

Movement of substances

Question Paper 1

| | |
|-------------------|------------------------------|
| 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 1 |

Time Allowed : 70 minutes

Score : / 58

Percentage : /100

Grade Boundaries:

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

- 1 Many microorganisms can digest cellulose by using a group of enzymes collectively known as cellulases. Cellobiose is the disaccharide produced during cellulose digestion.

The cellulase known as β -glucosidase completes the digestion of cellulose by hydrolysing the cellobiose molecule to produce two β -glucose molecules.

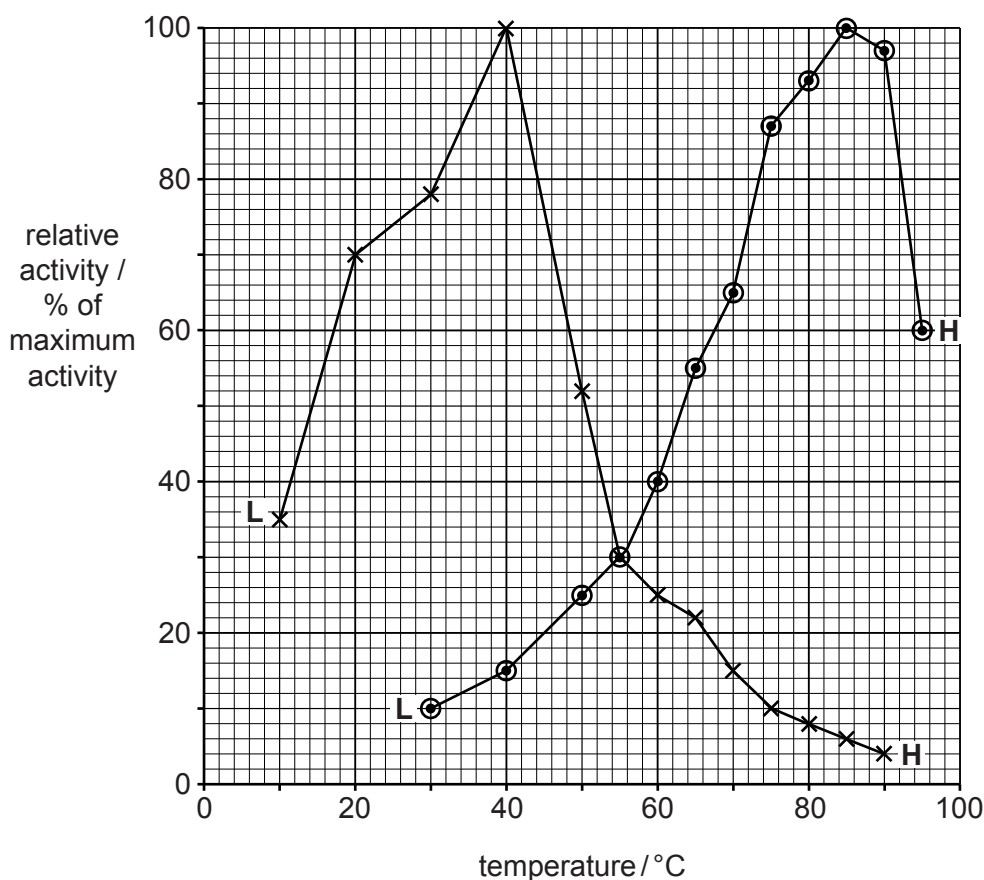
- (a) Draw the ring structure of one β -glucose molecule in the space provided.

[2]

- (b) β -glucosidase was extracted from two different bacteria, *Agrobacterium tumefaciens* and *Thermotoga maritima*.

Fig. 4.1 shows the results of an investigation into the effect of temperature between 0 °C and 100 °C, on the activity of each enzyme.

- **L** represents the lowest temperature at which activity of each enzyme was detected.
- **H** represents the highest temperature at which activity of each enzyme was detected.



Key

x enzyme **A** (extracted from *A. tumefaciens*)

o enzyme **T** (extracted from *T. maritima*)

Fig. 4.1

2 The cell surface membrane has a fluid mosaic structure.

(a) Describe what is meant by the term *fluid mosaic*.

.....

.....

.....

.....[2]

(b) In 1934, the biologists Davson and Danielli published their suggestion for the structure of the cell surface membrane, as shown in Fig. 1.1.

They suggested that the membrane was a phospholipid bilayer with a layer of hydrophilic protein on both surfaces.

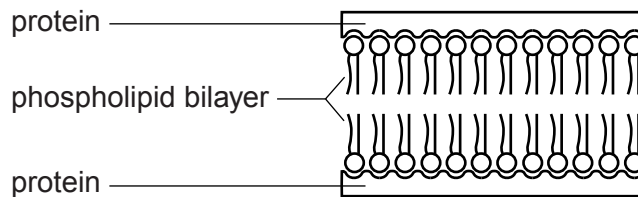


Fig 1.1

State **one** way in which the Davson-Danielli structure is similar to the fluid mosaic structure **and one** way in which it differs from the fluid mosaic model.

similarity

.....

.....[1]

difference

.....

.....[1]

3 One role of the cell surface membrane is to control the entry and exit of substances.

(a) Complete Table 1.1 to show the transport mechanisms across cell surface membranes and examples of materials transported.

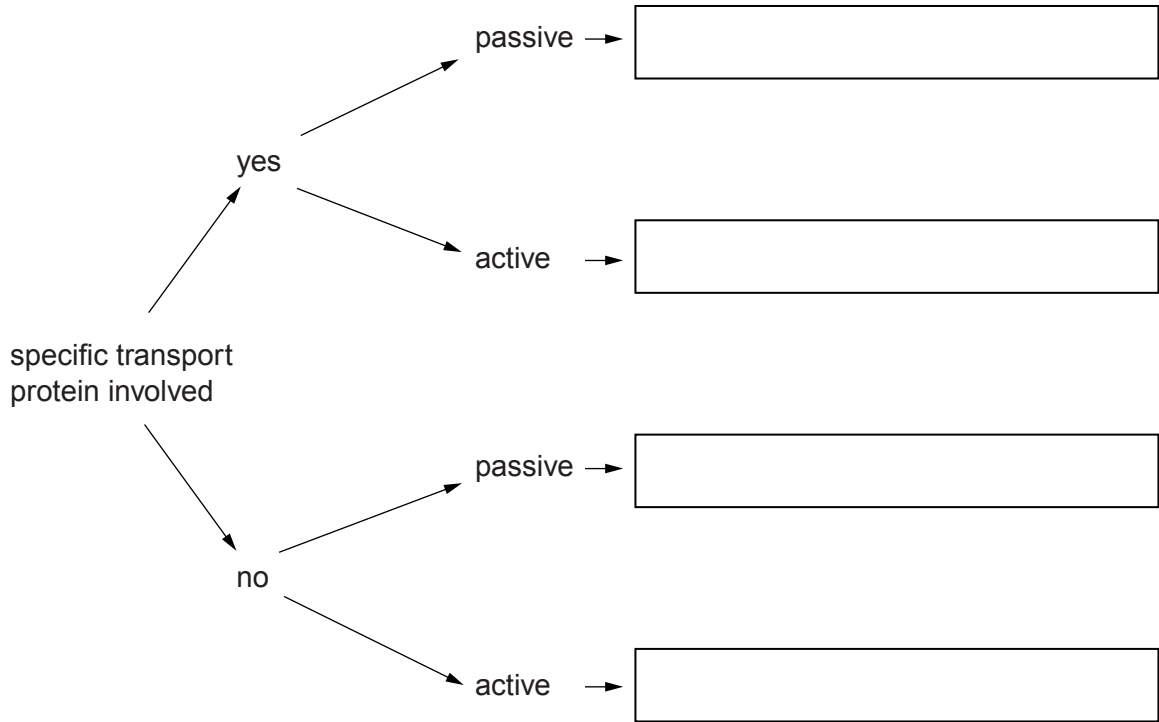
Table 1.1

| transport mechanism across cell surface membrane | example of material transported across membrane |
|---|--|
| active transport | sodium ions |
| | oxygen molecules |
| | bacteria |
| exocytosis | mucin (for mucus) |
| facilitated diffusion | |
| osmosis | |

[2]

(b) Each transport mechanism across cell surface membranes has a characteristic set of features.

In **each** of the boxes below, state **one** example of a transport mechanism that matches the pathway shown.



[4]

[Total: 6]

(b) State and explain three ways in which the **structure** of xylem vessels is adapted to transport water.

1.

explanation

.....

2.

explanation

.....

3.

explanation

..... [6]

[Total: 10]

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

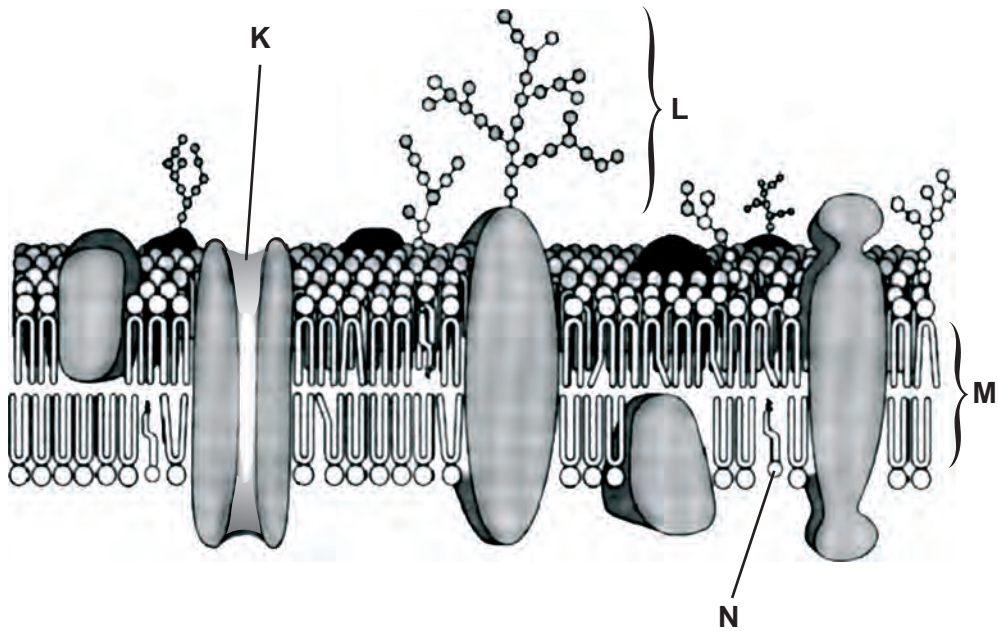


Fig. 6.1

(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

.....

L

.....

M

.....

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.

.....
.....
.....
..... [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.

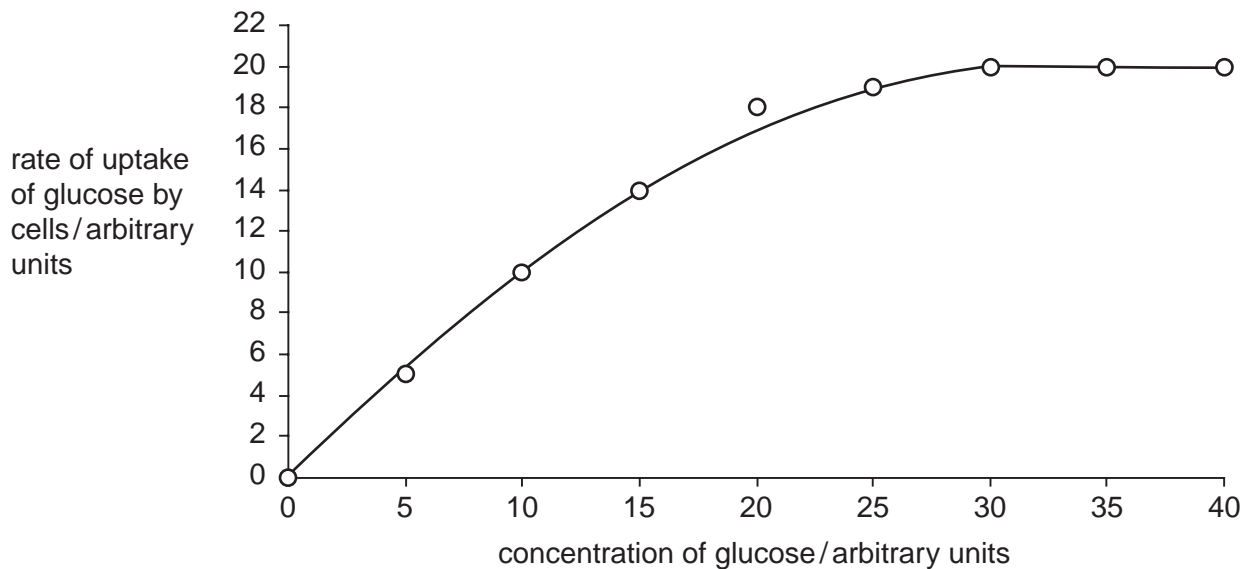


Fig. 6.2

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

.....
.....
.....
.....
.....
..... [2]

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

.....
.....
.....[1]

[Total: 10]

6 Fig. 2.1 is a drawing of a transverse section of a leaf.

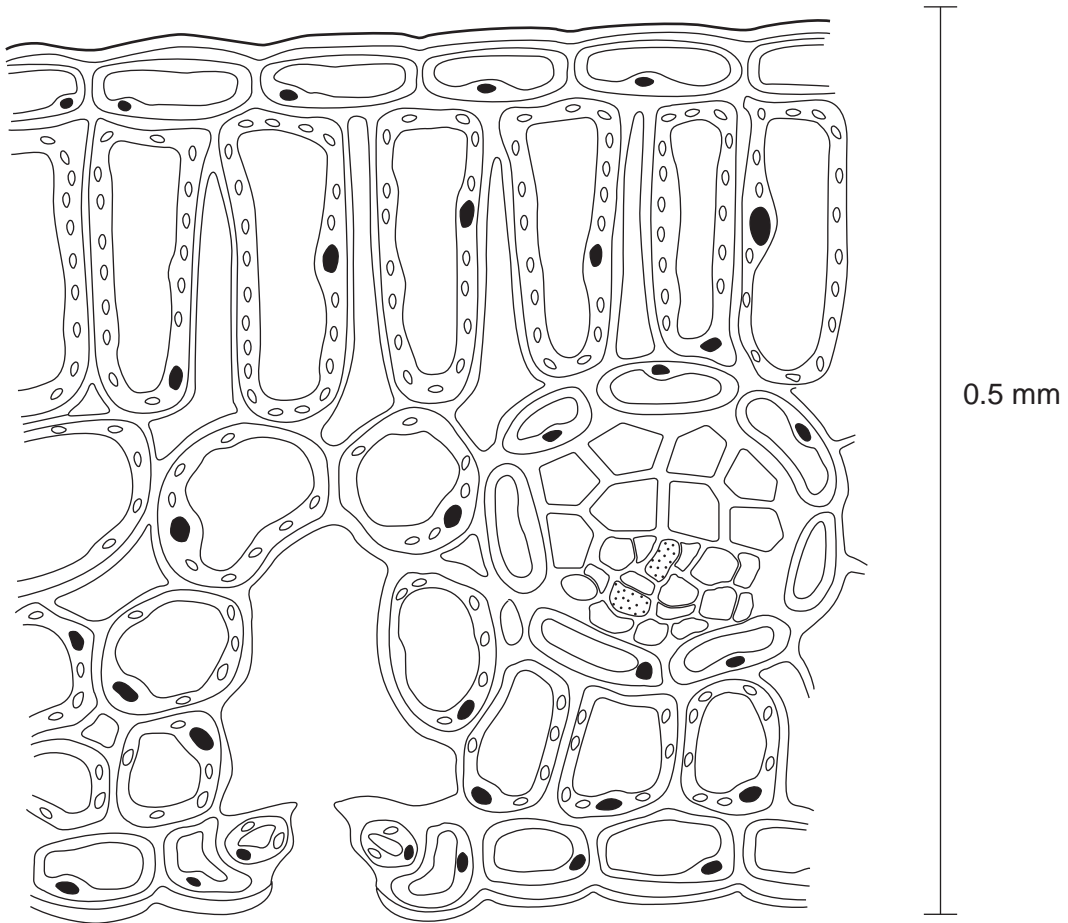


Fig. 2.1

(a) (i) Use label lines and the letters **X**, **S**, **E** and **D** to indicate the following on Fig. 2.1:

- X** – a xylem vessel
- S** – a phloem sieve tube
- E** – a lower epidermal cell
- D** – a palisade mesophyll cell

[4]

(ii) Calculate the magnification of Fig. 2.1. Show your working and express your answer to the nearest whole number.

Answer [2]

(b) Name **two** assimilates that move from the palisade mesophyll cells to the vascular tissue to be exported from the leaf.

1

2 [2]

(c) Explain, using the term **water potential**, how water moves from the vascular tissue to the atmosphere.

.....

.....

.....

.....

.....

.....

.....

..... [4]

[Total: 12]