

The gas exchange system and Smoking

Question Paper 1

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 1

Time Allowed : 63 minutes

Score : / 52

Percentage : /100

Grade Boundaries:

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

- 1 Pathogens enter the body in a variety of ways, including through the gas exchange system. The body has several defence mechanisms against the entry of pathogens and their spread throughout the body.

Fig. 2.1 is an electron micrograph of a cross section of the lining of a bronchiole.



Fig. 2.1

- (a) (i) Name tissue X and cell Y.

X

Y [2]

- (ii) With reference to the structures visible in Fig. 2.1, state three ways in which the lining of the trachea, bronchus and bronchioles provides protection against the entry of bacterial pathogens.

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Fig. 2.2 shows part of the immune response to the first infection by a bacterial pathogen that has entered the body through the lining of a bronchiole. J and K are stages in the immune response.

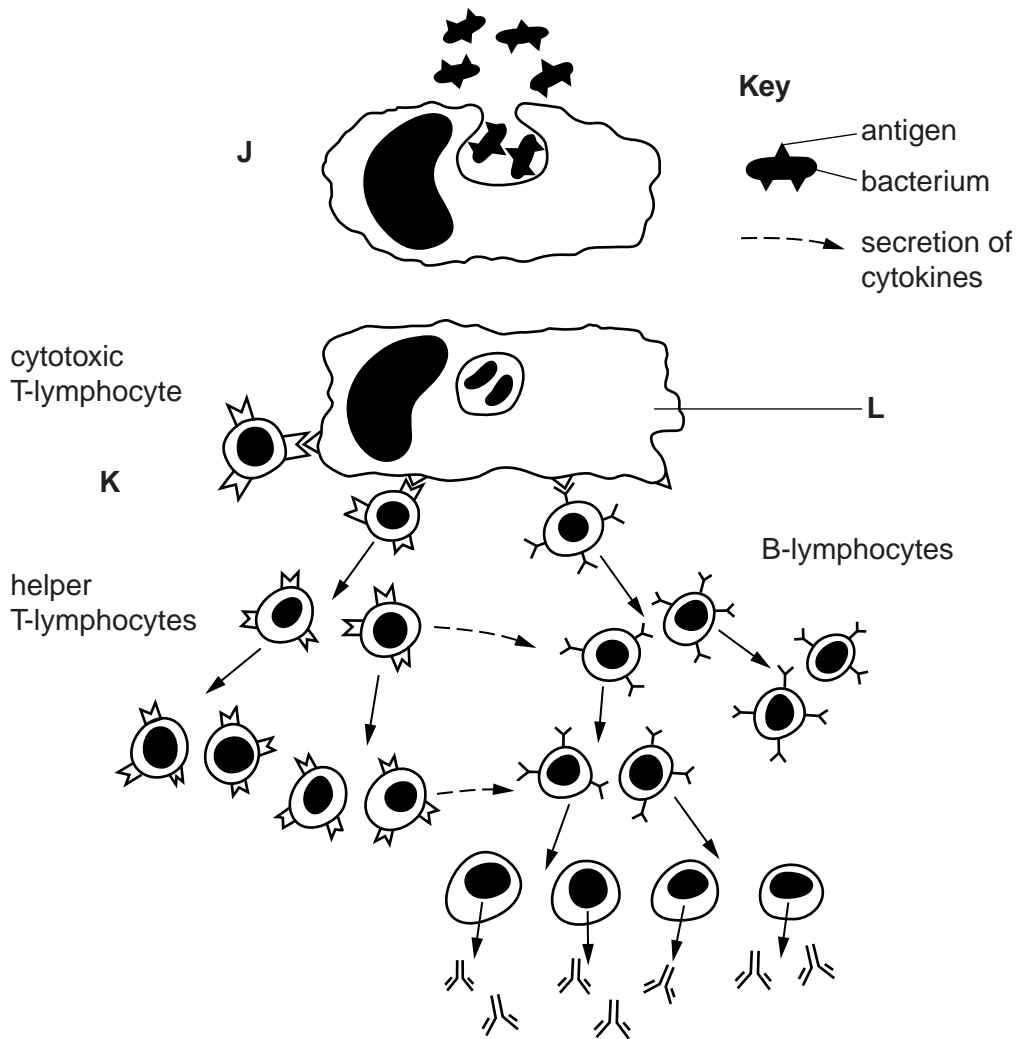


Fig. 2.2

(b) (i) State what is happening at stage J.

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(ii) Explain the role of cell L at stage K in the immune response.

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- (c) With reference to Fig. 2.2, explain how the response to a second infection by this bacterial pathogen differs from the first.

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[3]

- (d) There are various ways in which the effectiveness of immune responses can be reduced. Suggest how each of the following reduces the effectiveness of an immune response.

- (i) The number of T-lymphocytes is reduced in a person with HIV/AIDS.
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[1]

- (ii) Some pathogens are covered in cell surface membranes from their host.
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[1]

- (iii) B-lymphocytes do not mature properly and do not recognise any antigens.
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[1]

[Total: 14]

- 2 Fig. 2.1 is a scanning electron micrograph of an area of the trachea showing the presence of *Bordetella pertussis* bacteria.

B. pertussis is the causative organism of a respiratory disease in humans known as whooping cough. The disease is transmitted from person to person in a similar way to tuberculosis (TB).

A symptom that is common to TB and to whooping cough is the production of an excess of mucus.

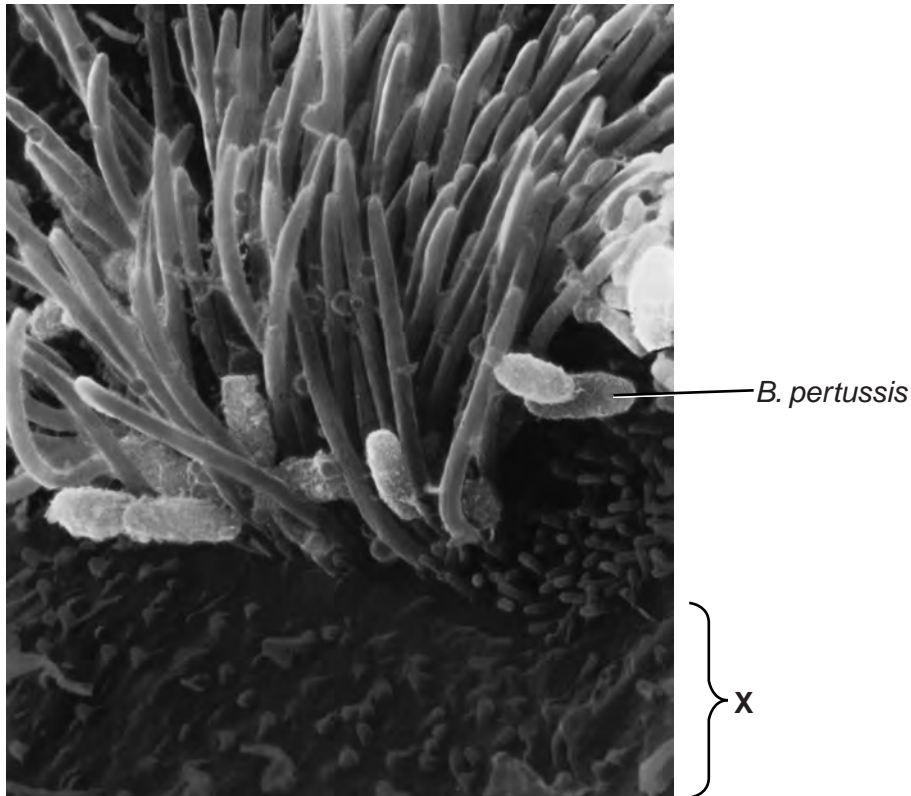


Fig. 2.1

- (a) Describe the damage caused by *B. pertussis* that is shown in the area labelled **X** on Fig. 2.1 and explain how this will affect the functioning of the epithelial tissue of the trachea.

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- (ii) Following translation, the polypeptide formed is modified by the addition of many short chains of monosaccharides in a process called glycosylation.

Suggest where glycosylation occurs in the cell **and** explain why mucin is packaged into vesicles.

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- (e) Overproduction of mucus is one of the symptoms of chronic obstructive pulmonary disease (COPD).

Describe the signs and symptoms that enable diagnosis of COPD.

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[Total: 16]

- 3 (a) Cartilage is present in some parts of the gas exchange system to prevent collapse due to pressure changes during inhalation.

State the parts of the gas exchange system in which cartilage is located.

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- (b) Fig. 3.1 shows the changes that occur in atmospheric pressure and oxygen partial pressure as altitude changes. The highest altitude at which people live permanently is 5100 m.

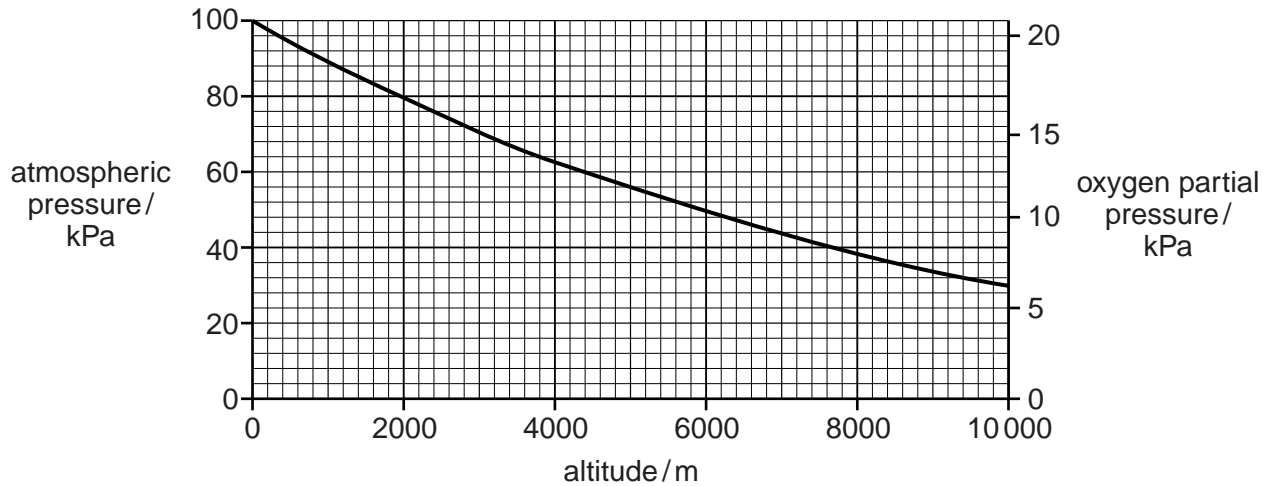


Fig 3.1

With reference to Fig. 3.1:

- (i) describe the effect of increasing altitude on both atmospheric pressure and the partial pressure of oxygen

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[2]

- (ii) calculate the change in the atmospheric pressure when a person travels from sea level to an altitude of 3500 m.

Show your working.

answer[2]

- (c)** When a person travels from 0m (sea level) to a high altitude, gas exchange in the lungs is affected. A condition known as hypoxia results, where the body tissues do not receive an adequate oxygen supply.

Explain how hypoxia occurs when a person ascends from sea level to a high altitude.

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- (d)** At high altitudes, short-term responses by the body to hypoxia include:

- a decrease in the volume of plasma in the blood
- a decrease in the volume of blood pumped out of the heart per heart beat
- an increase in the heart rate
- an increase in the breathing rate.

- (i)** Suggest why a decrease in the volume of plasma in the blood may reduce the effects of hypoxia.

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- (ii)** Explain why an increase in the heart rate occurs in response to hypoxia.

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- (e) People with sickle cell anaemia have a form of haemoglobin that is unable to bind to oxygen efficiently. The cause of the condition is a mutation in the gene coding for the β -globin polypeptide of haemoglobin.

Outline how this mutation can lead to an altered amino acid sequence of the β -globin polypeptide.

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[Total: 15]

4 Fig. 6.1 shows a section of diseased artery from a smoker.

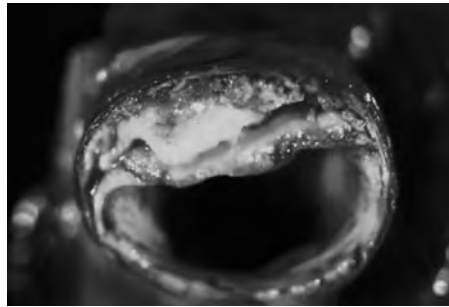


Fig. 6.1

(a) (i) With reference to Fig. 6.1, describe how this diseased artery differs in appearance from a healthy one.

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.....[2]

(ii) State one way in which nicotine in tobacco smoke affects arteries.

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.....[1]

(b) Arteries and capillaries have different structures related to their different functions.

For each type of blood vessel, give **one** structural feature and the function that it provides.

(i) artery:

structural feature

function

.....[2]

(ii) capillary:

structural feature

function

.....[2]

[Total: 7]