

1.3 Cells: Membrane Structure & Transport

Question Paper

Course	DP IB Biology
Section	1. Cell Biology
Topic	1.3 Cells: Membrane Structure & Transport
Difficulty	Hard

Time allowed: 10
Score: /5
Percentage: /100

Question 1

Signalling molecules are used to transfer information around the body. Once at the target cell, there are different ways in which different types of signalling molecule cause a response.

Which of the following is able to enter a cell directly through the phospholipid bilayer to cause a response without the requirement for a membrane protein?

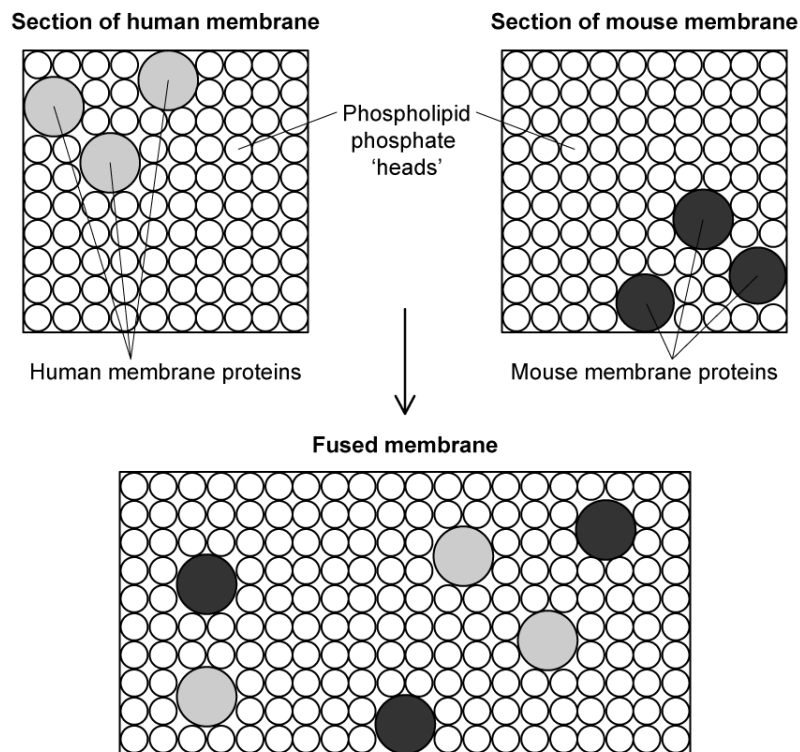
- A. lipid-based hormones
- B. protein-based hormones
- C. neurotransmitters
- D. charged molecules

[1 mark]

Question 2

Proteins in the cell surface membranes of mouse cells and human cells were labelled with coloured dyes, with a different colour for human and mouse proteins.

When a cell from each species is fused together, the different-coloured labels are first found in different regions of the hybrid cell's cell surface membrane. After 40 minutes, the labels are evenly distributed around the entire cell surface membrane. This is shown in the diagram below; the viewpoint is looking down onto the surface of the membrane.



What explains this observation?

- A. Groups of protein and phospholipid molecules in the cell surface membrane are attached to each other and move together.
- B. Only protein molecules in the outer layer of the cell surface membrane can move freely between phospholipid molecules.
- C. All protein molecules in the cell surface membrane are fixed to structures within the cell, but phospholipid molecules move freely between them.
- D. Protein molecules in the outer layer of the cell surface membrane and those which span the bilayer can move freely between phospholipid molecules.

[1 mark]

Question 3

Membranes in cells include the following components.

1. cholesterol
2. glycoproteins
3. phospholipids
4. proteins

Which row of the table shows the correct function of each component?

	Stabilising the hydrophobic layer	Recognising self / non self	Being not fully permeable to water	Transporting ions through membranes
A.	1	2	3	4
B.	3	1	2	4
C.	1	3	1	2
D.	4	3	4	2

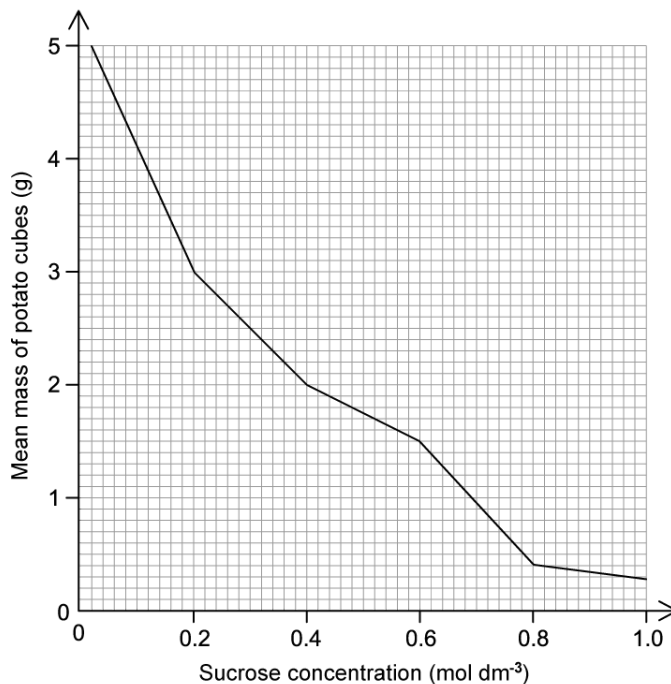
[1 mark]

Question 4

An experiment to calculate the osmolarity of potato was performed using the following protocol:

1. Dice potato into 1cm^3 cubes.
2. Add potato cubes to 6 test tubes, each containing solution with a different sucrose concentration.
3. Wait 12 hours.
4. Weigh the cubes from each test tube and plot a graph.

The mean mass of the potato cubes was 2.50g before being added to the solution and the graph shows the masses of potato cubes after the experiment.



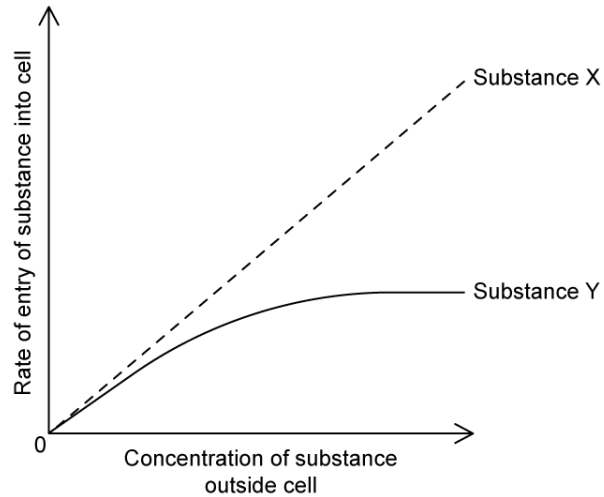
What concentration of sucrose has the same osmolarity as the potato?

- A. 0.00 mol dm^{-3}
- B. 0.12 mol dm^{-3}
- C. 0.31 mol dm^{-3}
- D. 0.66 mol dm^{-3}

[1 mark]

Question 5

The graph shows how the concentration of a substance affects its rate of absorption into a cell.



Substance **X** enters by simple diffusion, substance **Y** by facilitated diffusion.

Why does the curve for substance **Y** plateau above a certain concentration?

- A. ATP levels are used up and the cell has to prioritise.
- B. The concentration of Y being the same inside and outside of the cell
- C. Carrier proteins are saturated
- D. Above a certain concentration, the membrane is impermeable to Y

[1 mark]