Cell membranes and transport – AS 9700 November 2023

1. Nov/2023/Paper_ 9700/11/No.17

Three individual plant leaf cells were each placed in a different solution for 30 minutes. Each solution had a different water potential.

Which row correctly shows the **change in volume** of the three cells after 30 minutes?

	water potential of solution		
	lower than cells	equal to cells	higher than cells
A	decreased	increased	decreased
B	decreased	no change	increased
C	increased	decreased	decreased
D	increased	no change	increased

2. Nov/2023/Paper_ 9700/12/No.15

Which component of cell surface membranes helps to reduce fluidity of the phospholipids at high temperatures?

A phosphate groups

B unsaturated fatty acids

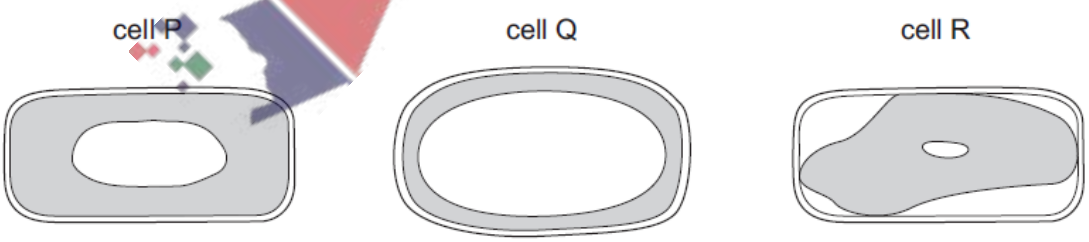
C cholesterol

D proteins

3. Nov/2023/Paper_ 9700/12/No.16

Plant cells were left for 50 minutes in three different sugar solutions, 10%, 5% and 1%. The water potential in the cytoplasm of the three cells was the same at the start of the experiment.

The diagrams show the appearance of the cells after 50 minutes, using a light microscope.



Which conclusion is correct?

A Cell P has the same concentration of sugar inside and outside the cell.

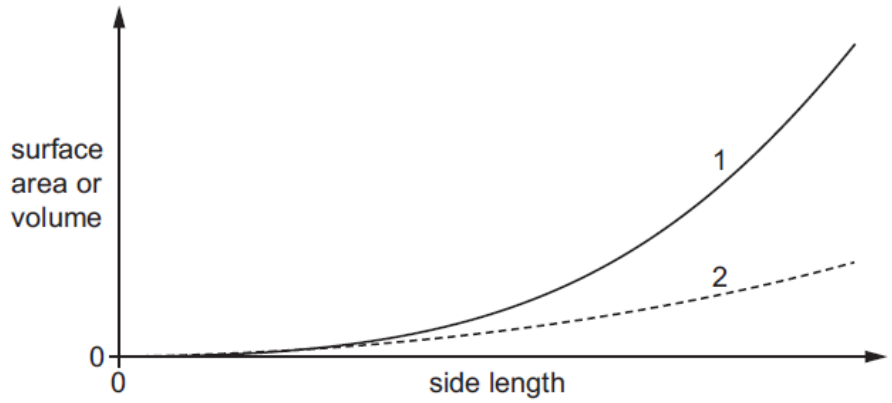
B Cell Q is flaccid and cell P is plasmolysed.

C Cell Q was placed in the 1% solution.

D The sugar solution outside cell R has a less negative water potential than inside cell R.

4. Nov/2023/Paper_ 9700/12/No.17

The graph shows the effect of increasing the side length of agar cubes on the surface area and the volume of the cubes.

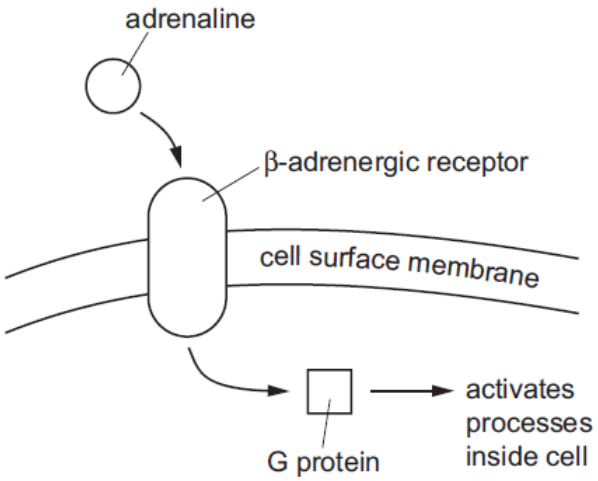


Which row correctly identifies line 1, line 2 and the effect of increasing side length on the surface area : volume ratio of the cubes?

	line 1	line 2	surface area : volume ratio
A	surface area	volume	decreases
B	surface area	volume	increases
C	volume	surface area	decreases
D	volume	surface area	increases

5. Nov/2023/Paper_ 9700/13/No.17

The diagram shows how adrenaline activates processes inside a cell.



Which row is correct?

	type of receptor molecule	result of ligand binding to the receptor
A	phospholipid	receptor leaves membrane
B	protein	receptor changes shape
C	phospholipid	receptor changes shape
D	protein	receptor leaves membrane

6. Nov/2023/Paper_ 9700/13/No.18

The statements are comparisons of endocytosis and exocytosis.

- Both are mechanisms that involve vesicles or vacuoles and the transport of materials across the cell surface membrane.
- Both mechanisms occur to allow bulk transport across the cell surface membrane.
- Endocytosis involves taking materials into the cell, whereas exocytosis involves the release of materials from the cell.
- Some of the cell surface membrane is lost when endocytosis occurs and there is an increase in the cell surface membrane when exocytosis occurs.

How many statements are correct?

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

7. Nov/2023/Paper_ 9700/13/No.19

A student was asked to calculate the surface area : volume ratio for an agar cube with a side length of 5.5 mm.

Which surface area : volume ratio is correct?

A 0.2 : 1 **B** 0.9 : 1 **C** 1.0 : 1 **D** 1.1 : 1

8. Nov/2023/Paper_ 9700/21/No.1

Scientists measured the concentration of sodium ions and potassium ions in the red blood cells and in the blood plasma of a group of people. The results are shown in Table 1.1.

Table 1.1

	mean concentration of sodium ions / mmol dm^{-3}	mean concentration of potassium ions / mmol dm^{-3}
red blood cells	10	100
blood plasma	100	4

(a) (i) Use the information in Table 1.1 to identify **and** describe the process by which potassium ions enter red blood cells from the blood plasma.

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..... [3]

(ii) Sodium ions and oxygen molecules enter red blood cells.

State **one** similarity and **one** difference between the processes used by sodium ions and oxygen molecules to enter red blood cells.

similarity .....

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difference .....

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[2]

(iii) Chloride ions move across the membrane of human red blood cells in a process called the chloride shift.

Explain why the chloride shift is important in the transport of carbon dioxide from respiring tissues.

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..... [2]

(b) Scientists studied the uptake of a substance, **F**, by human red blood cells.

The red blood cells were immersed in a solution of substance **F** for 30 minutes. After this time the scientists recorded two observations:

- the cell surface membrane of the red blood cells showed infoldings (invaginations)
- an increase in the number of vesicles in the cytoplasm.

Identify the process by which substance **F** entered the red blood cells.

..... [1]

[Total: 8]