

Membranes

Question Paper 3

Level	International A Level
Subject	Biology
Exam Board	CIE
Topic	Cell Membranes and Transport
Sub Topic	Membranes
Booklet	Theory
Paper Type	Question Paper 3

Time Allowed : 87 minutes

Score : / 72

Percentage : /100

Grade Boundaries:

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

- 1 (a) Fig. 5.1 represents a molecule of a triglyceride.

Name the components **A** and **C** and name the bond **B**.

Write your answers on the dotted lines provided in Fig. 5.1.

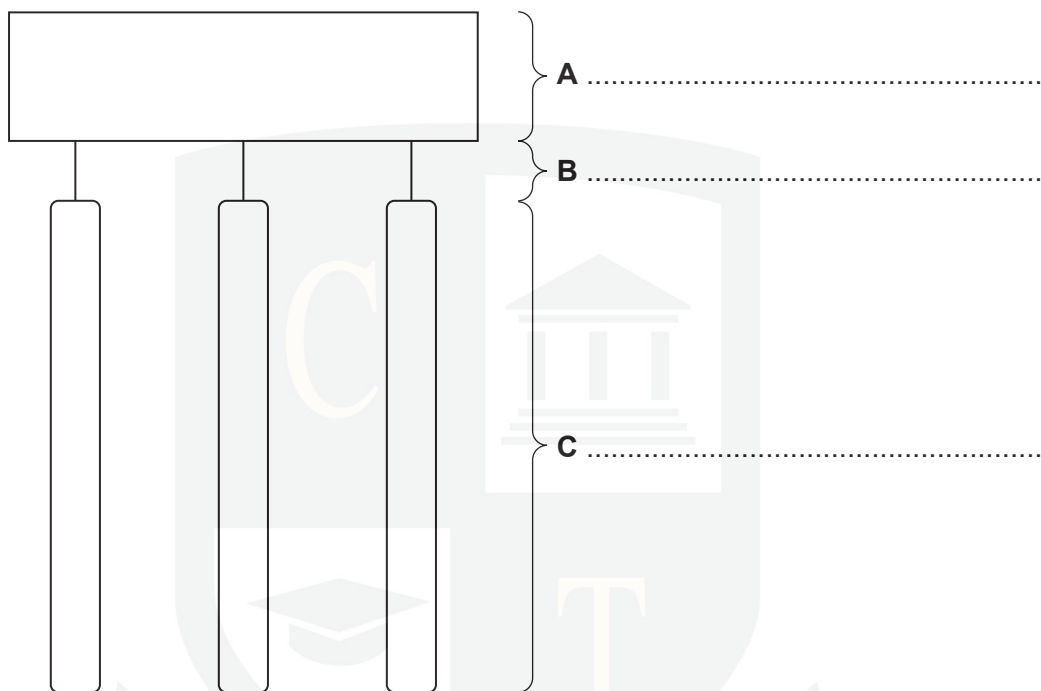


Fig. 5.1

[3]

- (b) A phospholipid is sometimes described as a modified triglyceride.

- (i) State how the structure of a phospholipid differs from a triglyceride.

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[2]

- (ii) Explain how a phospholipid is suited to its role in cell membranes.

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[3]

A student carried out an investigation into the digestion of triglycerides using lipase.

Ten cm³ of olive oil, adjusted to pH 8.0, was added to a test-tube, which was then put in a water bath at 37 °C for ten minutes.

One cm³ of lipase solution was incubated at the same temperature in a separate test-tube before being added to the olive oil.

The initial pH of the reaction mixture was measured using a pH meter. The pH was recorded at five minute intervals for 60 minutes.

(c) Suggest why the olive oil was adjusted to pH 8.0 before the lipase was added.

.....[1]

(d) Fig. 5.2 shows the results of the investigation.

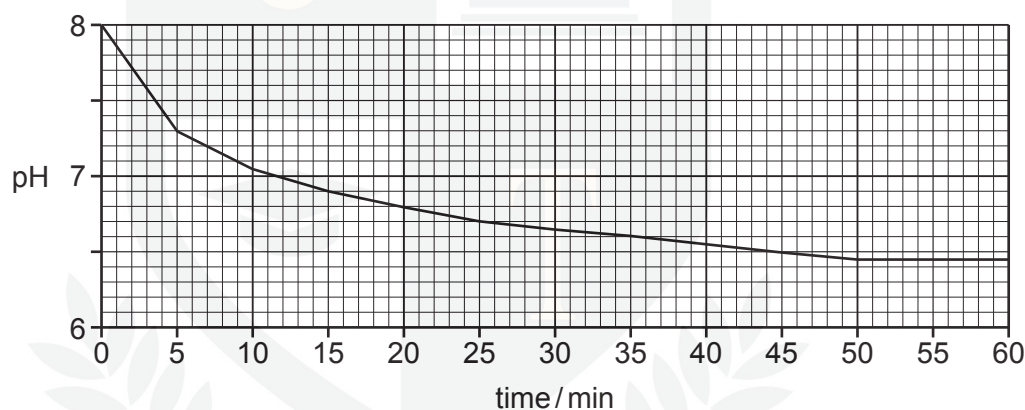


Fig. 5.2

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With reference to Fig. 5.2,

(i) describe the results of the investigation

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(ii) explain the results of the investigation.

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[Total: 15]

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2 Fig. 6.1 shows a diagram of a plasma (cell surface) membrane.

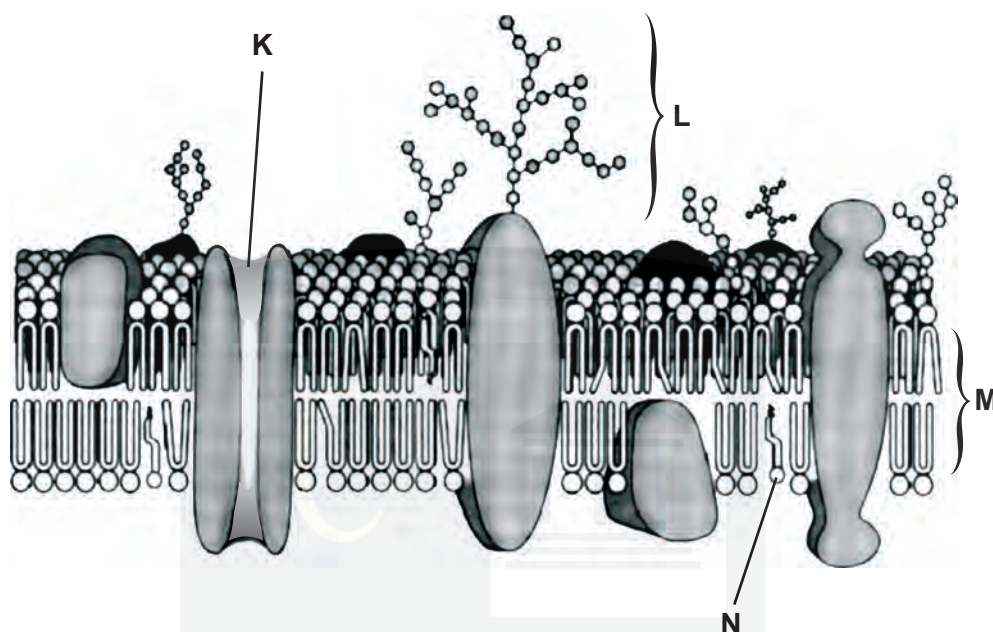



Fig. 6.1

(a) Indicate, by putting a circle, , around **one** of the following, the width of the membrane shown in Fig. 6.1.

0.7 nm 7.0 nm 70 nm $\times 10^{-5} \text{ m}$ 700 μm 7. μm [1]

(b) Outline the functions of the following components of the plasma membrane.

K

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L

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M

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N

.....[4]

- (c) Some substances may cross plasma membranes by simple diffusion. Glucose, however, does not.

Explain why glucose cannot pass across membranes by simple diffusion.

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.....[2]

- (d) In an investigation, animal cells were exposed to different concentrations of glucose. The rate of uptake of glucose into the cells across the plasma membrane was determined for each concentration. Fig. 6.2 shows the results.

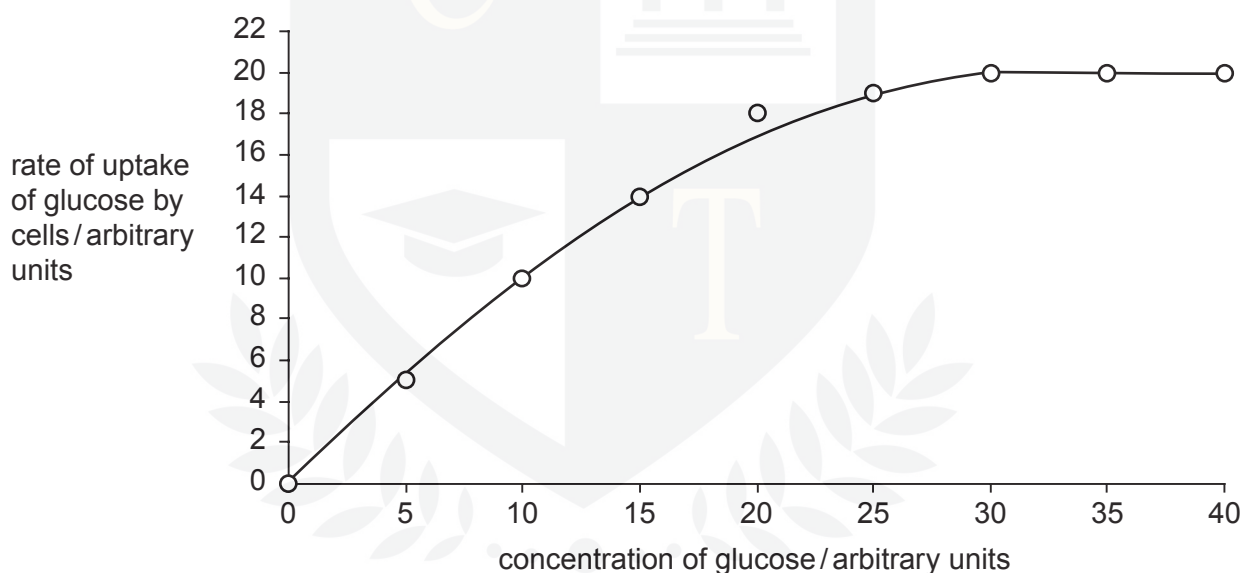


Fig. 6.2

Using the information in Fig. 6.2, explain how the results of the investigation support the idea that glucose enters cells by facilitated diffusion.

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.....[2]

(e) State how active transport differs from facilitated diffusion.

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[Total: 10]



- 3 Cholesterol is synthesised in the smooth endoplasmic reticulum (SER) in liver cells by a series of enzyme-catalysed reactions.

Within the SER, molecules of cholesterol and triglycerides are surrounded by proteins and phospholipids to form lipoproteins. These lipoprotein particles enter the Golgi apparatus where they are packaged into vesicles and pass to the blood.

Fig. 4.1 is an electron micrograph of part of a liver cell showing lipoprotein particles within the Golgi apparatus.

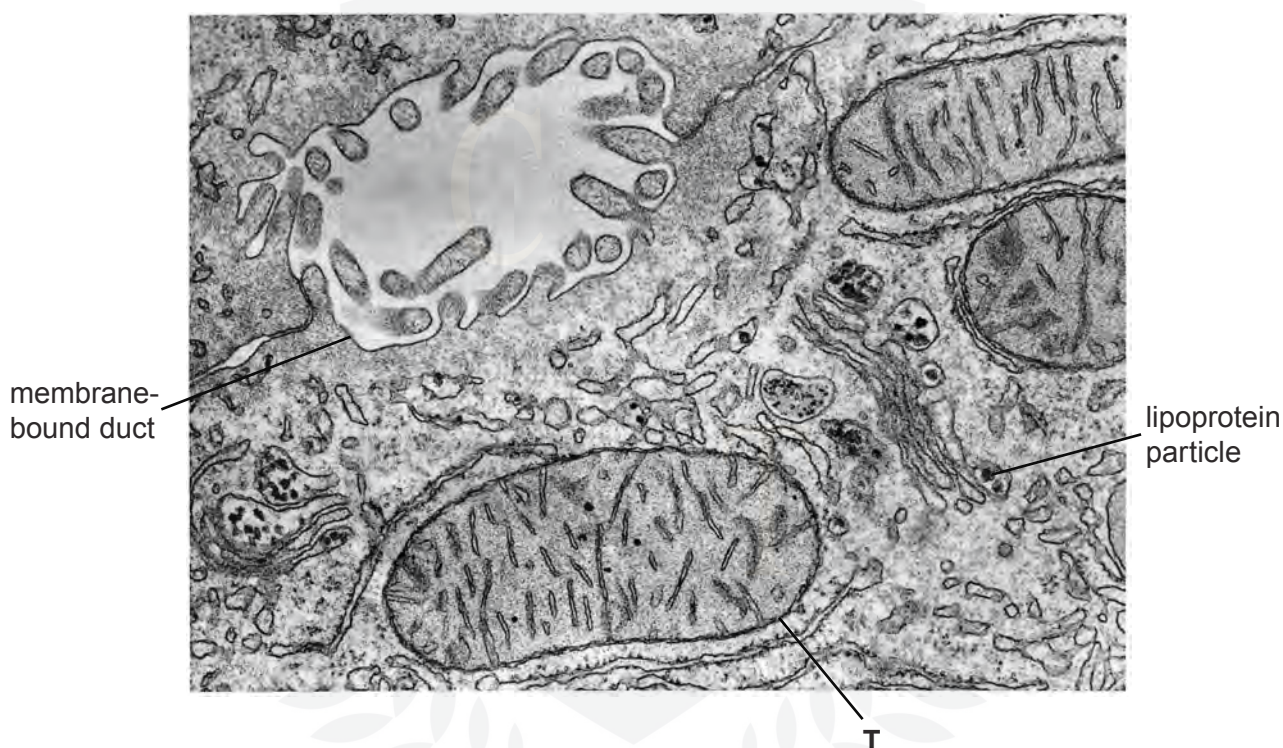


Fig. 4.1

- (a) Name structure **T** in Fig. 4.1 and state its role in liver cells.

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.....[3]

- (b) (i) Suggest why cholesterol is packaged into lipoproteins before release from liver cells into the blood.

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- (ii) Explain why cells of the body need to be supplied with cholesterol.

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.....[2]

- (c) Cholesterol is also packaged into vesicles by the SER and then secreted from the cell into small fluid-filled spaces between the liver cells. These spaces form ducts that drain into the gall bladder to form bile.

Suggest how cholesterol is secreted into ducts, such as the duct in Fig. 4.1.

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.....[2]

- (d) State **one** function of the Golgi apparatus **other than** the packaging of substances into vesicles for transport.

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.....[1]

[Total: 9]

- 4 (a)** Describe the main features of an organism belonging to the plant kingdom. [7]
- (b)** Describe the structure of a mitochondrion and outline its function in a plant cell. [8]

[Total: 15]



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- 5 Thale cress, *Arabidopsis thaliana*, is used to study the roles of genes and proteins in plants.

The cell membranes of the root hairs of *A. thaliana* contain proteins called aquaporins that allow the movement of water between the soil and the cytoplasm as shown in Fig. 2.1.

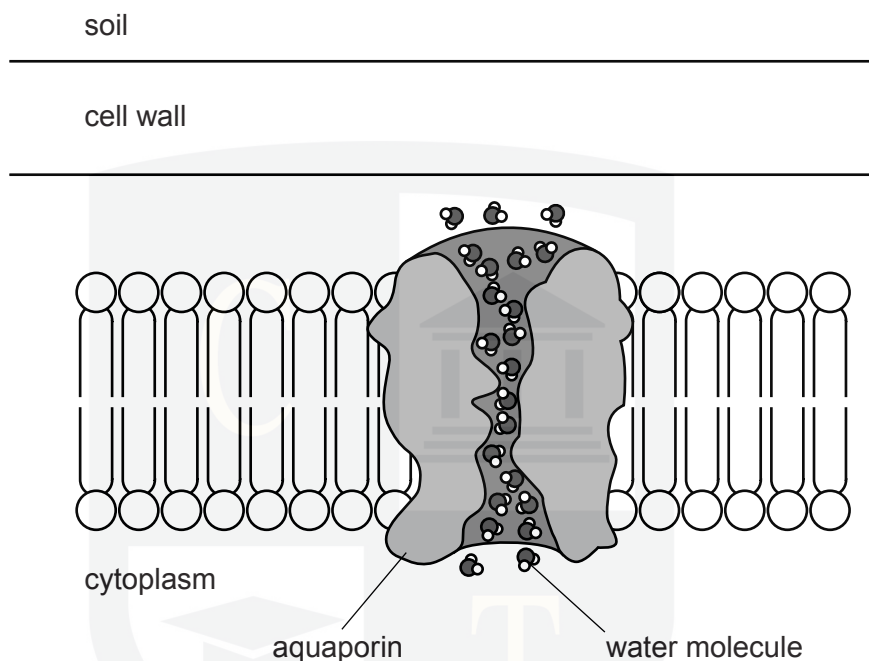


Fig. 2.1

(a) With reference to Fig. 2.1:

- (i) explain how water is absorbed by root hairs of *A. thaliana*

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..... [3]

- (ii) state why aquaporins are necessary in cell surface membranes.

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..... [1]

- [3]

[3]



An investigation was carried out to find the effect of an enzyme in *A. thaliana* on the composition of the cuticle. The enzyme is involved in the production of lipid that accumulates in the cuticle.

Plants were discovered with a mutation of the gene that codes for the enzyme.

Some of these mutant plants (Group **A**) were grown in pots and their rate of transpiration was determined over three days. They were compared with control plants (Group **B**) in which the gene was switched on and the enzyme present. The results are shown in Fig. 2.2.

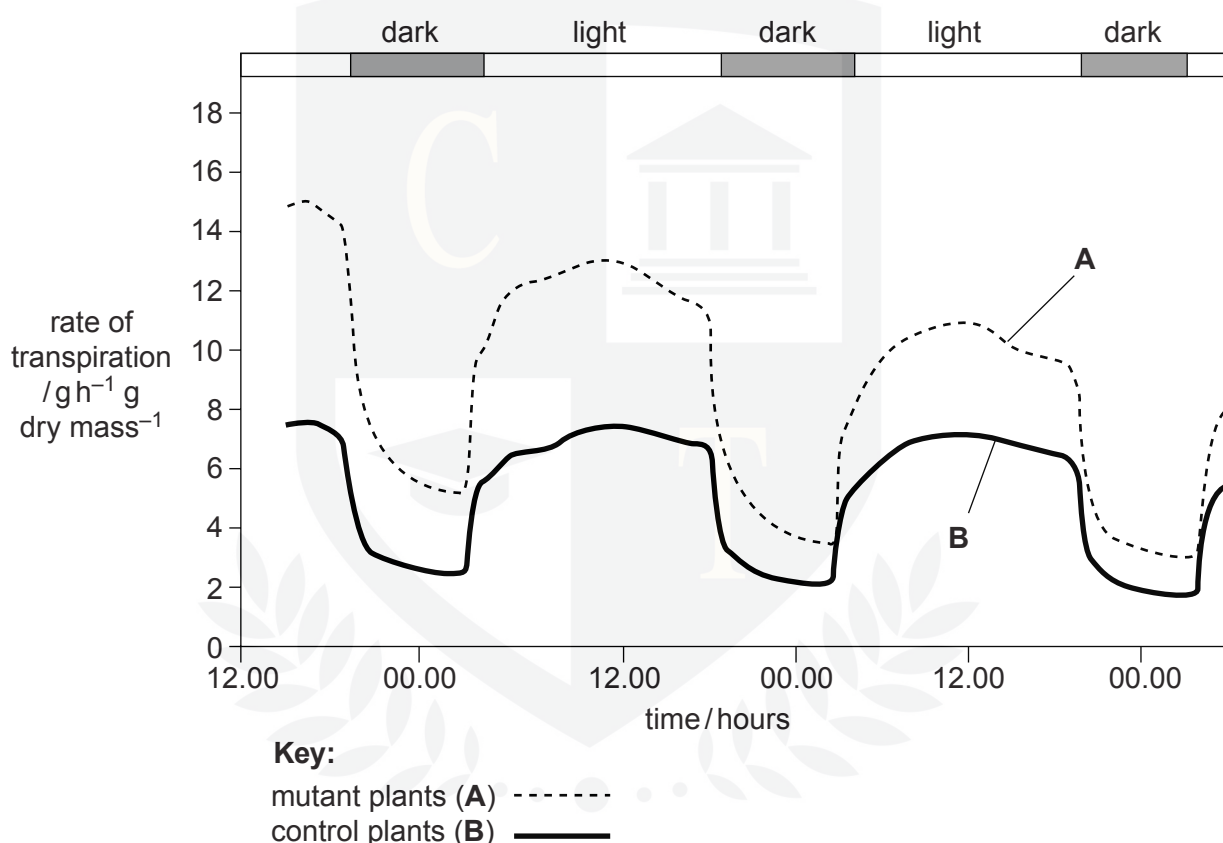


Fig. 2.2

(c) With reference to Fig. 2.2, explain:

- (i) why the rate of transpiration is higher during the day than at night in both groups of plants

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[3]

[3]

[Total: 11]

- 6 During an immune response, plasma cells secrete antibody molecules. Fig.1.1 is a diagram of an antibody molecule. The diagram is **not** complete.




Fig. 1.1

- (a) (i) Draw a circle around a variable region. [1]
(ii) Draw in and label the position of the disulfide bonds in the molecule. [1]
(iii) Explain the importance of disulfide bonds in protein molecules, such as antibodies.

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.....[3]



Describe three roles of the proteins in cell surface membranes.

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.....[3]

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