

Membranes

Question Paper 1

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

Time Allowed : 72 minutes

Score : / 60

Percentage : /100

Grade Boundaries:

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

1 Fig. 5.1 shows a section of a cell surface membrane.

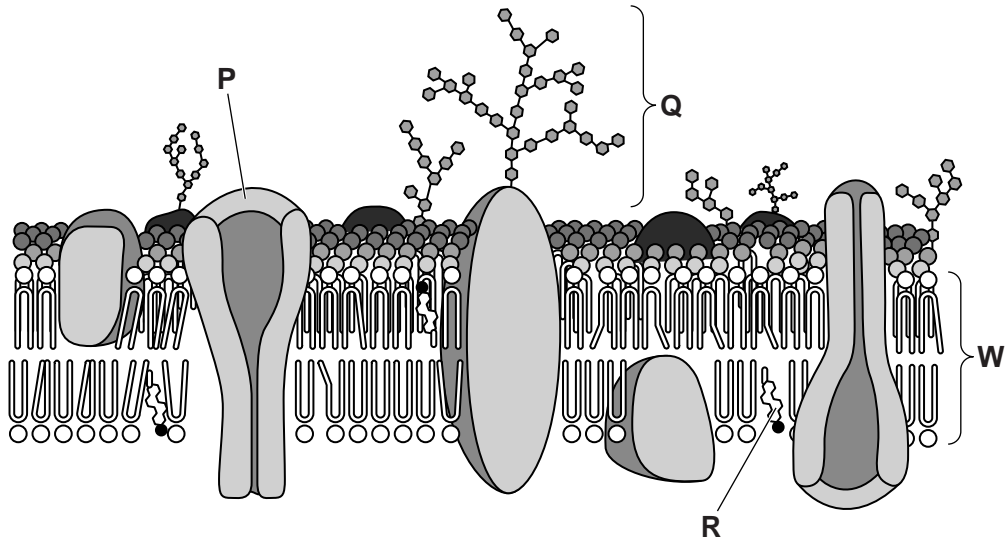


Fig. 5.1

(a) State the functions of structures P, Q and R.

P

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Q

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.....

R

..... [3]

(b) Circle the width of the membrane shown as W in Fig. 5.1.

17.0 μm 1.7 μm 0.7 μm 70.0 nm 17.0 nm 7. nm 0. nm [1]

(c) Membranes, such as the cell surface membrane, are described as having a fluid mosaic structure.

Explain what is meant by the term *fluid mosaic*.

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..... [2]

- (d)** Aquaporins are membrane channel proteins in plant and animal cells. They permit the movement of water across membranes. Explain why they are necessary.

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..... [3]

[Total: 9]

- 2 Fig. 1.1 is an electron micrograph of a transverse section of palisade mesophyll tissue in the leaf of the flowering plant, *Zinnia elegans*.



magnification $\times 7000$

Fig. 1.1

- (a) Name the features labelled A, B and C.

A

B

C

[3]

- (b) Calculate the width of the vacuole across the line X-Y.

Show your working and give your answer to the nearest micrometre (μm).

- (c) The membrane surrounding the vacuole, called the tonoplast, has a fluid mosaic structure.

Describe the structure of this membrane.

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..... [4]

- (d) Palisade mesophyll cells have very large vacuoles.

Explain how water moves from the xylem in the leaf into these vacuoles.

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..... [3]

[Total: 12]

3 The fluid mosaic model of membrane structure was first proposed in 1972 by Singer and Nicolson. The model describes in detail how the components of a membrane are organised.

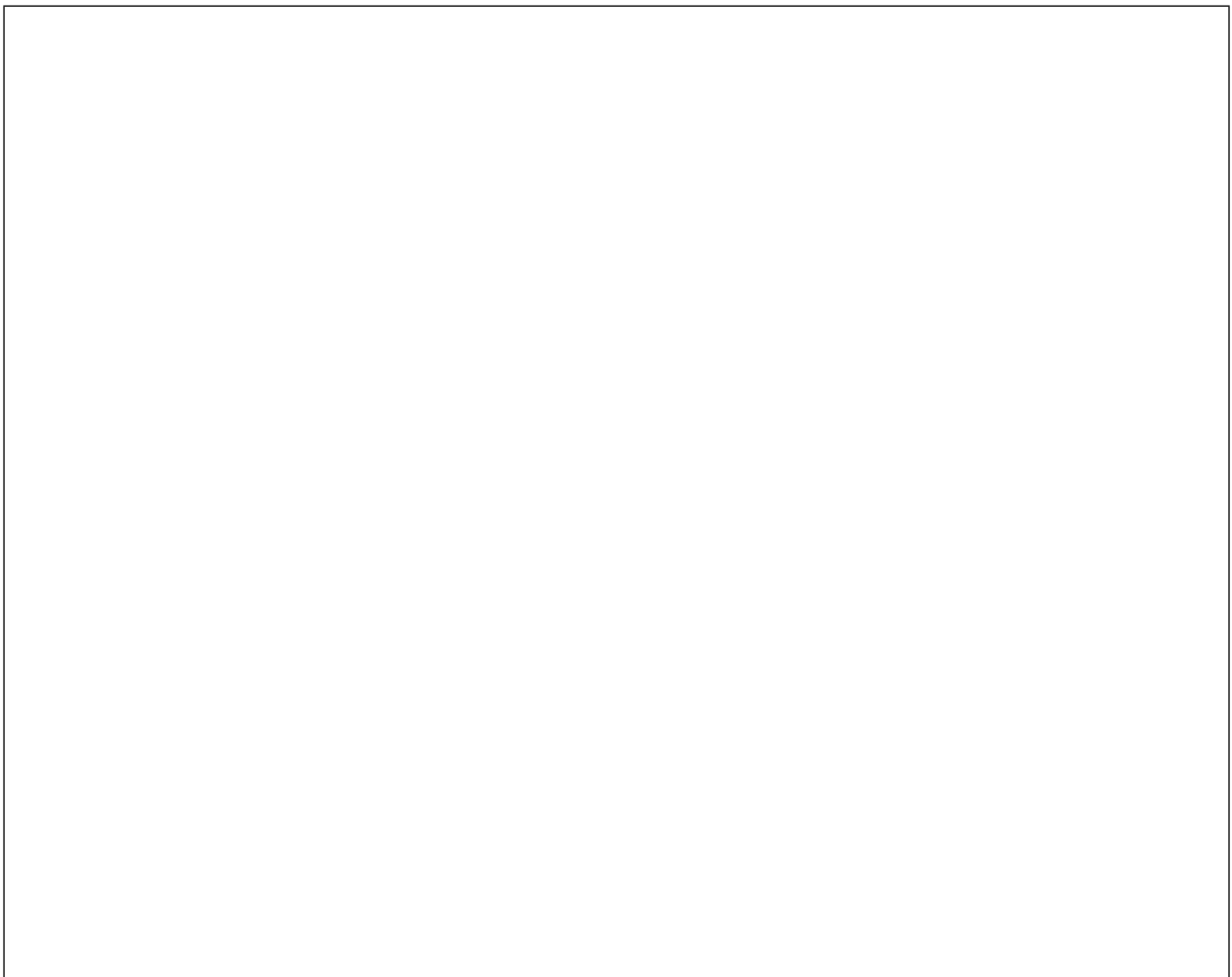
(a) Some of the components of the cell surface membrane are:

- phospholipid molecules
- protein molecules
- cholesterol molecules.

(i) In the box below, draw a labelled diagram of a section through a cell surface membrane to show how the above components are organised within the membrane.

The diagram should include other named components of the membrane.

Label the inner and outer surfaces of the membrane.



- (ii) Suggest why 'fluid mosaic' is an appropriate term to use to describe membrane structure.

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..... [3]

[Total: 8]

4 Fig. 1.1 is a diagram of a cell surface membrane.

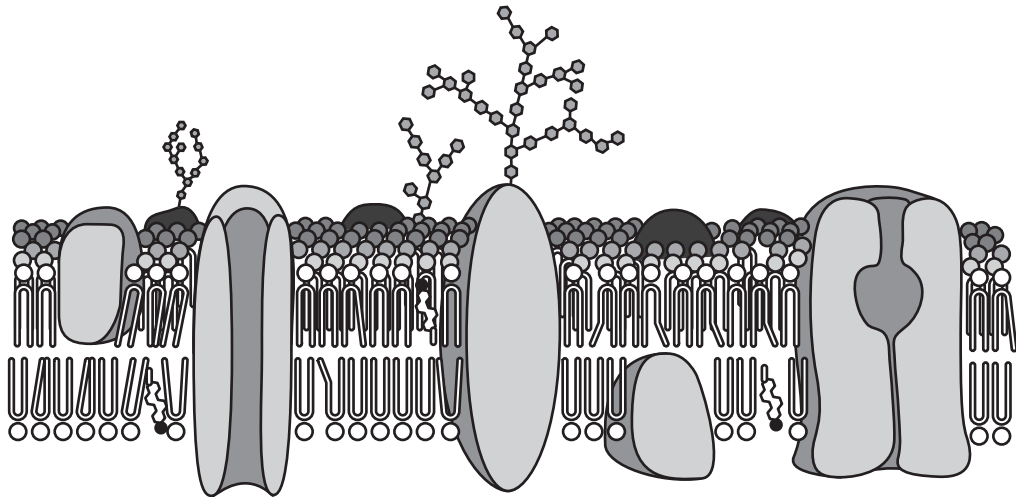


Fig. 1.1

(a) Use a label line and the appropriate letter to label each of the following on Fig. 1.1.

- P protein for active uptake of potassium ions
- Q protein for facilitated diffusion of polar molecules
- R receptor site for a hormone
- S hydrophilic heads of phospholipids on the internal surface of the membrane
- T molecule that modifies the fluidity of the membrane

[5]

(b) Some cells take in bacteria by endocytosis.

Explain how endocytosis occurs at a cell surface membrane.

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..... [3]

[Total: 8]

5 Cholera bacteria release the enzyme neuraminidase which alters some of the surface proteins on the membranes of epithelial cells in the small intestine.

These surface molecules become receptors for the toxin, cholera toxin, released by cholera bacteria. The toxin stimulates the cells to secrete large quantities of chloride ions into the lumen of the small intestine. Sodium ions and water follow the loss of chloride ions.

(a) (i) Name the pathogen that causes cholera.

..... [1]

(ii) Suggest how chloride ions are moved from the epithelial cells into the lumen of the small intestine.

..... [1]

(iii) Explain how cholera bacteria are transmitted from one person to another.

..... [3]

A potential vaccine for cholera toxin was trialled on volunteers. Fig. 4.1 shows the concentration of antibodies against cholera toxin in the blood of a volunteer who received a first injection at week 0, followed by a booster injection at week 15.

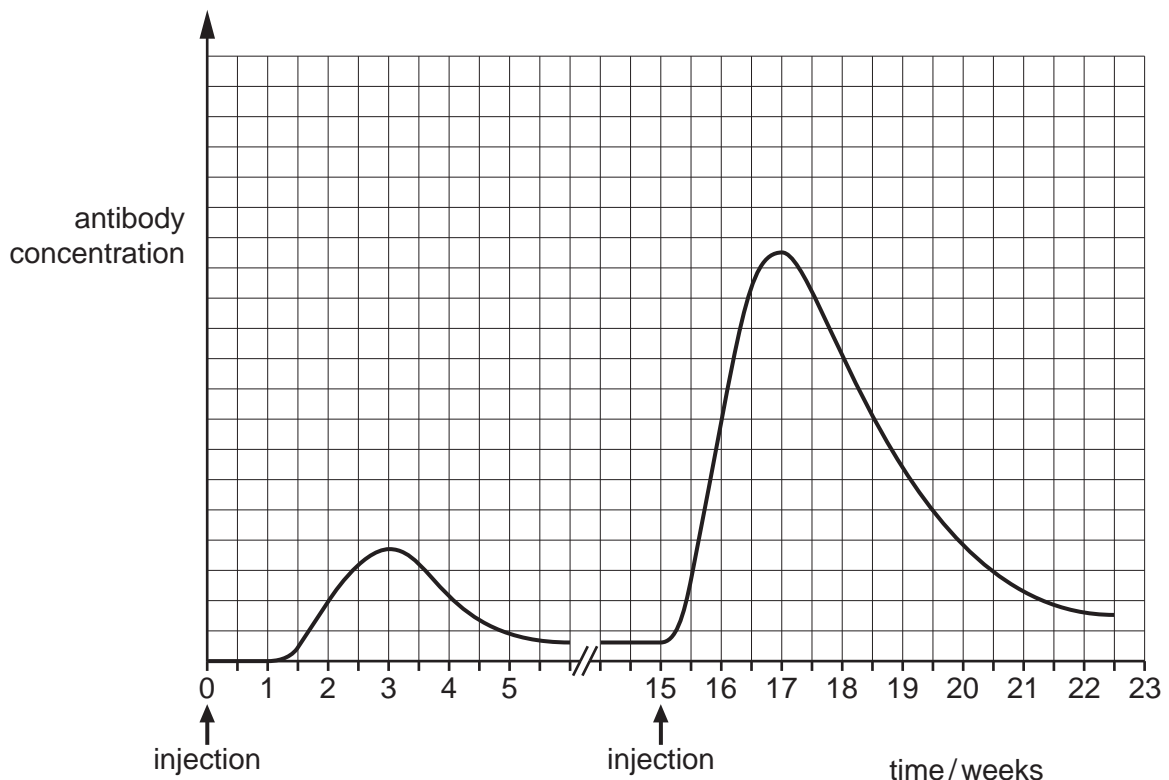


Fig. 4.1

6 Fig. 1.1 shows a diagram of part of a cell surface membrane.

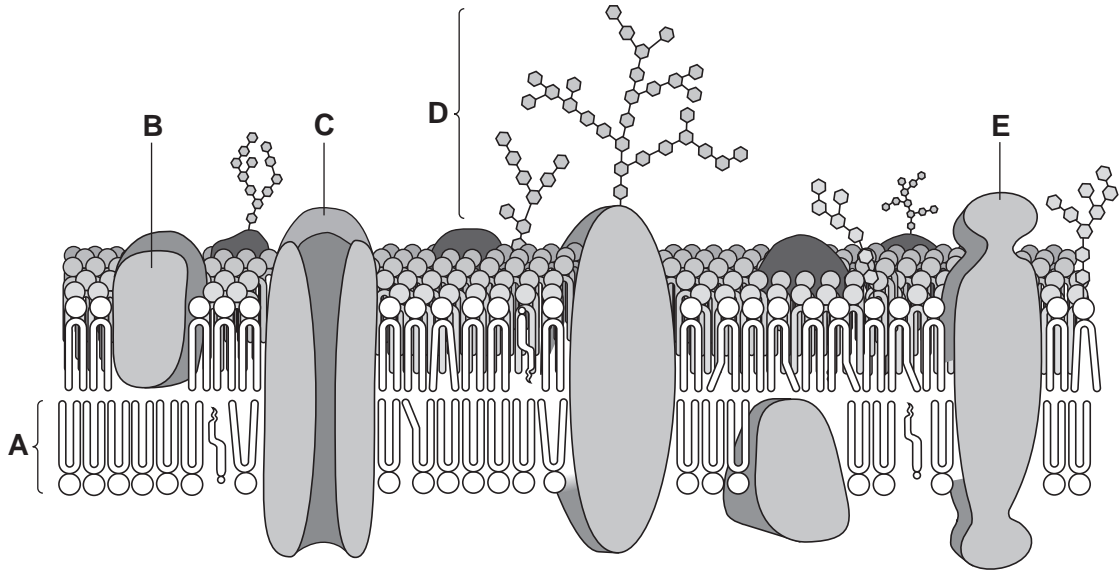


Fig. 1.1

(a) (i) Name molecules A and B.

A

B.....[2]

(ii) Explain how the features of molecules of A cause them to form a layer in the membrane as seen in Fig. 1.1.

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.....[3]

(b) State the functions of **C** and **D**.

C

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D

..... [2]

(c) Structure **E** is a protein composed of 588 amino acids.

Calculate the minimum number of nucleotide base pairs required in the gene coding for this protein. Show your working.

Answer = [2]

[Total: 9]