Movement of substances

Question Paper 2

Level	International A Level
Subject	Biology
Exam Board	CIE
Topic	Cell Membranes and Transport
Sub Topic	Movement of substances
Booklet	Theory
Paper Type	Question Paper 2

Time Allowed : **74 minutes**

Score : **/ 61**

Percentage : **/100**

Grade Boundaries:

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

1 Protein production involves a complex sequence of events and a number of cell structures.

(a) The first column in Table 1.1 shows some of the events that occur in the production of a protein in a cell and its eventual release from the cell.

Table 1.1

event	sequence of events (numbers)	cell location (letters)
exocytosis		
protein modification		
secretory vesicle formation		
transcription		
translation		

(i) In Table 1.1, write the sequence in which the events occur, using **1** as the **first** process in the sequence. [2]

(ii) From the list **A** to **F** below, choose **one** cell location for each event and write the letter in Table 1.1. Each letter may be used once, more than once, or not at all.

A Golgi apparatus
B lysosome
C nucleus
D rough endoplasmic reticulum
E smooth endoplasmic reticulum
F plasma (cell surface) membrane [3]

(b) Describe the process of *exocytosis*.

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..... [3]

(c) One example of protein modification is the removal of the first amino acid, methionine, from a newly formed polypeptide chain to make a functioning protein.

(i) The DNA nucleotide sequence that specifies the amino acid methionine is TAC.

State the mRNA nucleotide sequence that is complementary to the DNA sequence for methionine.

..... [1]

(ii) Suggest **two** other ways in which the polypeptide chain is modified to produce the functioning protein.

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..... [2]

[Total: 11]

2 Fig. 7.1 shows a section through part of the cortex of a kidney.

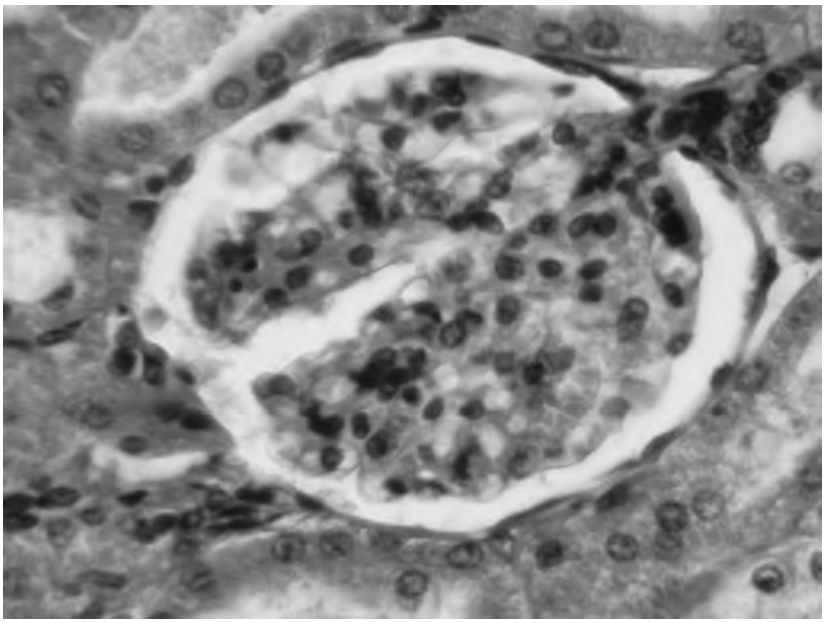

Fig. 7.1

(a) On Fig. 7.1, draw label lines and use the letters **G** and **R** to identify :

- a glome ulus with the letter **G**.
- a renal capsule with the letter **R**. [2]

(b) State the name of the hormone that is involved in the control of the water potential of the blood.

.....[1]

(c) Table 7.1 shows the concentration of some compounds in the fluids of a glomerulus, a renal capsule and a collecting duct of the kidney.

Table 7.1

compound	concentration / g 100 cm^{-3}		
	blood plasma entering glomerulus	filtrate in renal capsule	urine in collecting duct
water	90	90	96
proteins	8.0	0.0	0.0
glucose	0.1	0.1	0.0
urea	0.03	0.03	2.0

With reference to Table 7.1,

(i) explain why proteins occur in the blood entering the glomerulus but not in the filtrate in the renal capsule

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..... [2]

(ii) explain why there is glucose present in the filtrate but not in the urine

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..... [2]

(iii) explain the difference in the concentration of urea between the filtrate and urine.

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..... [2]

[Total: 9]

3 In mammalian kidneys, the loop of Henle is closely associated with the process of osmoregulation.

(a) Explain what is meant by osmoregulation.

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..... [2]

Fig. 3.1 shows the water potential of renal fluid as it passes through the loop of Henle.

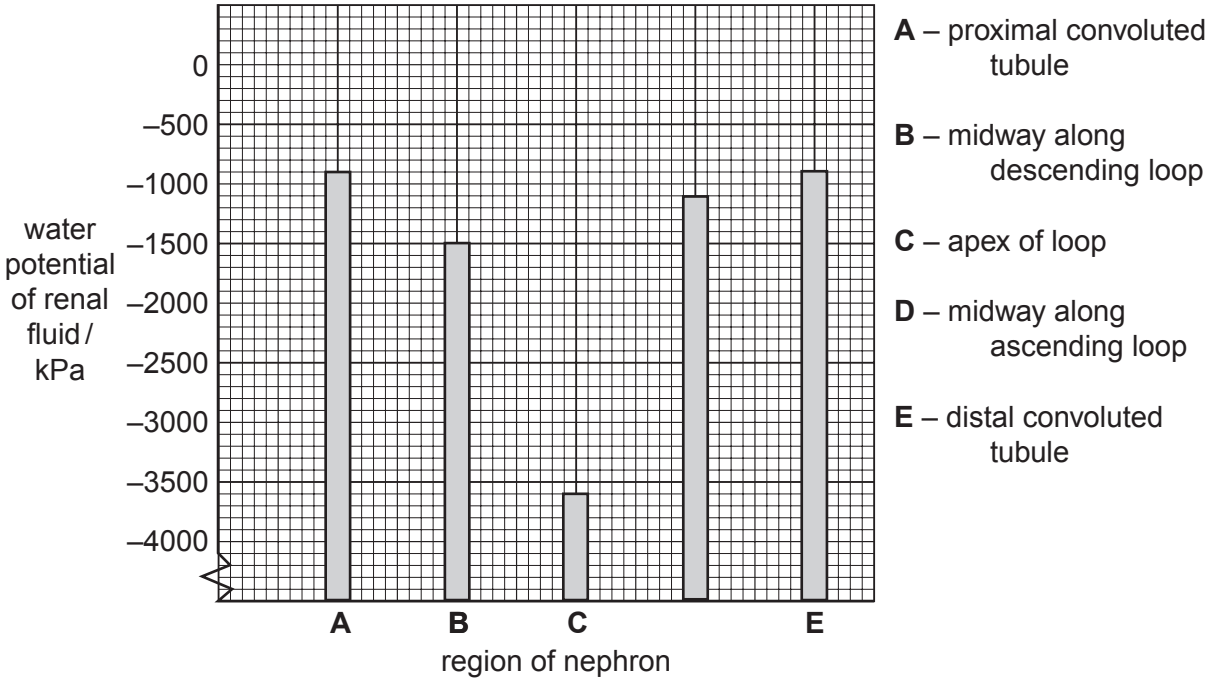

Fig. 3.1

(b) Using the information given in Fig. 3.1, describe and explain what happens to the renal fluid as it passes through the loop of Henle.

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..... [5]

(c) Control systems often work by using negative feedback. These systems require a receptor and an effector. In the process of osmoregulation name the receptor and effector involved.

Receptor .....

Effector ..... [2]

[Total: 9]

4 Fig. 5.1 shows a diagram of the molecular structures of tristearin (a triglyceride) and phosphatidylcholine (a phospholipid).

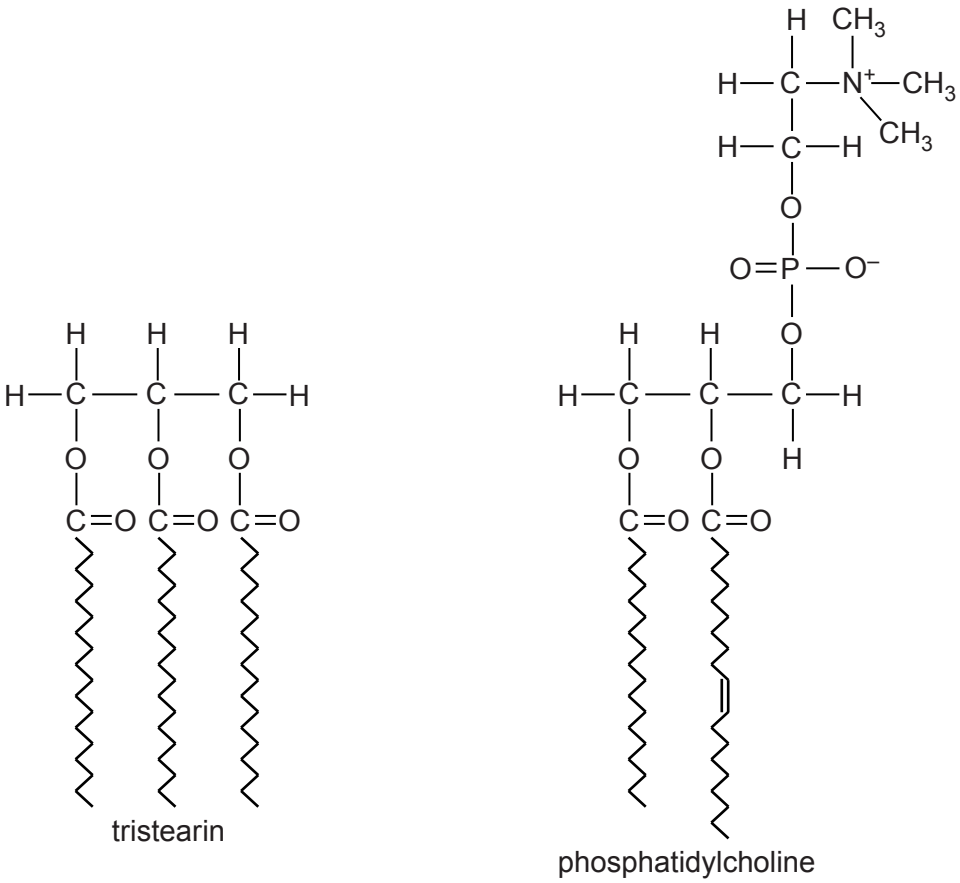

Fig. 5.1

(a) Table 5.1 shows a structural difference between the two molecules shown in Fig. 5.1.

Complete Table 5.1 with two further structural differences **other than** in numbers of different types of atoms.

Table 5.1

structural feature	tristearin	phosphatidylcholine
length of fatty acid chains	all the same length	different lengths

[2]

(b) Cells in the pancreas secrete enzymes, such as amylase and trypsin, into a duct.

The enzymes are packaged in vesicles so that they can be exported from these cells as shown in Fig. 5.2.

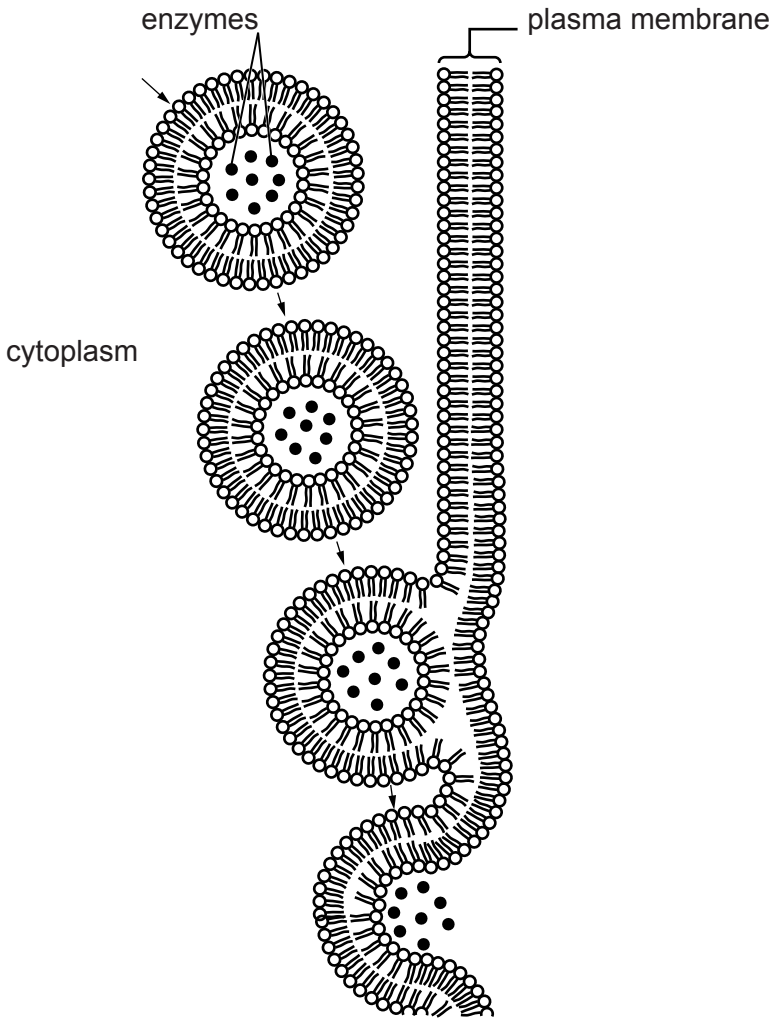

Fig. 5.2

With reference to Fig. 5.2, explain how enzymes that are secreted by cells in the pancreas are packaged into vesicles and exported.

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.....[4]

(c) Water has many significant roles to play in cells and living organisms.

Complete Table 5.2 below by stating the property of water that allows each of the following to take place.

Table 5.2

role of water	property of water
solvent for glucose and ions	
movement in xylem	
helps to decrease body temperature in mammals	

[3]

[Total: 9]

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

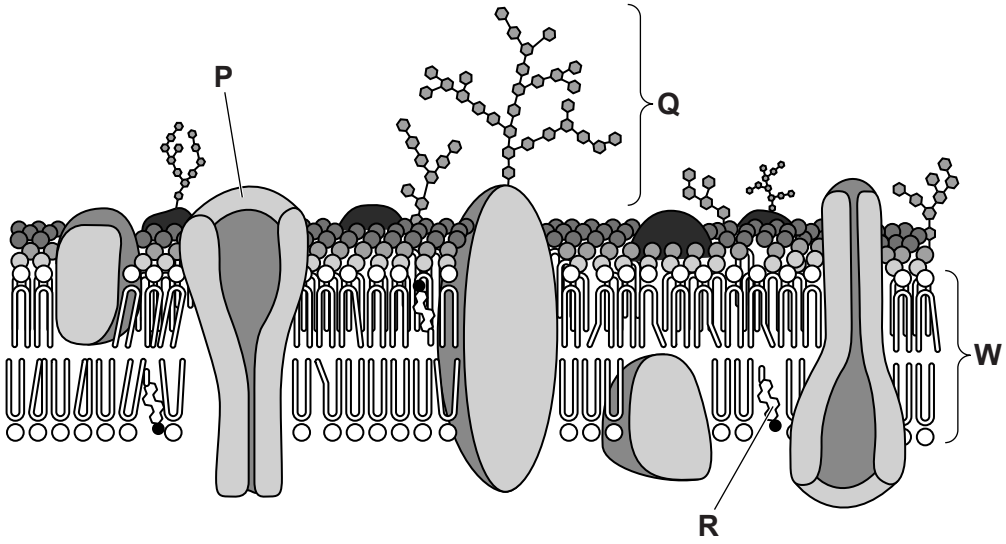

Fig. 5.1

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

P .....

.....

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]

6 Fig. 2.1 shows a drawing made from an electron micrograph of two adjacent cells in a leaf.

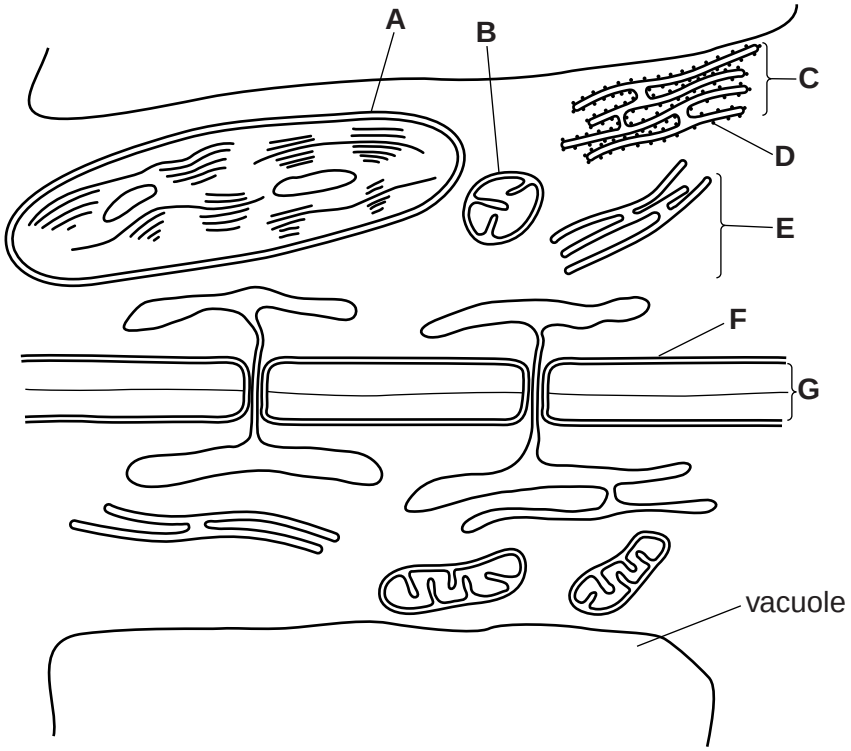

Fig. 2.1

(a) Structures **A** and **B** are both visible using the light microscope, but the internal detail of these organelles shown in Fig. 2.1 is only visible using the electron microscope.

Explain why the internal details of structures **A** and **B** are only visible when using the electron microscope and not when using the light microscope.

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..... [3]

(b) Name in full the structures labelled **C**, **D** and **E**.

C .....

D .....

E ..... [3]

(c) State **one** role of vacuoles in plant cells.

..... [1]

(d) Structures **F** and **G** have very different permeability properties.

Explain how the composition of structures **F** and **G** determines the permeability properties of these structures.

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..... [4]

(e) Fig. 2.1 shows two plasmodesmata connecting the adjacent cells.

Describe the roles of plasmodesmata in transport in plants.

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..... [3]

[Total: 14]