Structure of transport tissues

Question Paper 1

Level	International A Level
Subject	Biology
Exam Board	CIE
Topic	Transport in plants
Sub Topic	Structure of transport tissues
Booklet	Theory
Paper Type	Question Paper 1

Time Allowed : **66 minutes**

Score : **/ 55**

Percentage : **/100**

Grade Boundaries:

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

1 When a leaf is first formed it is described as a sink for carbohydrate. As the leaf continues to grow, it starts to photosynthesise and becomes a source of carbohydrates and other assimilates.

Fig. 3.1 shows the changes that occur to the structure of plasmodesmata in the leaf as it grows.

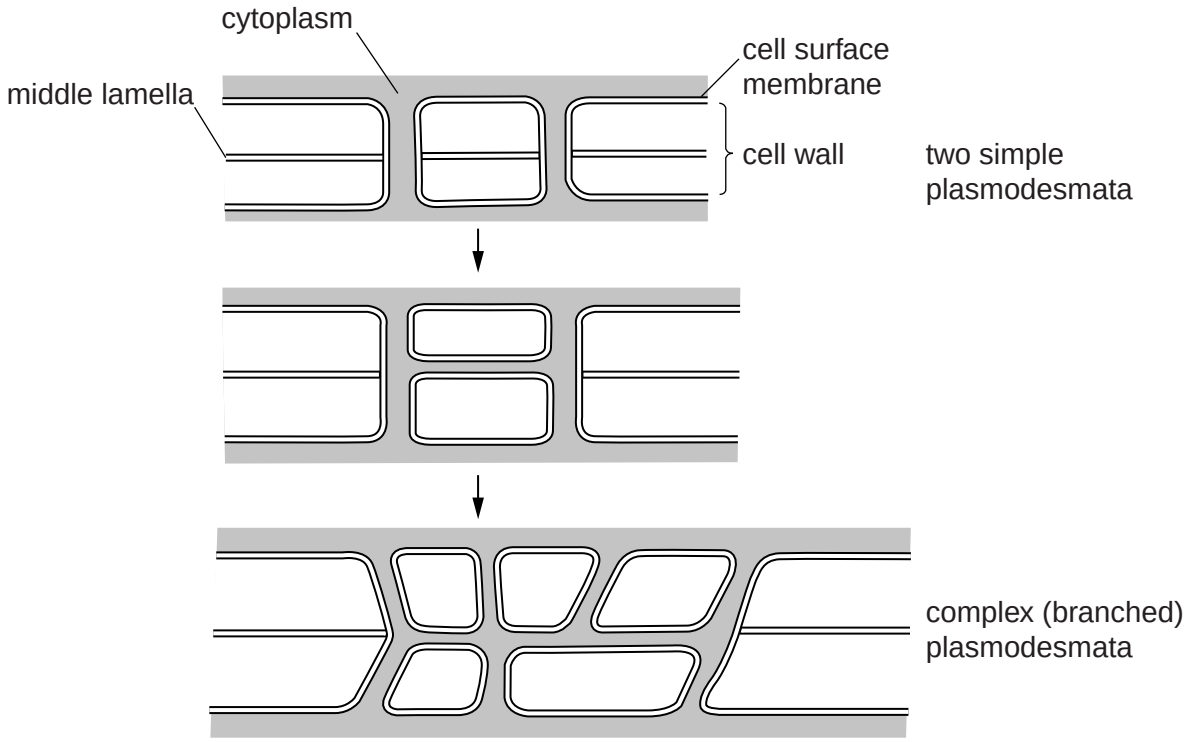

Fig. 3.1

(a) Suggest the advantage of complex plasmodesmata between cells in leaves.

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.....[2]

(b) Assimilates are transported into phloem sieve tubes.

Explain how assimilates in phloem sieve tubes move from the veins in a mature leaf to sinks, such as flowers and fruits, in the rest of the plant.

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.....[4]

[Total: 6]

2 Fig. 2.1 shows xylem tissue in a longitudinal section through the stem of a dicotyledonous plant.

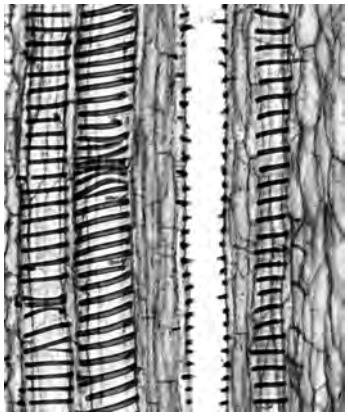

Fig. 2.1

(a) Describe and explain how the structure of xylem vessels is suited to their function.

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(b) It is possible to obtain images, such as Fig. 2.1, at the same magnification with both the light microscope and the electron microscope.

State the advantages of using the light microscope, rather than using the electron microscope, in studies of tissues.

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..... [2]

[Total: 7]

3 Fig. 2.1 shows part of a summer squash, *Cucurbita pepo*. Fig. 2.2 is a high power drawing of an area of phloem from a transverse section of the stem of *C. pepo*.

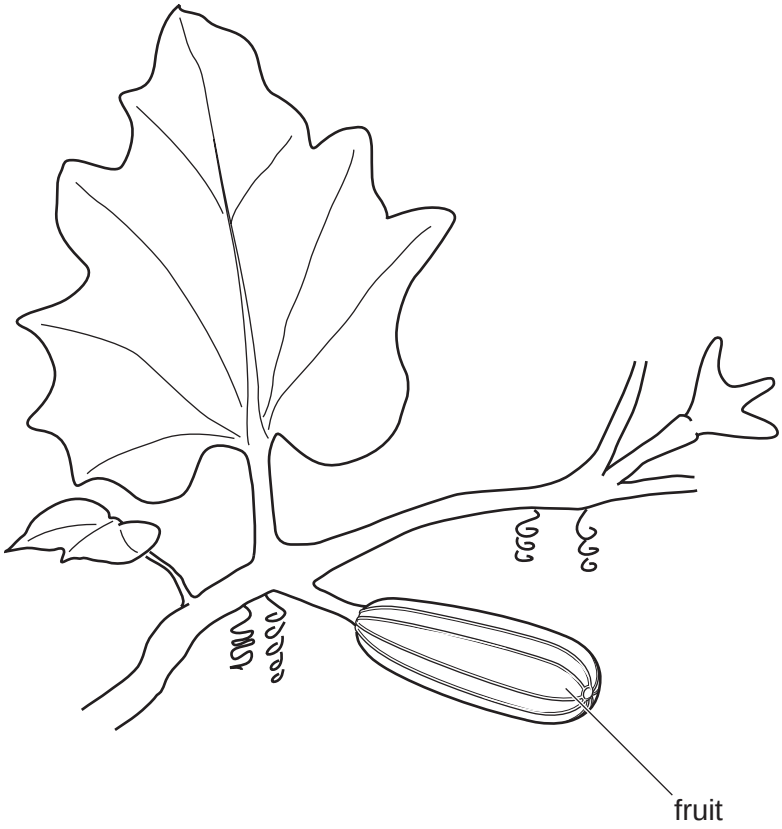

Fig. 2.1

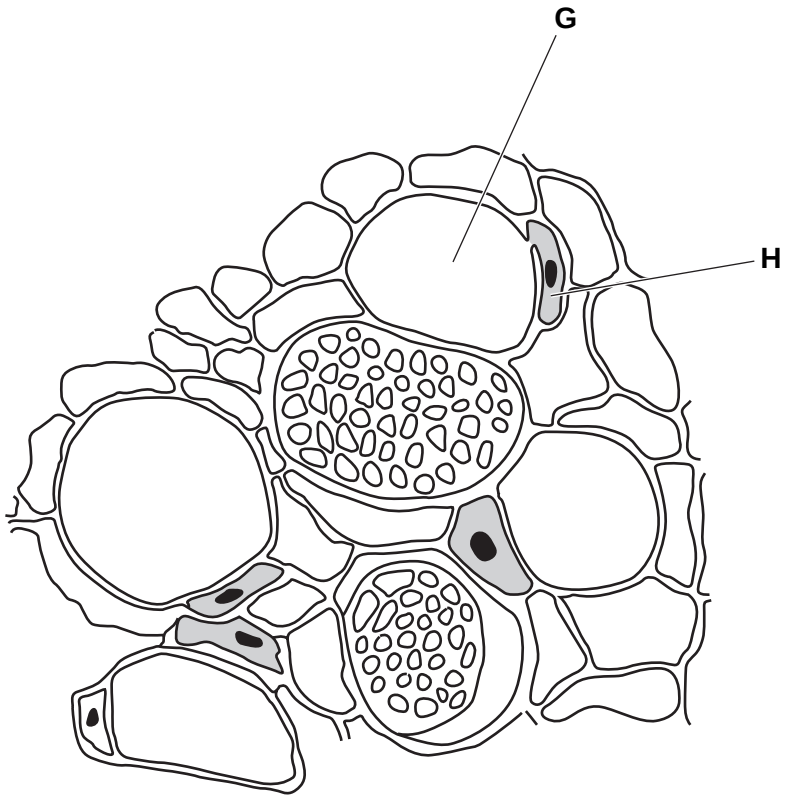

Fig. 2.2

(a) **(i)** Name **G** and **H**.

G .....

H .....[1]

(ii) Describe three ways in which the **structure** of a xylem vessel differs from the structure of cell **G**.

1. .....

2. .....

3. .....[3]

(b) The liquid extracted from the phloem of *C. pepo* contains sucrose.

Explain how sucrose is transported in the phloem along the stem from the leaf to the fruit.

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(c) Most of the sucrose transported in the phloem enters the fruit.

Suggest why summer squash fruits are not sweet.

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[Total: 9]

4 Table 6.1 contains some information about xylem vessels and phloem sieve tube elements in plants.

Table 6.1

features	**xylem vessels**	**phloem sieve tube elements**
living cells		yes
substances transported		dissolved sugars and amino acids
direction of flow of substances	one direction, roots to leaves	
permeability of cell walls to water	not permeable	
cell wall material		

(a) Complete Table 6.1. [4]

(b) State **one** use for magnesium ions in plants.

.....[1]

[Total: 5]

5 Fig. 6.1 is a photomicrograph of phloem sieve tubes from a plant stem.

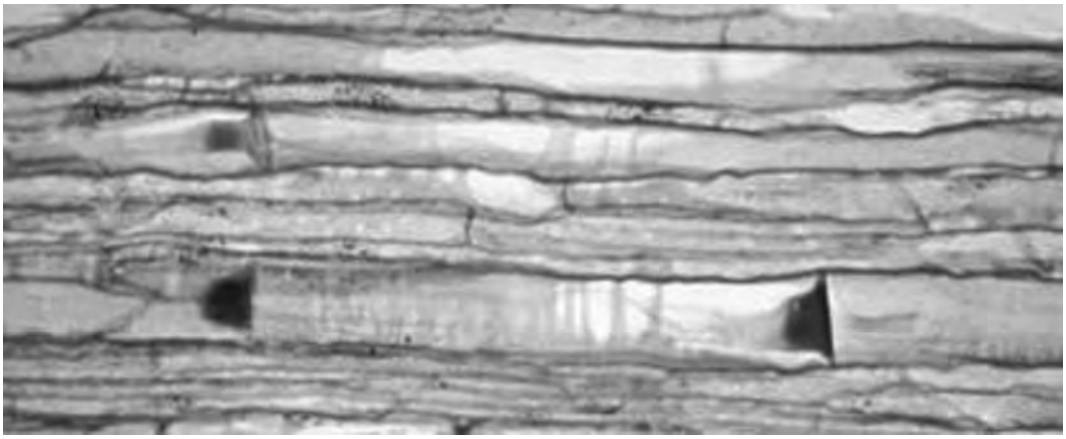

Fig. 6.1

(a) State two features, **visible in Fig. 6.1**, which distinguish sieve tubes from xylem vessels.

1. .....

2. .....
[2]

(b) Explain briefly how sucrose is **moved**, or translocated, **through** sieve tubes.

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(c) Some enzymes are found in phloem tissue.
Describe how enzymes catalyse reactions.

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[Total: 7]

6 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.

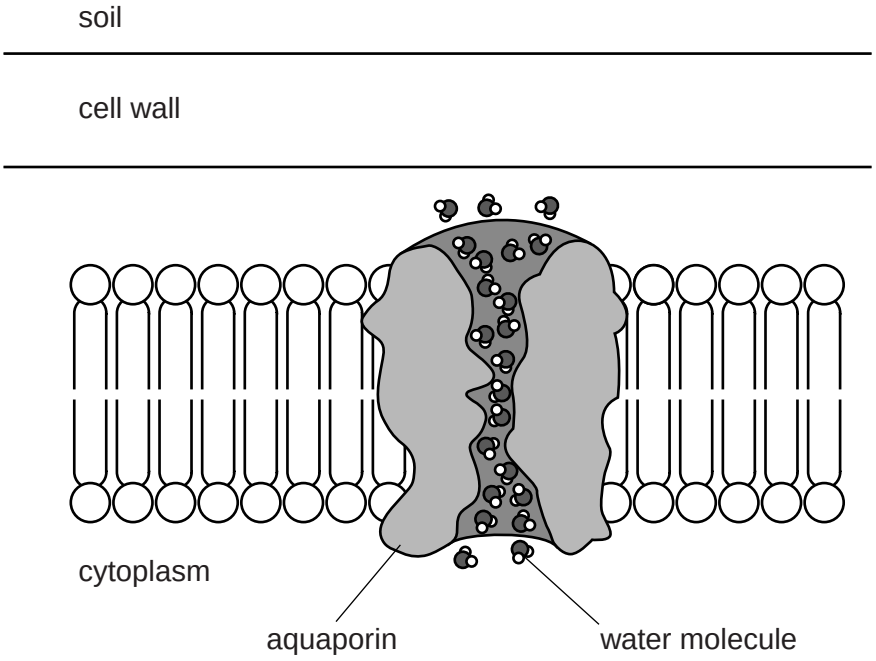

Fig. 2.1

(a) With reference to Fig. 2.1:

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

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

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(b) Describe the pathway taken by water from the cytoplasm of the root hair cell to a xylem vessel in the centre of the root.

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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.

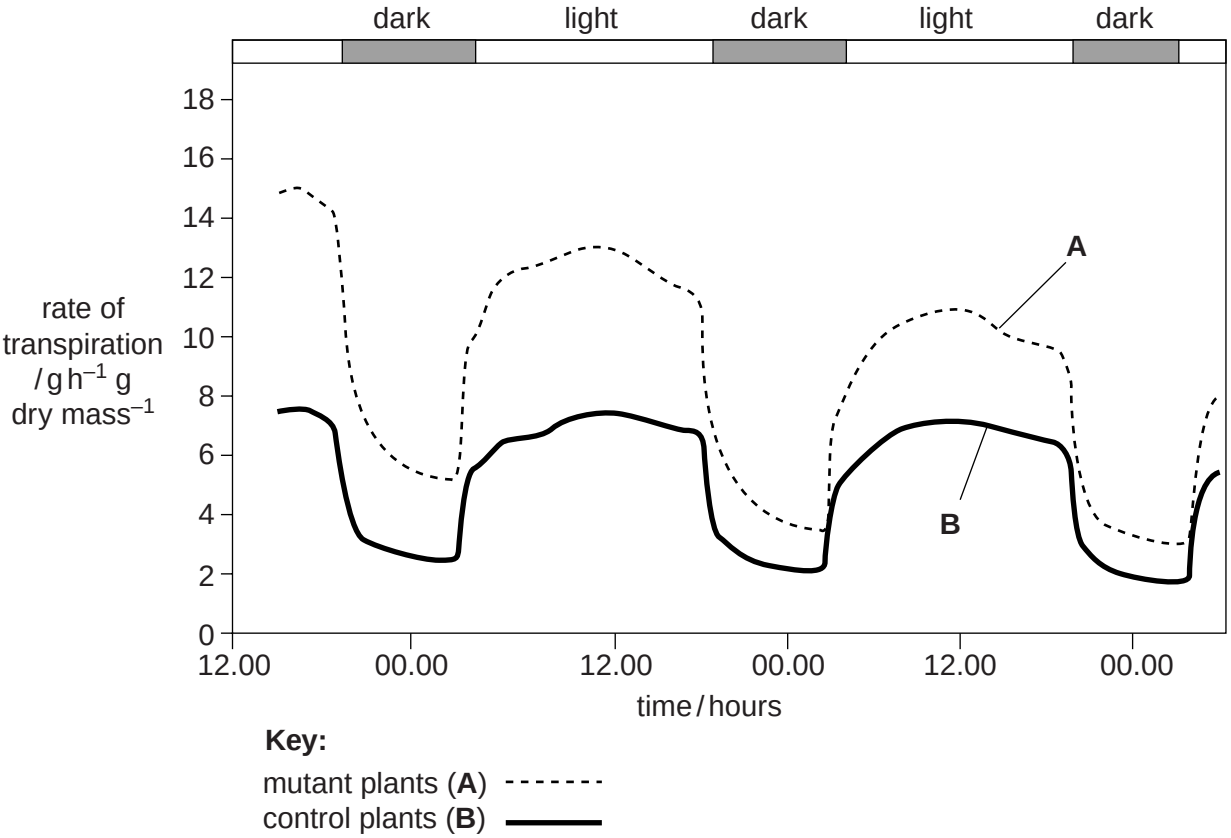

Fig. 2.2

(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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(ii) how the results show that the cuticle is less effective in the mutant plants.

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[Total: 11]

7 Fig. 4.1 is an electron micrograph of a transverse section through a plant stem. The xylem vessels are clearly visible.

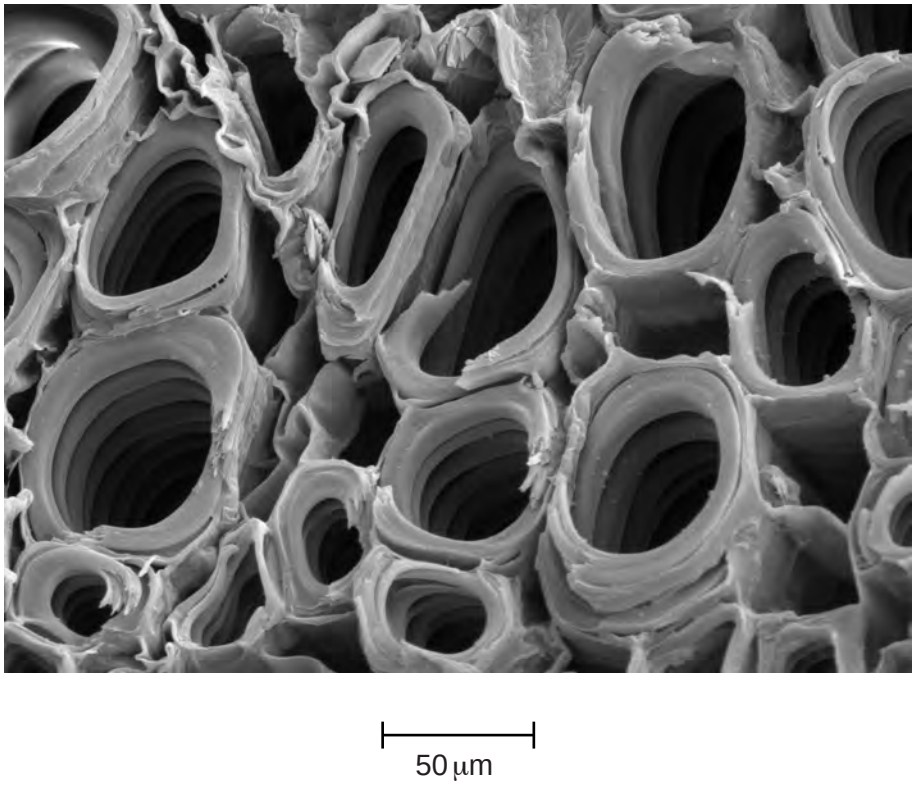

Fig. 4.1

(a) Calculate the magnification of the electron micrograph in Fig. 4.1.

Show your working and give your answer to the nearest 100.

answer .....[2]

(b) Describe how the structure of xylem vessels is adapted to their function.

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(c) Describe **and** explain how water moves from the xylem vessels in the leaves to the atmosphere surrounding the leaves of the plant.

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[Total: 10]