

Transport mechanism

Question Paper 4

Level	International A Level
Subject	Biology
Exam Board	CIE
Topic	Transport in plants
Sub Topic	Transport mechanism
Booklet	Theory
Paper Type	Question Paper 4

Time Allowed : 76 minutes

Score : / 63

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.

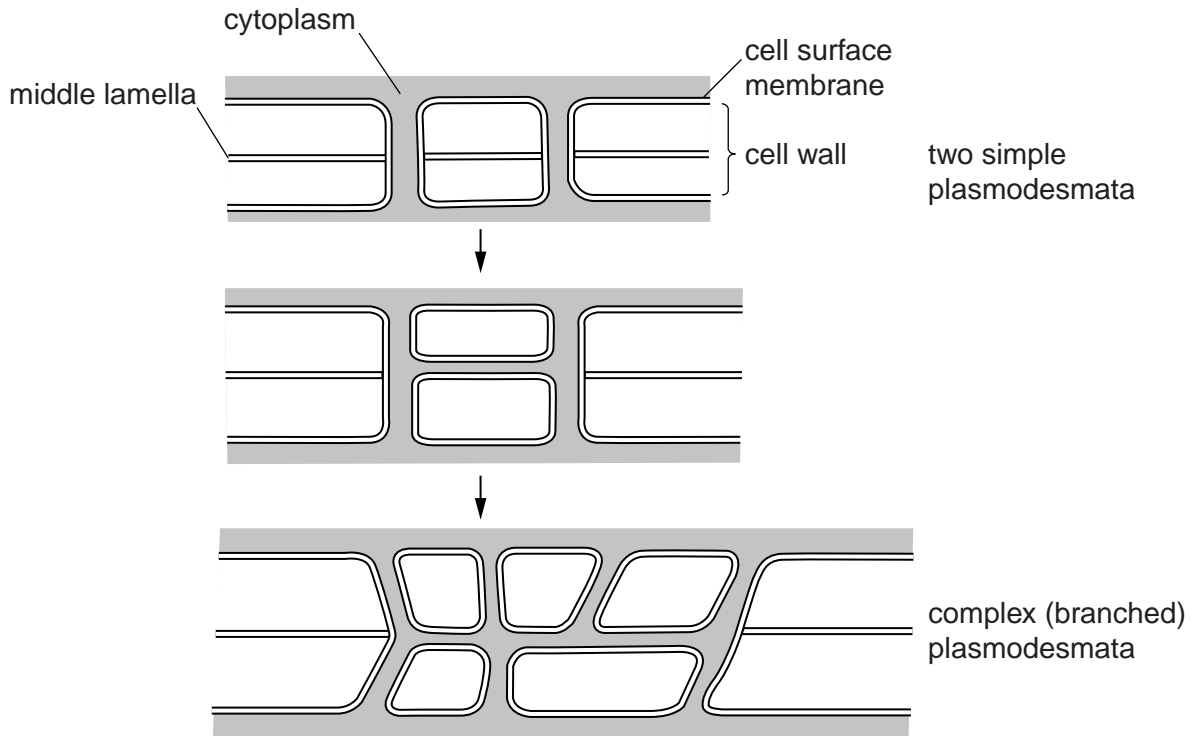


Fig. 3.1

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

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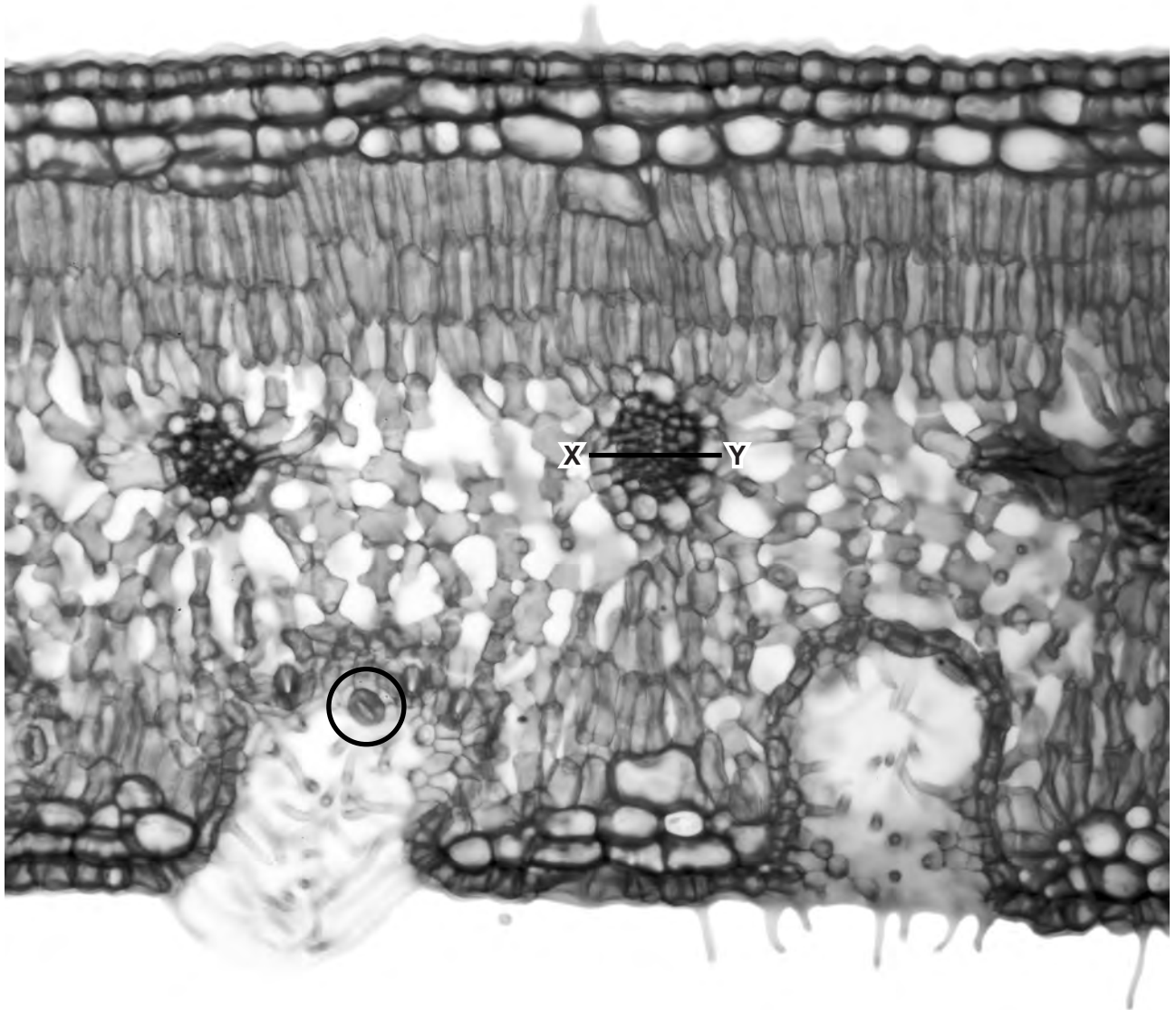
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.....[2]

- 2 Fig. 4.1 is a light micrograph of a section through a leaf of the xerophytic plant *Nerium oleander*. An area containing one of the plant's stomata is circled.



Magnification $\times 60$

Fig. 4.1

- (a) List three adaptations, visible in Fig. 4.1, which are characteristic of xerophytic plants.

1.
2.
3.

[3]

(b) Calculate the diameter of the vascular bundle across the line X-Y.

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

answer..... μm [2]

(c) Describe the process of transpiration in plants such as *N. oleander*.

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.....[4]

[Total: 9]

- 3 Haemoglobinopathies are inherited conditions linked to the structure and function of haemoglobin. Sickle cell anaemia is one of these conditions in which the transport and delivery of oxygen to tissues is less than normal.

An investigation was carried out to discover the effect of sickle cell anaemia on the ability of blood to carry oxygen. Blood samples were taken from two people:

- person **L** without sickle cell anaemia
- person **M** with sickle cell anaemia.

The percentage saturation of haemoglobin with oxygen was determined over a range of partial pressures of oxygen.

Fig. 3.1 shows oxygen haemoglobin dissociation curves for the two blood samples.

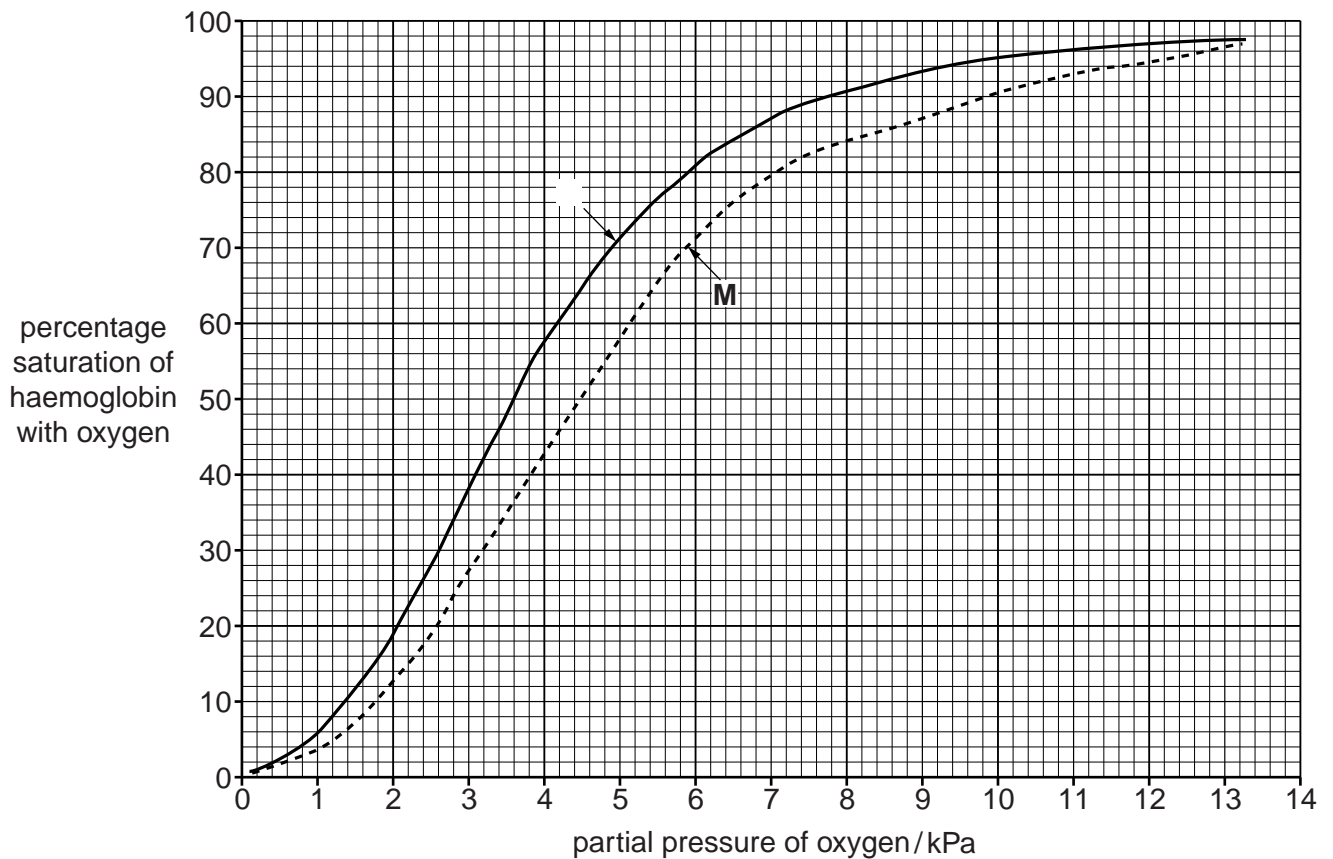


Fig. 3.1

- (a) P50 is the partial pressure of oxygen at which haemoglobin is 50% saturated with oxygen. It is taken as a measurement of the affinity of haemoglobin for oxygen.

- (i) State the P50 for the two blood samples, **L** and **M**.

L

M [1]

(d) Vaccination is used to control the spread of diseases, such as measles.

Explain why vaccination cannot be used to prevent sickle cell anaemia.

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..... [2]

[Total: 13]

- 4 (a) Table 2.1 shows eight ions that are biologically important.

Table 2.1

ammonium (NH_4^+)	A
hydrogen (H^+)	B
hydrogen carbonate (HCO_3^-)	C
iron (Fe^{2+})	D
magnesium (Mg^{2+})	E
nitrate (NO_3^-)	F
phosphate (PO_4^{3-})	G
sulfate (SO_4^{2-})	H

Choose one ion to match each of the following statements. In each case write **one** letter from Table 2.1. You may use each letter (**A** to **H**) once, more than once or not at all.

- (i) A component of polynucleotides.

..... [1]

- (ii) Ion produced by enzyme activity inside red blood cells.

..... [1]

- (iii) Ion used in the production of all amino acids in chloroplasts.

..... [1]

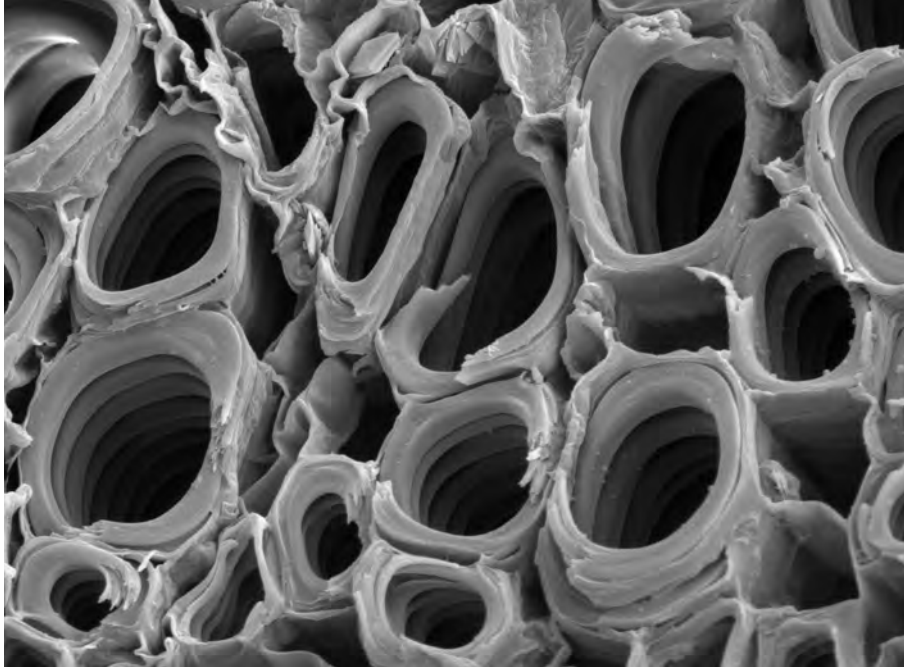
- (iv) Ion that diffuses through carrier proteins with sucrose into companion cells in phloem tissue.

..... [1]

- (v) Component of haem group in haemoglobin that binds oxygen.

..... [1]

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



50 μm

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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..... [3]

(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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..... [5]

[Total: 10]

- 6 Fig. 1.1 is a drawing made from an electron micrograph. It shows a longitudinal section through a sieve tube element and a companion cell in the phloem of a flowering plant.

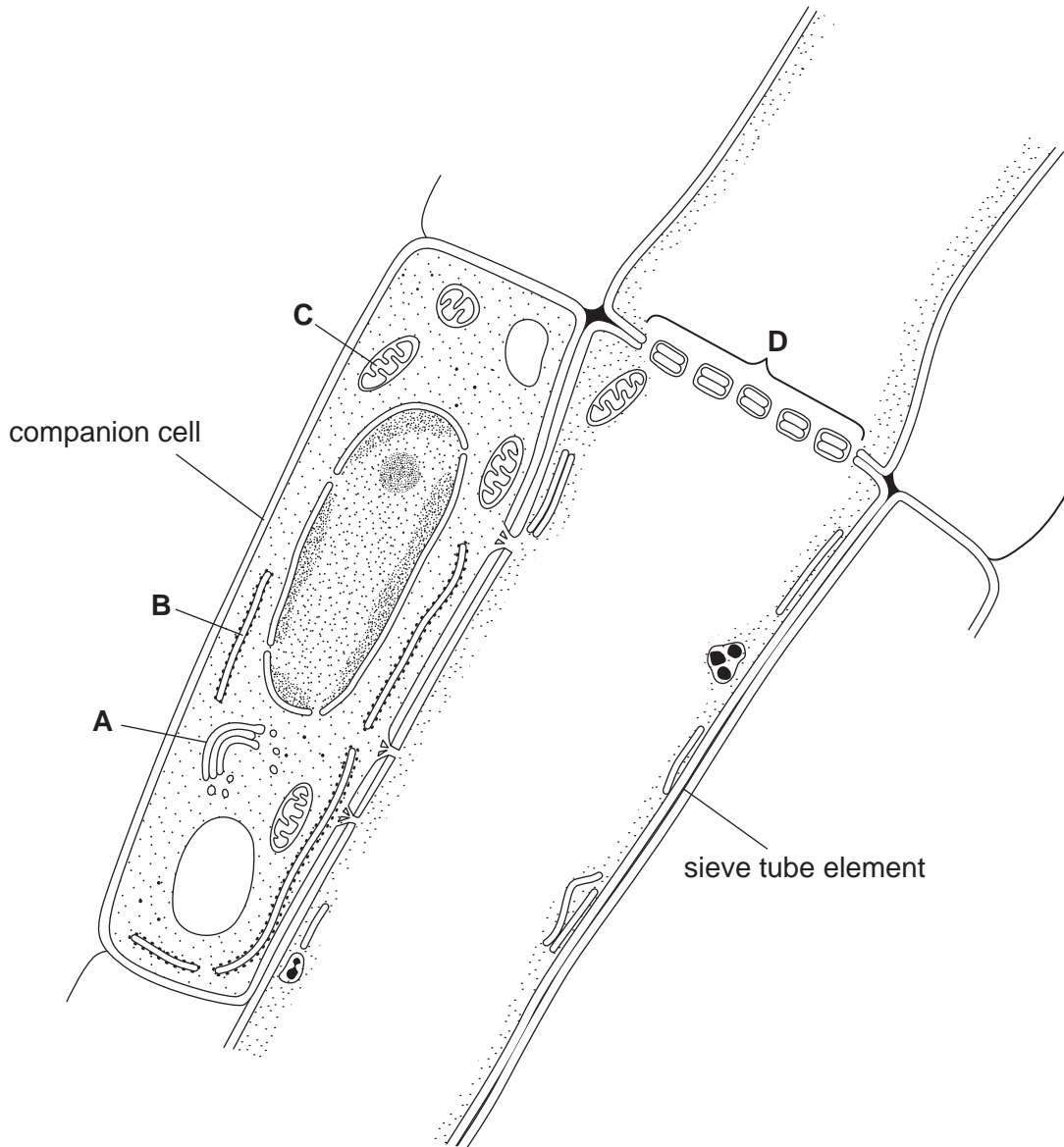


Fig. 1.1

(a) Refer to Fig. 1.1.

(i) Name structures A to C.

A

B

C[3]

(ii) State the name given to the region labelled **D** that separates the two sieve tube elements.

.....[1]

(iii) Name **one assimilate** that is transported in the phloem.

.....[1]

(b) Explain how the structure of sieve tube elements helps the translocation of substances in the phloem.

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.....[3]

(c) Describe the role of companion cells in translocation in the phloem.

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.....[2]

[Total : 10]