

The gas exchange system and Smoking

Question Paper 4

Level	International A Level
Subject	Biology
Exam Board	CIE
Topic	Gas exchange and smoking
Sub Topic	The gas exchange system and Smoking
Booklet	Theory
Paper Type	Question Paper 4

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%

(b) This flatworm lives in freshwater that has a low concentration of sodium ions. The flatworm's body fluids have a higher concentration of sodium ions than the surrounding water.

(i) Suggest how the flatworm retains sodium ions in its body fluids.

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

(ii) State **one** role of sodium ions in organisms.

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..... [1]

[Total: 7]

- (c) Some components of tobacco smoke are absorbed into the blood stream and affect the cardiovascular system.

Describe the effects of nicotine and carbon monoxide on the cardiovascular system.

nicotine

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carbon monoxide

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..... [4]

[Total: 11]

- 3 Scientists at the Tibet Institute of Medical Sciences in Lhasa investigated differences between adult Tibetans who had lived in Lhasa (altitude 3658 m) all their lives and adult Han Chinese residents who had lived there for about 8 years. The Tibetans and the Han Chinese exercised at maximum effort and various aspects of their breathing were measured.

Some of the results are shown in Table 4.1.

Table 4.1

feature	Tibetans	Han Chinese
minute volume / $\text{dm}^3 \text{ min}^{-1}$	149	126
oxygen uptake / $\text{cm}^3 \text{ kg}^{-1} \text{ min}^{-1}$	51.0	46.0

- Minute volume. This is the volume of air breathed in during one minute.
- Oxygen uptake. This is the volume of oxygen absorbed into the blood during one minute. It is expressed per kg of body mass.

The researchers observed that

- the greater minute volume of the native Tibetans resulted from a greater tidal volume
- the tidal volumes of the Tibetans showed a positive correlation with their vital capacity measurements
- the Han Chinese had lower values for both tidal volume and vital capacity.

- (a) State what is meant by the term *tidal volume*.

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..... [1]

- (b) Suggest why the researchers also measured the *vital capacity* of the people in the study.

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..... [2]

- (c) Explain how the minute volume **at rest** would be determined.

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..... [2]

- (d) Suggest two differences in the **structure** of the lungs that may account for the greater oxygen uptake by the Tibetans shown in Table 4.1.

1

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2

..... [2]

- (e) When people who have lived all their lives at low altitude go to a place at high altitude, such as Lhasa, they are often breathless, lack energy and suffer from altitude sickness. However, with time, they often acclimatise to the high altitude.

In another study, researchers found that the red blood cell count increases in such people by about 30% over several weeks.

Explain why the red blood cell count increases so much when people visit places at high altitude.

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..... [2]

[Total: 9]

- 4 Fig. 1.1 is a drawing made from an electron micrograph of a cell from the ciliated epithelium of the bronchus.

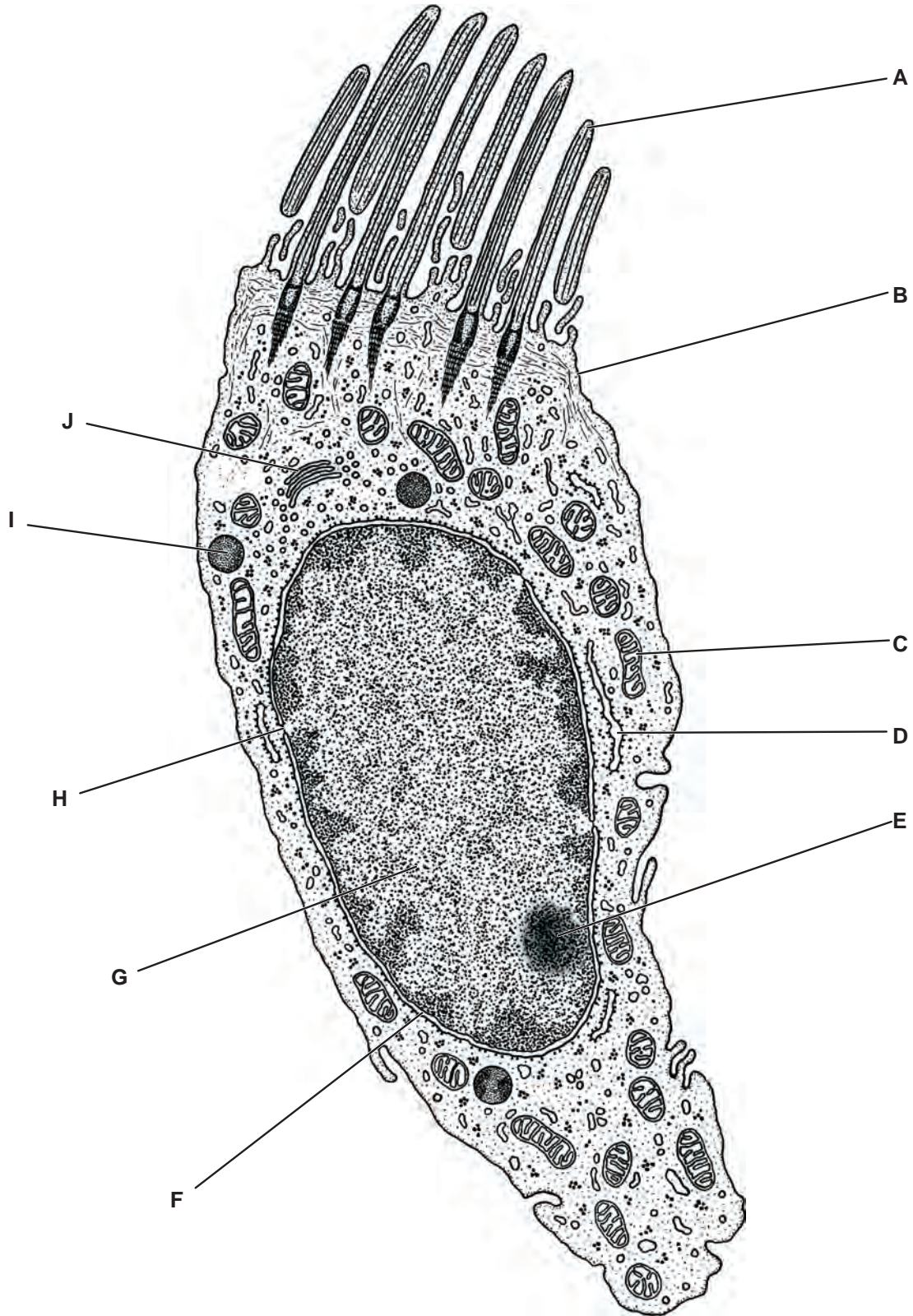


Fig. 1.1

5 Fig. 1.1 is an electron micrograph of cells from the lining of the small intestine.

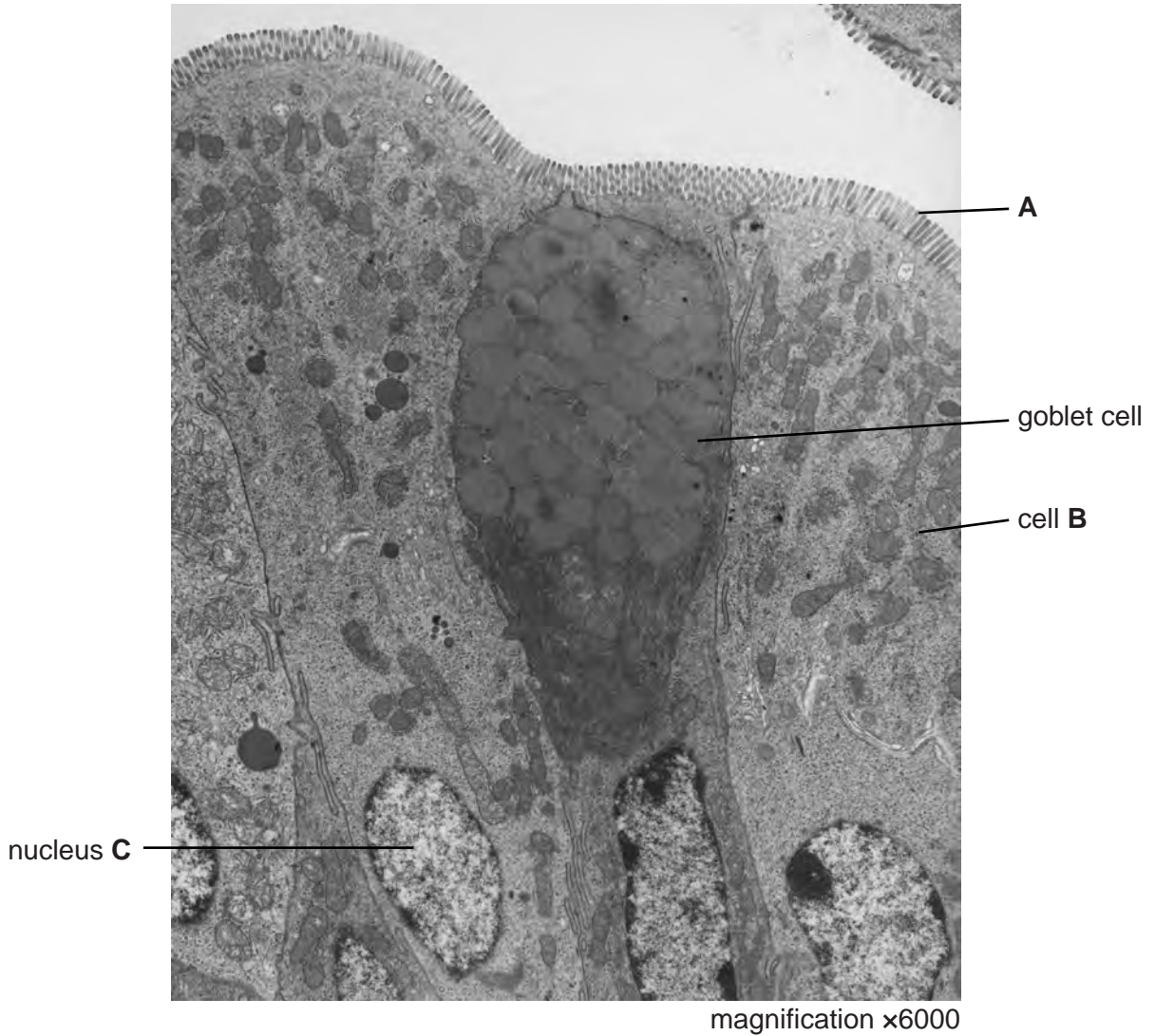


Fig. 1.1

(a) Identify the structures labelled **A** and state their role for the cell.

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[2]

(b) There are many mitochondria in cell **B**.

Suggest why cell **B** contains a large number of mitochondria.

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..... [2]

(c) Calculate the actual length of the nucleus **C**.

Show your working and express your answer to the nearest 0.1 micrometre.

answer μm [2]

(d) There are many goblet cells within the epithelium lining the trachea and the bronchi in the gas exchange system.

Describe the role of goblet cells in the gas exchange system.

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..... [3]

(e) State two ways in which the cells lining the alveoli in the lungs differ from cell **B** shown in Fig. 1.1.

1.
2. [2]

[Total: 11]

6 Fig. 1.1 is a light micrograph of a section through part of the gas exchange system.

A, B and C are three different types of tissue.



Fig. 1.1

(a) The cell types in tissue A have different functions.

Describe how the cell types work together to maintain the health of the gas exchange system.

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(b) Suggest why the cells in tissue **B** have many mitochondria.

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..... [1]

(c) Name the parts of the gas exchange system where tissue **C** is distributed.

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..... [1]

[Total: 5]