1 **(a)** An investigation was carried out into the effect on lung function on giving up smoking.

The investigators measured the maximum volume of air that could be exhaled in one second (FEV_1) in a group of people who had stopped smoking, and in a similar group of people who continued to smoke over a five year period.

The results are shown in Fig. 5.1.

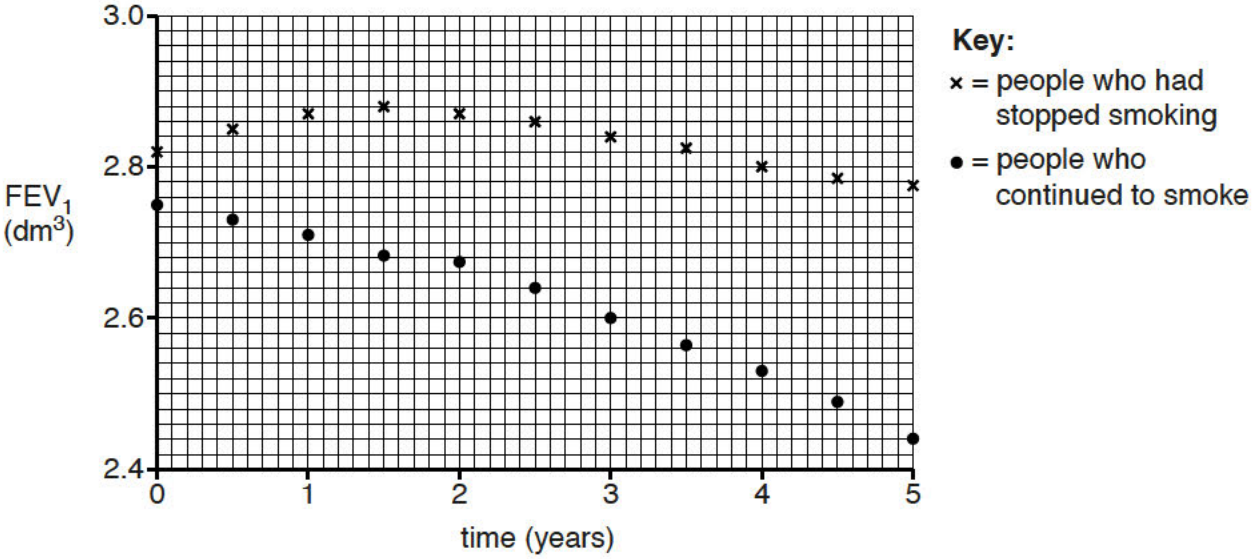


Fig. 5.1

(i) Using the information in Fig. 5.1, calculate the percentage decrease in the FEV_1 over the 5 year period for the group of people who **continued to smoke**.

Show your working. Give your answer to **one decimal place**.

Answer = ... % **[2]**

(ii) Describe the trends shown by the results in Fig. 5.1.

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..... **[4]**

(b) (i) One of the symptoms of smoking is the development of a smoker's cough.

Explain how smoking causes a smoker's cough **and** how the cough itself can lead to further problems in the lungs over a long period of time.



In your answer you should clearly distinguish between the development of the cough and the effects of prolonged coughing.

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(ii) Chronic obstructive pulmonary disease (COPD) is a combination of diseases that can result in coughing, breathing difficulties and fatigue.

Name **two** specific diseases that contribute to COPD.

1 .....

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

(iii) One form of COPD develops because enzymes are released by phagocytes entering the alveoli. This enzyme action can break down elastin in the lining of the bronchioles and alveoli.

Use the example of elastin breakdown to explain the induced-fit hypothesis of enzyme action.

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..... **[5]**

[Total: 20]

2 Fig. 1.1 shows an air sac and a capillary in the mammalian lung.

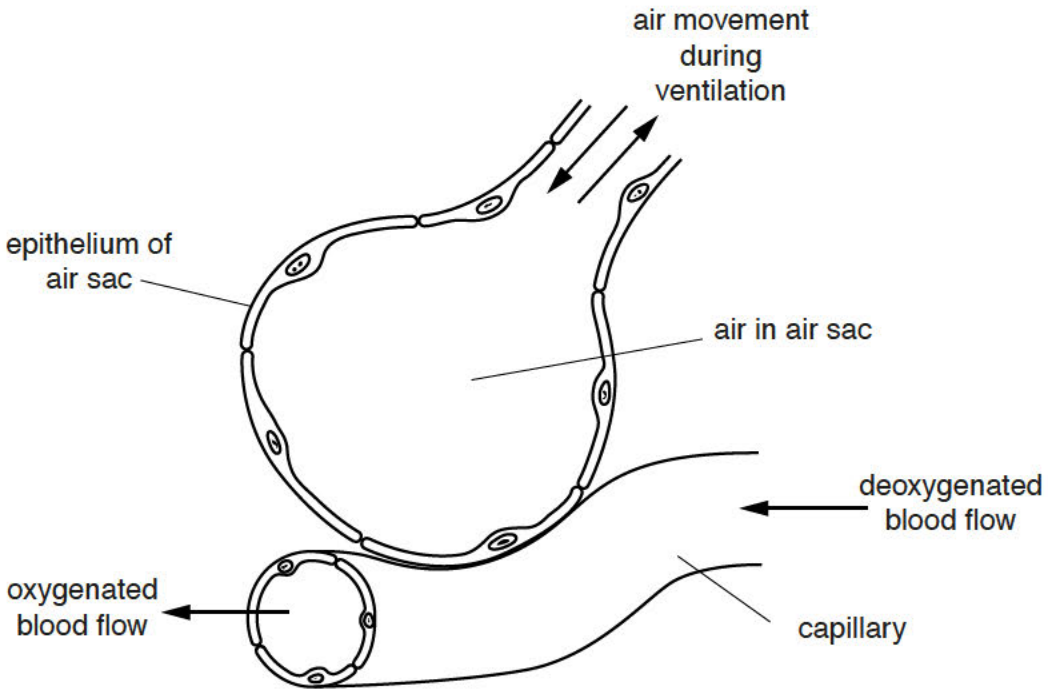


Fig. 1.1

(a) The mammalian lungs contain many air sacs.

(i) Name the air sacs **and** state why there are many air sacs in the lungs.

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

(ii) Name the type of epithelium in the walls of the air sacs.

..... **[1]**

(iii) The air sacs contain many elastic fibres.

Explain the role of these elastic fibres during ventilation.

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

(b) For efficient gaseous exchange to occur, a steep diffusion gradient must be maintained between the air in the air sacs and the blood.

A steep diffusion gradient can be maintained by ventilating the lungs. This refreshes the air in the air sacs.

(i) Explain how refreshing the air in the air sacs helps to maintain a steep diffusion gradient.

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

(ii) Describe **and** explain **one other** way in which a steep diffusion gradient is maintained in the lungs.

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

[Total: 9]

3 **(a)** Fig. 1.1, **on the insert**, shows an electron micrograph of cells from the liver.

(i) Some cells, such as liver cells, contain a lot of Golgi apparatus.

State **one** function of the Golgi apparatus.

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..... **[1]**

(ii) Suggest why the nuclear envelope contains pores.

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

(iii) State the function of the lysosomes.

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..... **[1]**

(b) The liver is an organ.

Explain what is meant by the term *organ*.

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

(c) Using the mammalian **gaseous exchange system** as an example, explain how the different cells and tissues enable the effective exchange of gases.



In your answer, you should use appropriate technical terms, spelt correctly.

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[Total: 11]

4 Fig. 5.1 shows a spirometer, which is used to investigate lung function.

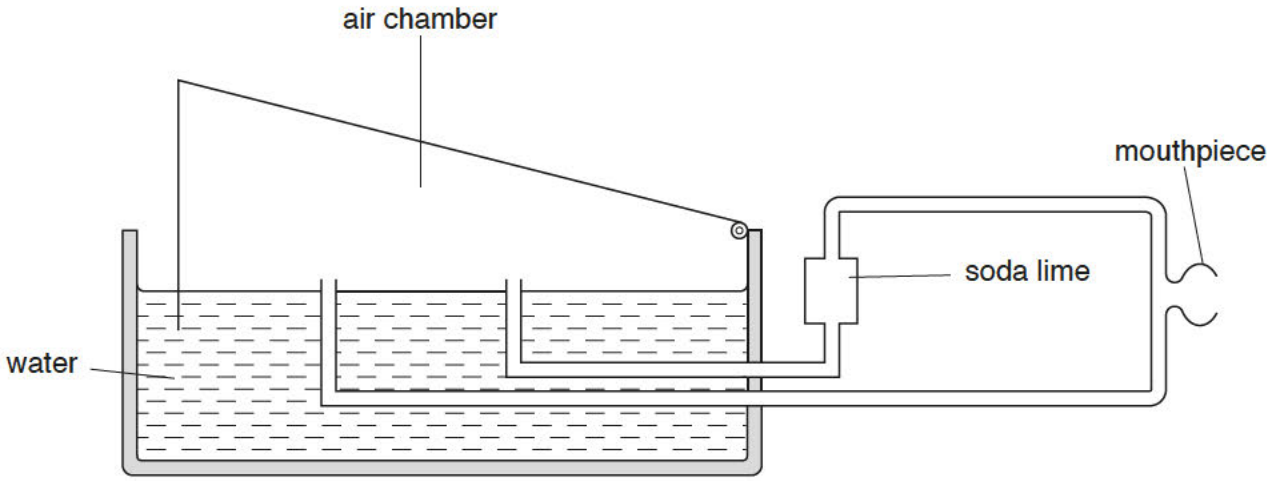


Fig. 5.1

(a) (i) Describe how the spirometer would be used to measure tidal volume.

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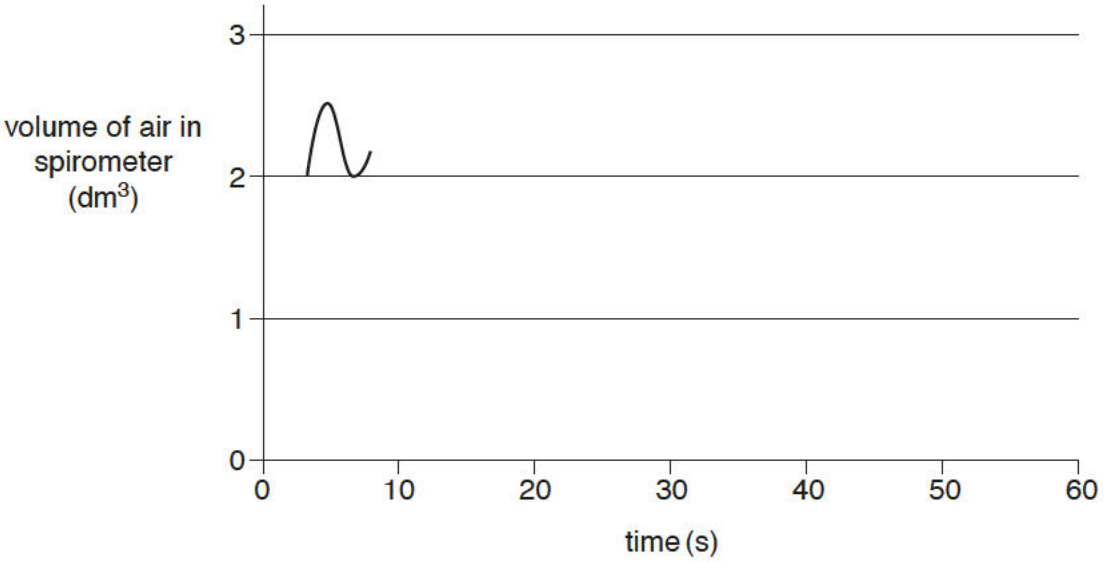
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..... **[3]**

(ii) Using the axes below, complete the spirometer trace that you expect to see recorded from a healthy sixteen year old over **ten further breaths**, while at rest.



[2]

(iii) Describe how you could use a spirometer trace to measure the rate of oxygen uptake.

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..... **[3]**

(b) Suggest **two** factors that should be considered when carrying out a risk assessment for an experiment using a spirometer.

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

[Total: 10]

5 Fig. 2.1 shows a drawing of a part of the lung.

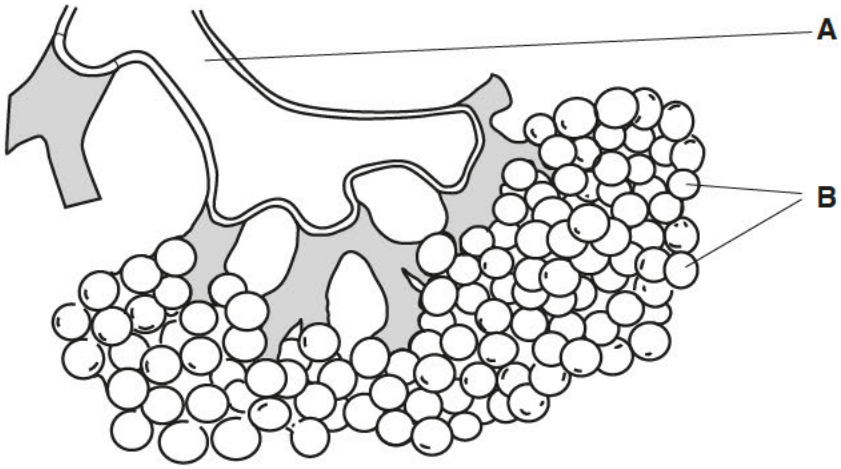


Fig. 2.1

(a) Name the structures labelled **A** and **B**.

A .....

B ..... **[2]**

(b) State **two** features of the structures labelled **B** that enable efficient gaseous exchange.

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

(c) As part of an allergic response, certain cells in the lungs release histamine.

Histamine is a cell signalling molecule that stimulates smooth muscle in the wall of structure **A** to contract.

Suggest how histamine stimulates smooth muscle contraction.

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

(d) Another action of histamine is to make capillary walls more permeable.

Suggest **two** effects this increased permeability may have on the surrounding tissues.

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[Total: 8]