The gas exchange system and Smoking

Question Paper 7

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 7

Time Allowed : **72 minutes**

Score : **/ 60**

Percentage : **/100**

Grade Boundaries:

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

1 Fig. 3.1 shows some cells from the lining of the bronchus from a person who has never smoked.
Fig. 3.2 shows cells from the same area in a heavy smoker who suffers from chronic bronchitis.

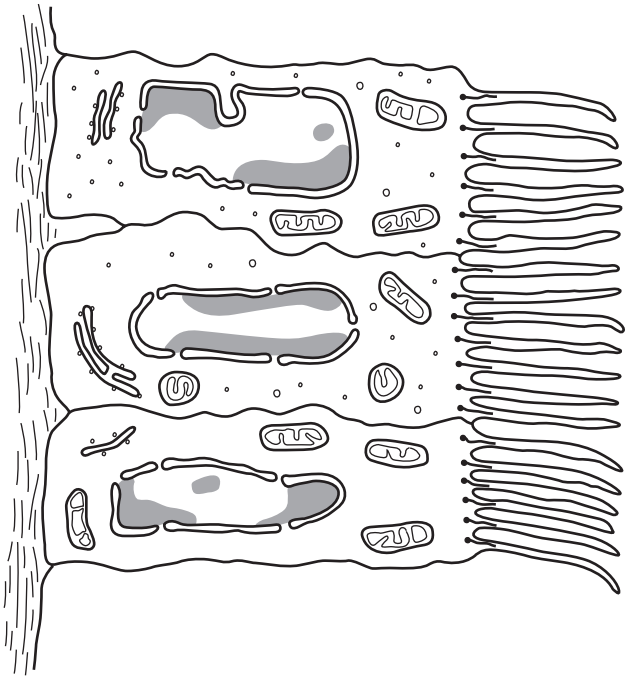

Fig. 3.1

Fig. 3.2

(a) Using label lines and the following letters, label the structures **A** to **C** on Fig. 3.1.

A cilia
B nuclear membrane (nuclear envelope)
C endoplasmic reticulum [3]

(b) Explain why the lungs are at an increased risk of infection when the bronchial epithelium is damaged as is shown in Fig. 3.2.

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(c) Chronic obstructive pulmonary disease (COPD) includes chronic bronchitis and emphysema.

A student used the World Health Organisation database to investigate the link between cigarette smoking and deaths from COPD. Fig. 3.3 shows deaths from COPD plotted against the mean annual consumption of cigarettes in 20 countries for the period 1997 to 2002.

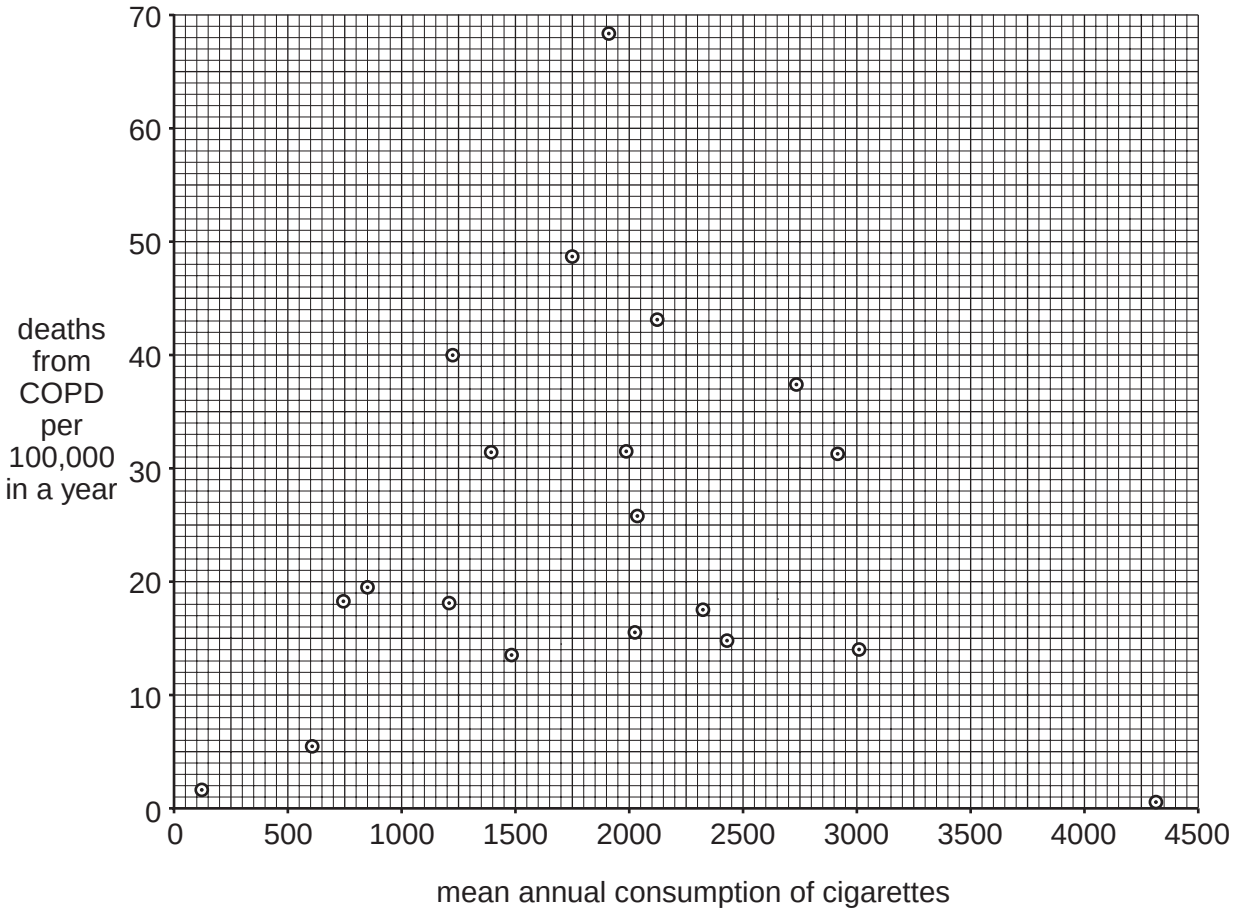

Fig. 3.3

The student concluded that there was no link between cigarette consumption and deaths from COPD.

Use the information in Fig. 3.3 to discuss the student's conclusion.

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[Total: 9]

2 Fig. 1.1 is a drawing made from an electron micrograph showing a cross-section of an alveolus and two adjacent capillaries.

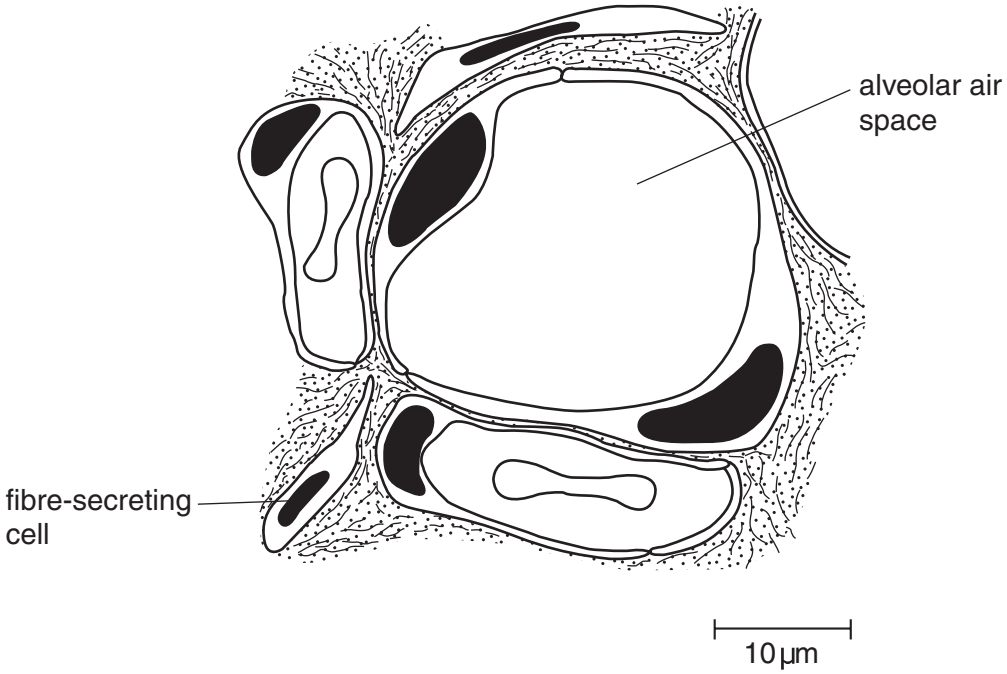

Fig. 1.1

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

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(b) With reference to Fig. 1.1, describe the process of gaseous exchange in the alveolus.

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Allergies, such as asthma, are the result of an over reaction by the immune system to a harmless antigen. When people suffer from an asthma attack, their immune systems respond to the presence of a specific antigen by producing antibodies. These antibodies attach to the surface of mast cells in the airways causing these cells to release histamine. This hormone-like chemical stimulates inflammation in the lining of the airways, which then makes breathing very difficult.

(c) State the name of the cells of the immune system that secrete antibodies.

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(d) Describe the changes that occur in airways, such as the bronchioles, during an asthma attack that make breathing difficult.

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[Total : 10]

3 **(a)** Explain why transpiration is the inevitable consequence of gaseous exchange in land plants.

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Fig. 3.1 shows some of the cells from the lower part and under surface of a leaf. The water potentials of three cells, **A**, **B** and **C**, are shown.

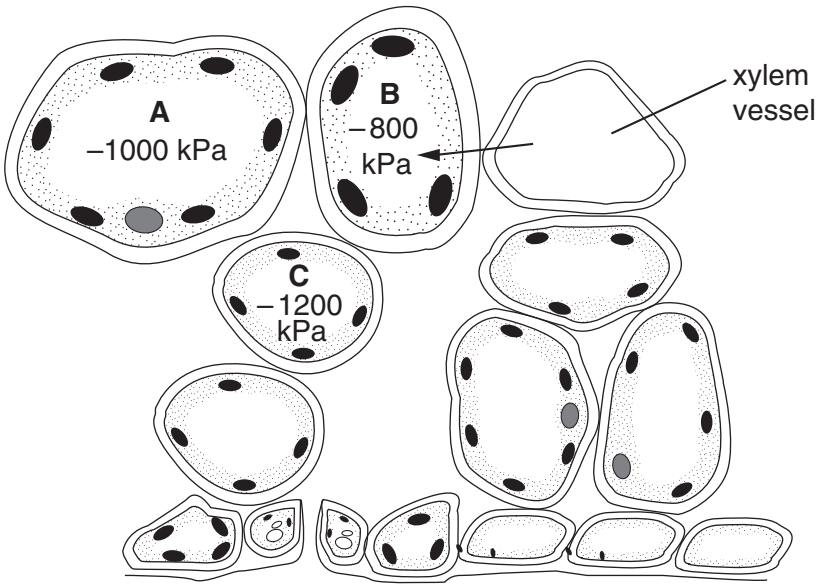

Fig. 3.1

(b) Explain how water moves from the xylem vessel to cell **B**.

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(c) Draw labelled arrows on Fig. 3.1 to show the direction in which

(i) water flows between the cells **A**, **B** and **C**; [2]

(ii) water vapour diffuses. [1]

(d) State two features of xerophytic plants that help to reduce the loss of water by transpiration from their leaves.

1. ....

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2. ....

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[Total : 11]

4 **(a)** Explain why tuberculosis (TB) is known as an **infectious** disease.

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(b) Outline the role of antibiotics in the treatment of infectious diseases, such as TB.

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Tobacco smoking is a risk factor for a number of diseases. This means that it increases the risk of developing disease. In 2009, the World Health Organization (WHO) published a factsheet stating that tobacco smoking:

- may be responsible for more than 20% of the new cases of TB globally
- increases the risk of becoming infected and having active TB
- increases the risk of dying from TB
- is a risk factor for TB in all socioeconomic groups.

Projects have been set up in a number of different countries to tackle this health problem. One project involves health workers encouraging TB patients to give up smoking.

(c) Suggest what epidemiological evidence would lead to the conclusion that tobacco smoking is a risk factor for TB.

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(d) Suggest **and** explain how the effects of smoking can increase the risk of becoming infected with TB.

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(e) Many smokers know that tobacco smoking is a risk factor for coronary heart disease, but continue to smoke. Some of these smokers have stated that they expect medical practitioners to cure them if they develop coronary heart disease.

List two treatments used by medical practitioners to treat coronary heart disease.

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2. ..... [2]

[Total: 14]

5 **(a)** With reference to the structure of a leaf, explain the difference between evaporation and transpiration.

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(b) Apple, *Pyrus malus*, sour cherry, *Prunus cerasus,* and peach, *Prunus persica*, are dicotyledonous trees that are of importance to commercial growers for the fruit that they produce.

A student chose a small area of land where all three species of fruit tree were growing. Leaf samples were removed and, using a microscope, the mean number of stomata per square millimetre was estimated for each species.

The rate of transpiration of each species was then measured on each of three separate occasions. The student performed the investigation outside where the trees were located and recorded the weather conditions on each day.

The mean transpiration rate was calculated per unit area of leaf.

The results are shown in Table 3.1.

Table 3.1

fruit tree	mean number of stomata / mm^{-2}	mean transpiration rate / $cm^3 h^{-1}$		
		hot dry day	warm dry day	warm rainy day
apple	266	0.19	0.35	0.21
sour cherry	284	0.09	0.28	0.25
peach	190	0.03	0.08	0.07

(i) With reference to Table 3.1, describe **and** explain the results of the investigation.

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(ii) The mean transpiration rate of each species was calculated over a 24 hour period.

Describe how the transpiration rate during the night would differ from the transpiration rate during the day.

Explain your answer.

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(iii) Suggest which of the three species of fruit tree has been described as 'drought-resistant' and would be economical to grow in areas where water is scarce.

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(c) Many fruits are thought to have beneficial health effects. Sour cherries and peaches may contribute to improved health for tobacco smokers.

Read the following statements. For each, explain how the fruit contributes to protecting smokers from smoking-related diseases.

(i) Glutathione is a protein known to be involved in the repair of damaged DNA. Regularly eating sour cherries increases the level of glutathione in the body.

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(ii) A diet rich in peaches can help reduce inflammation of the bronchi and bronchioles.

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[Total: 16]