

Microscopes

Question Paper 1

Level	International A Level
Subject	Biology
Exam Board	CIE
Topic	Cell Structure
Sub Topic	Microscopes
Booklet	Theory
Paper Type	Question Paper 1

Time Allowed : 65 minutes

Score : / 54

Percentage : /100

Grade Boundaries:

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

1 *Vibrio cholerae* is a prokaryotic organism.

Fig. 1.1 shows the structure of a cell of *V. cholerae*.

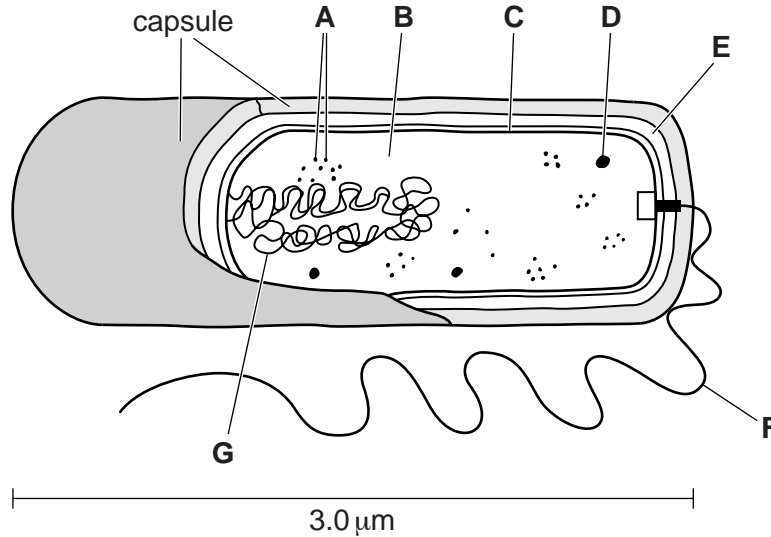


Fig. 1.1

(a) Calculate the magnification of Fig. 1.1.
Show your working and give your answer to the nearest whole number.

magnification × [2]

(b) Locate the structures in Fig. 1.1 that apply to each of the features shown in Table 1.1. Complete Table 1.1 by writing the appropriate letter and the name of the structure. You must only give one letter in each case. You may use each letter once, more than once or not at all. The first answer has been completed for you.

Table 1.1

feature	identity	name
provides motility	F	flagellum
stores genetic information		
partially permeable		
composed of murein (peptidoglycan)		
site of translation		

(c) State three **structural** features that are present in a mesophyll cell in a leaf that are **not** present in a prokaryotic cell such as that of *V. cholerae*.

- 1.
- 2.
- 3.

[3]

(d) Describe how *V. cholerae* is transmitted from an infected person to an uninfected person.

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..... [2]

(e) It is important to know how pathogens are transmitted in order to develop effective control methods.

Explain how this knowledge is used to control the spread of *V. cholerae* in the human population.

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..... [3]

[Total: 14]

- 2 Capillaries are known as exchange vessels. Substances are exchanged between blood and tissue fluid as the blood flows through the capillaries.

Fig. 1.1 is an electron micrograph of a section through a capillary with two red blood cells.



Fig. 1.1

- (a) (i) Name the cells labelled **A** and the structure labelled **B**.

A

B [2]

- (ii) Calculate the actual distance **X – Y** on Fig. 1.1.

Show your working and give your answer to the nearest micrometre (μm).

answer μm [2]

(iii) Explain how capillaries are adapted for their function as exchange vessels.

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..... [2]

(b) Table 1.1 shows the composition of blood, tissue fluid and lymph.

Table 1.1

component	blood	tissue fluid	lymph
red blood cells /cells mm ⁻³ × 10 ⁶	5.1	0.0	0.0
white blood cells /cells mm ⁻³	9000	75	1 000 000
glucose/g dm ⁻³	800	800	775
protein/g dm ⁻³	71	1	26

Explain the differences between the composition of blood, tissue fluid and lymph as shown in Table 1.1, for white blood cells, glucose and protein.

white blood cells

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glucose

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protein

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..... [5]

(c) Outline how **red blood cells** are involved in the transport of carbon dioxide.

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..... [3]

[Total: 14]

3 Fig. 1.1 shows part of an animal cell viewed with an electron microscope.

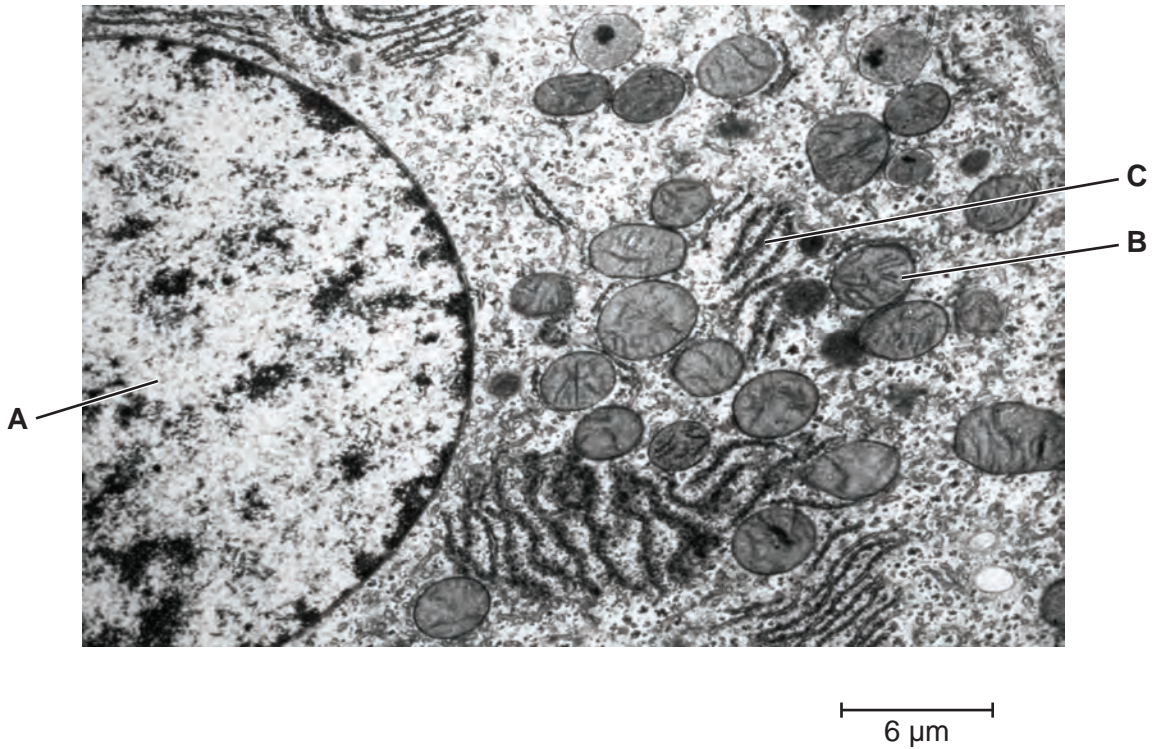


Fig. 1.1

(a) Name the structures A to C.

A

B

C [3]

(b) (i) State the function of structure C.

..... [1]

(ii) Explain why structure C cannot be seen using a light microscope.

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..... [2]

- (c) Suggest **one** disadvantage of the electron microscope compared to the light microscope for the study of cells.

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..... [1]

- (d) Calculate the magnification of the image in Fig. 1.1.

Show your working and give your answer to the nearest whole number.

Answer = [2]

[Total: 9]

- 4 Fig. 1.1 is a labelled diagram of a leaf palisade mesophyll cell, as seen with a high quality light microscope.

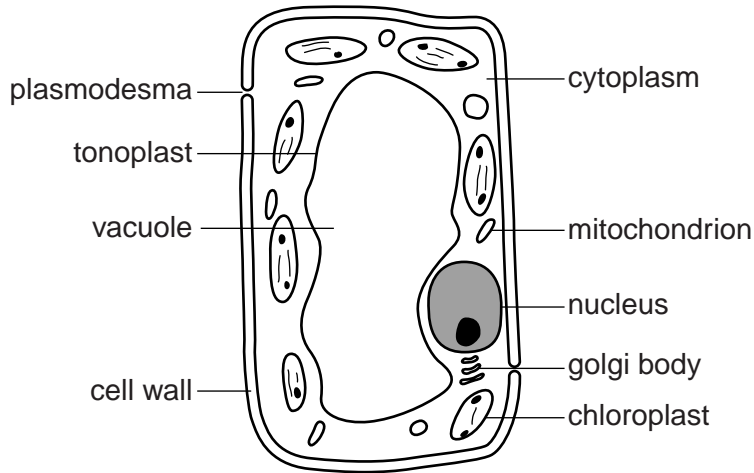


Fig. 1.1

An electron micrograph of the same leaf mesophyll cell at the **same magnification** would show more detail than is shown in Fig. 1.1.

- (a) Explain why, at the **same magnification**, an electron micrograph is able to provide more detail than a light micrograph.

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..... [2]

- (b) **Describe** three additional features that could be seen on an electron micrograph of the leaf mesophyll cell that are not seen in Fig. 1.1.

1.
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2.
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3.
..... [3]

- (c) The length of the labelled chloroplast in Fig. 1.1 is $5.0\ \mu\text{m}$. Calculate the magnification of the cell shown in Fig. 1.1.

Show your working.

magnification \times [2]

- (d) In Fig. 1.1, starch granules are visible within the chloroplasts. Starch is the most common storage compound of plants. It is composed of amylopectin and amylose.

- (i) Describe the structural differences between amylopectin and amylose.

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..... [2]

- (ii) State **one** role of magnesium ions within chloroplasts.

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..... [1]

[Total: 10]

- (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]