the root of a plant.



Which values of water potential (kPa) in the xylem and soil water help to explain why the land flooded with salty water is unsuitable for growth of plants?

	xylem	soil water
A	–700 kPa	0 kPa
B	–1800 kPa	–700 kPa
C	0 kPa	–1800 kPa
D	–700 kPa	–1800 kPa

38 Which adaptation would increase the efficiency of active transport of carbohydrates from a plant cell?

A areas where the cell wall is thin

B increased permeability of the cell wall

C large surface area of the cell surface membrane

D selective permeability of the vacuole membrane

39 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

40 Which pair of factors is inversely proportional to the rate of diffusion?

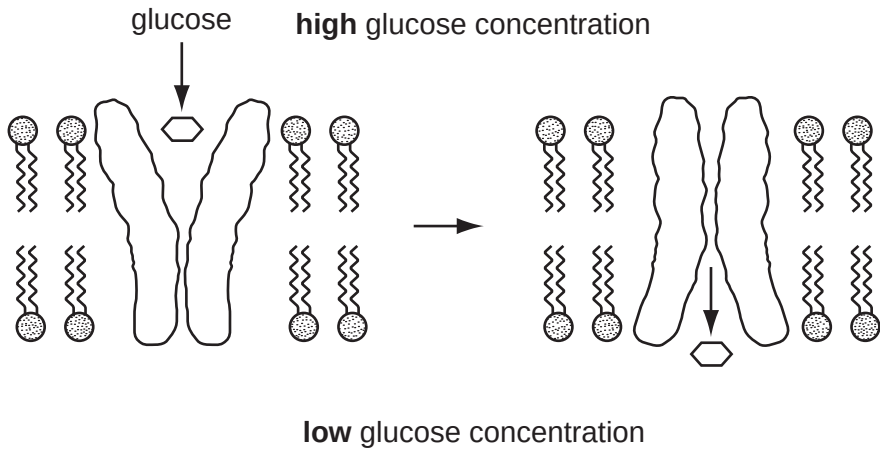
A concentration gradient and size of diffusing molecule

B distance over which diffusion occurs and surface area over which diffusion occurs

C size of diffusing molecule and distance over which diffusion occurs

D surface area over which diffusion occurs and concentration gradient

41 The diagram represents stages in glucose uptake through a cell surface membrane.



Which process is shown?

A active transport

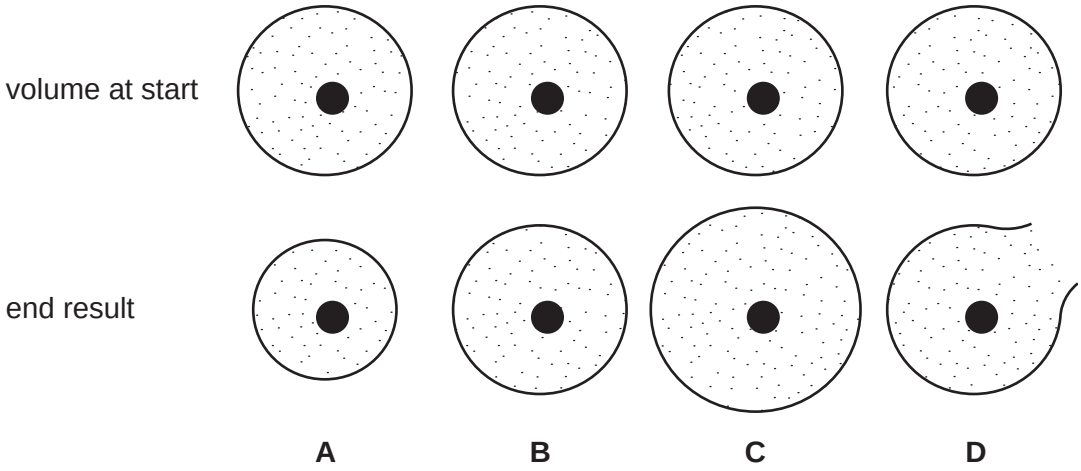
B facilitated diffusion

C osmosis

D simple diffusion

42 Identical animal cells were placed in solutions of differing water potentials. The diagram shows the volume of the cells at the start and the end result.

Which cell was placed in the solution with the lowest (most negative) water potential?



43 Which molecule prevents the cell surface membrane from becoming too fluid or too rigid?

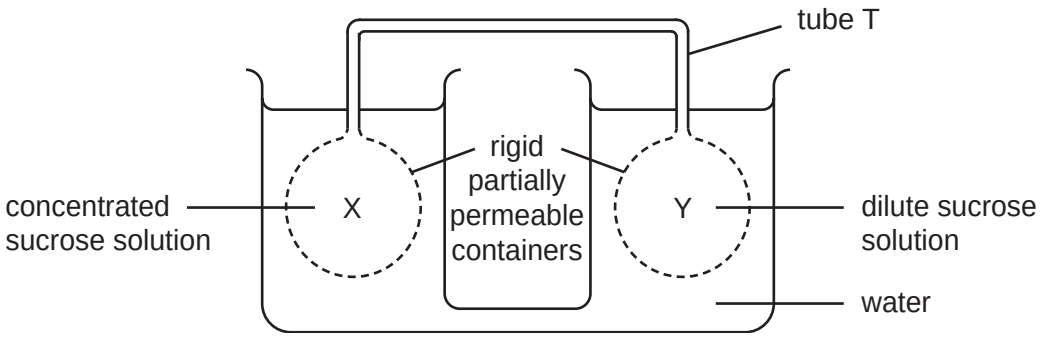
A cholesterol

B glycolipid

C glycoprotein

D phospholipid

44 The diagram shows a model which can be used to demonstrate mass flow.



X and Y are filled with sucrose solutions of different concentration, causing water to move in or out of X and Y by osmosis or as a result of hydrostatic pressure. Sucrose solution then moves through the tube T joining X and Y.

Which description of this is correct?

	water potential in X compared with Y	direction of movement of sucrose solution in tube T
A	higher (less negative)	from X to Y
B	higher (less negative)	from Y to X
C	lower (more negative)	from X to Y
D	lower (more negative)	from Y to X

45 Which process is the movement of molecules that are too large to diffuse in through a cell surface membrane?

A active transport

B endocytosis

C facilitated diffusion

D osmosis