

# Exchange Surfaces

## Question Paper 3

Level	A Level
Subject	Biology
Exam Board	OCR
Module	Exchange and transport
Topic	Exchange Surfaces
Booklet	Question Paper 3

**Time allowed:** 65 minutes

**Score:** /48

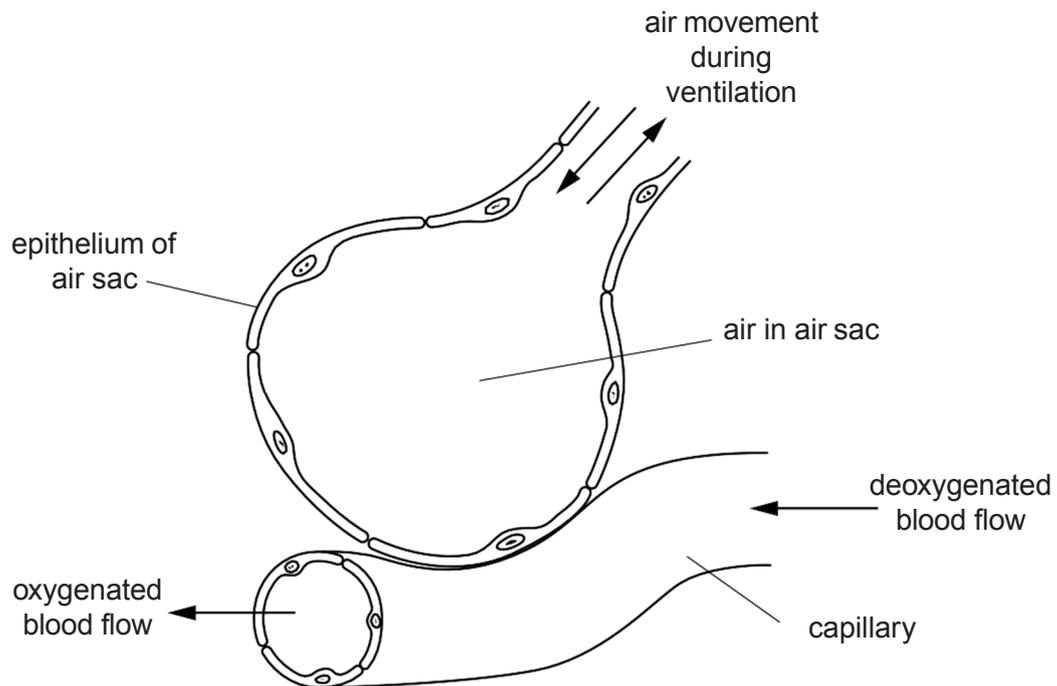
**Percentage:** /100

### Grade Boundaries:

A*	A	B	C	D	E
>69%	56%	50%	42%	34%	26%

## Question 1

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.

[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.

[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.

[2]

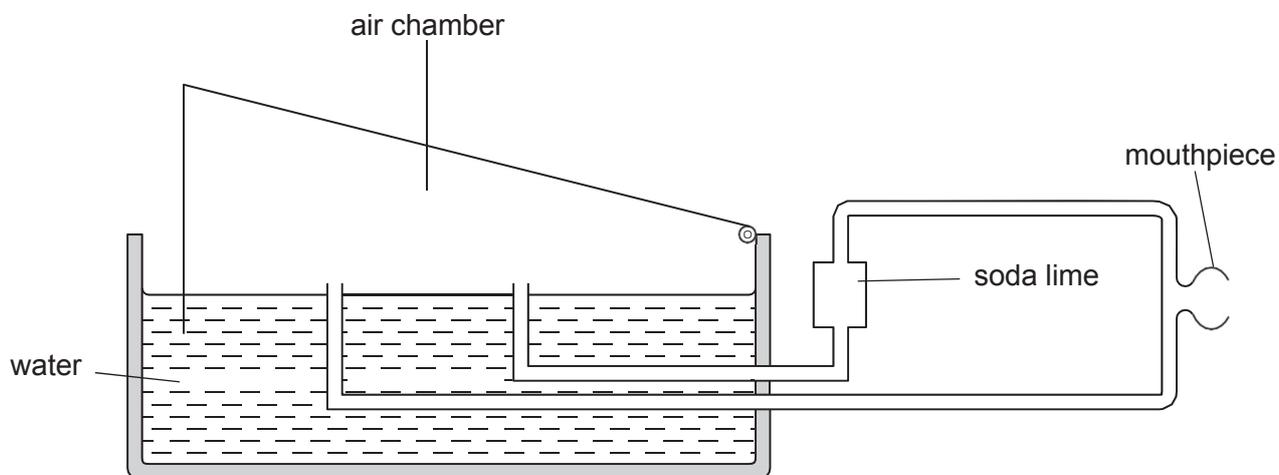
(ii) Describe **and** explain **one other** way in which a steep diffusion gradient is maintained in the lungs.

[2]

[Total: 9]

## Question 2

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

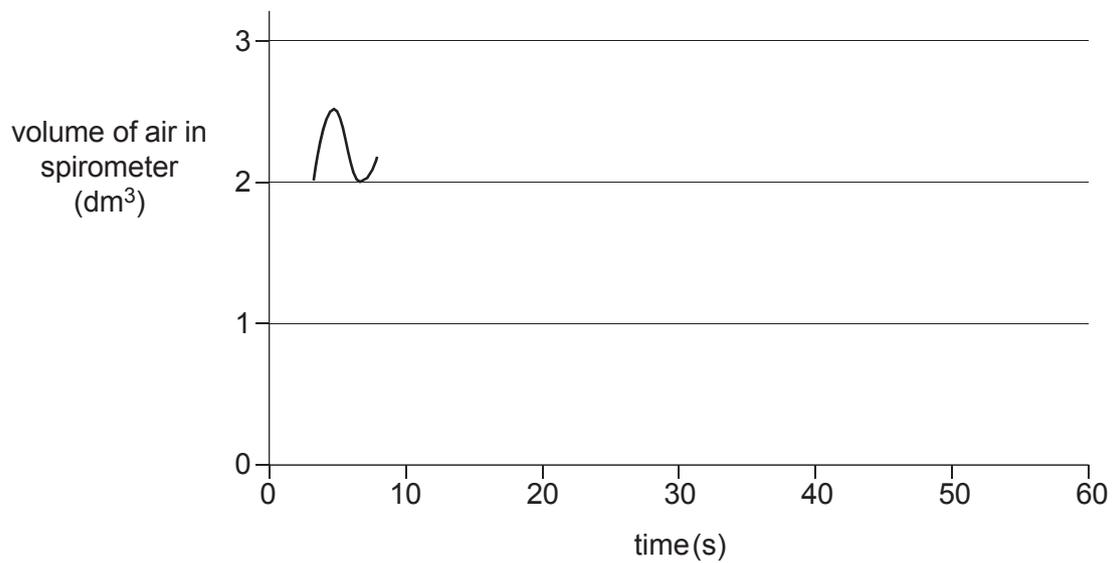


**Fig. 5.1**

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

**[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. [3]

- (b) Suggest **two** factors that should be considered when carrying out a risk assessment for an experiment using a spirometer. [2]

[Total: 10]

### Question 3

Fig. 6.1 is a diagram of a spirometer, a piece of apparatus used to measure some aspects of breathing, such as breathing rate and vital capacity.

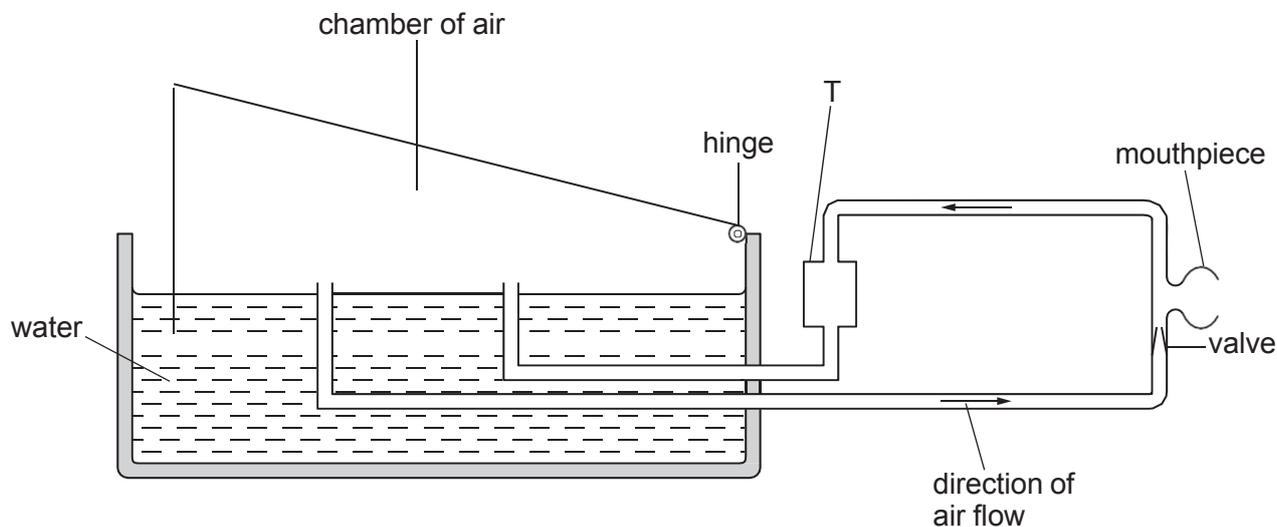


Fig. 6.1

(a) (i) Outline the mechanism of **inspiration**.



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

[3]

(ii) A person breathes through the mouthpiece of a spirometer.

State what happens to the air chamber in Fig. 6.1 during **inspiration**.

[1]

(iii) Chamber **T** contains a chemical that absorbs carbon dioxide.

Suggest a chemical that could be used in chamber **T** to absorb carbon dioxide.

[1]

(b) Explain why a person using the spirometer to measure their vital capacity should wear a nose clip. [2]

(c) State **two** other precautions that should be taken when using a spirometer to measure vital capacity. [2]

[Total: 9]

## Question 4

Fig. 1.1 (a) is a diagram of a part of a mammalian lung.

Fig. 1.1 (b) is an enlargement of part of the lining of the bronchus.

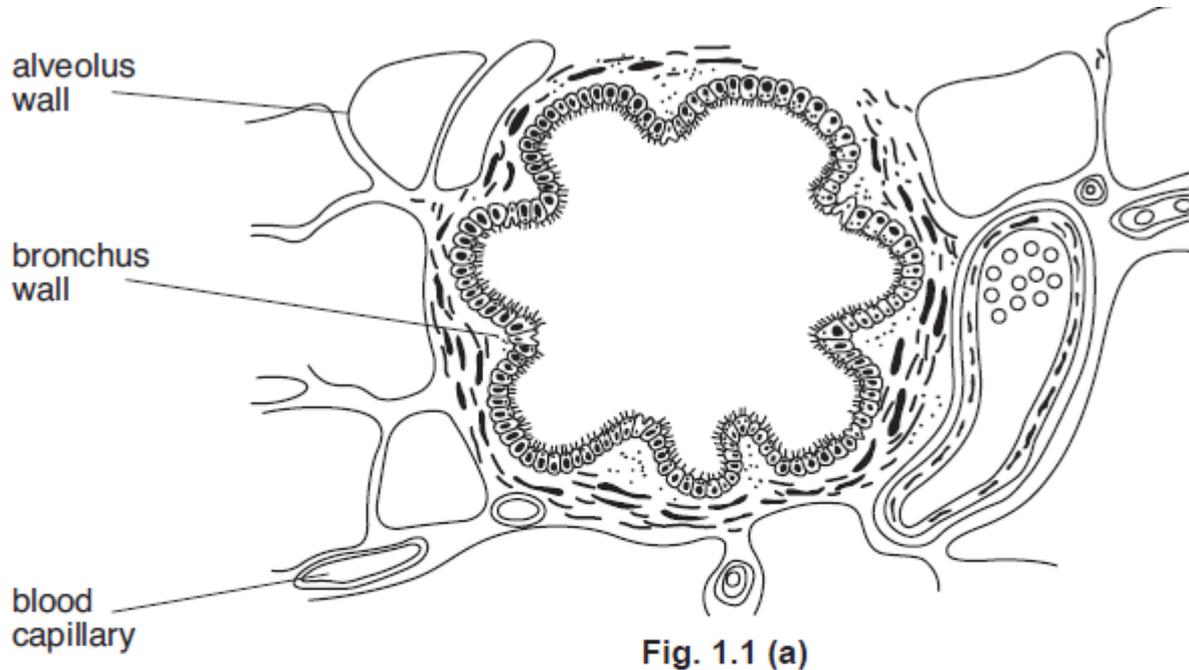


Fig. 1.1 (a)

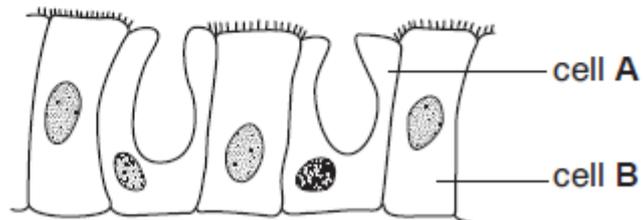


Fig. 1.1 (b)

(a) (i) Name the two types of cell, **A** and **B**, shown lining the **bronchus**. [2]

**A**

**B**

(ii) Describe how cell types **A** and **B** work together to keep the lung surface clear of dust and other particles. [3]

(iii) The bronchus wall also contains smooth muscle fibres.

State the function of the smooth muscle fibres.

**[1]**

(b) (i) Explain why blood capillaries and alveoli are very close together.

**[2]**

(ii) The walls of the alveoli contain elastic fibres.

State the function of these elastic fibres.

**[1]**

**[Total: 9]**

## Question 5

- (a) Explain, using the term **surface area to volume ratio**, why large, active organisms need a specialised surface for gaseous exchange.

[2]

- (b) Table 4.1 describes some of the features of the mammalian gas exchange system.

Complete the table by explaining how each feature improves the efficiency of gaseous exchange. The first one has been completed for you.

**Table 4.1**

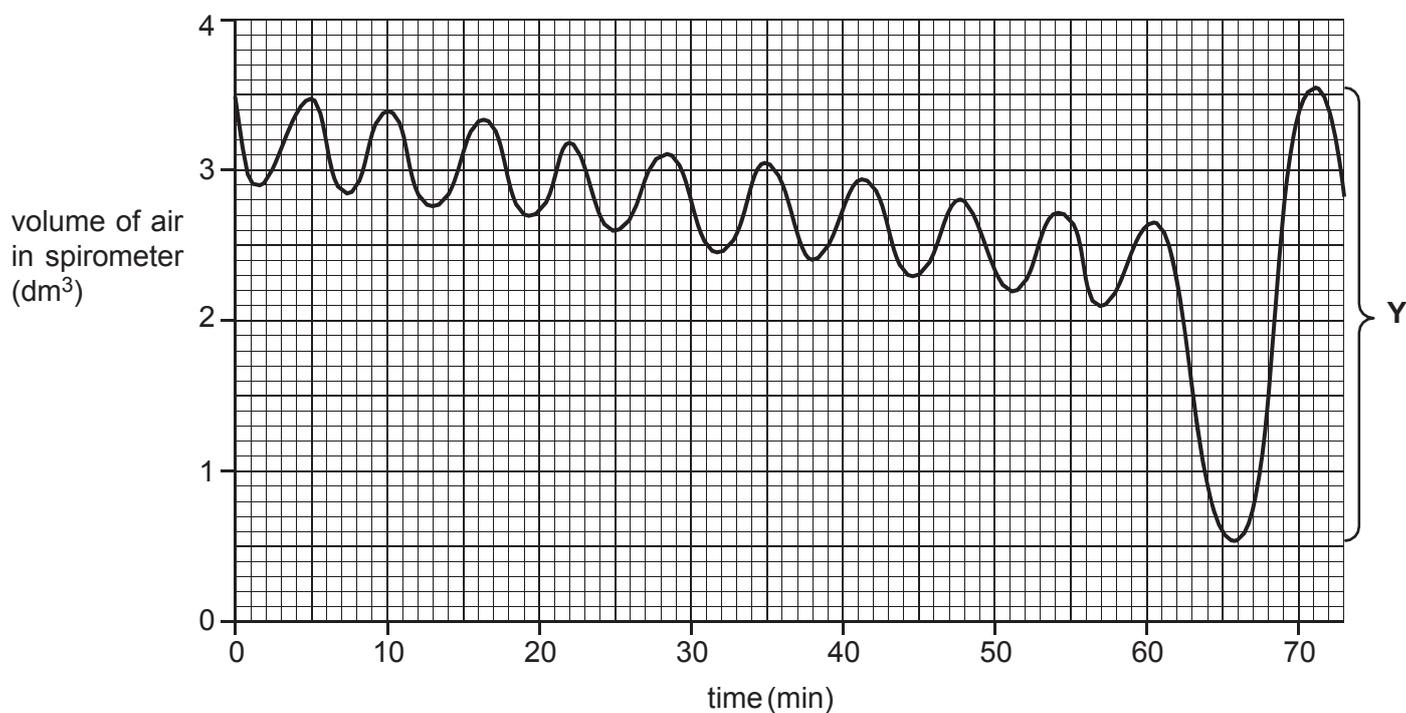
[3]

feature of gas exchange system	how feature improves efficiency of gaseous exchange
many alveoli	this increases the surface across which oxygen and carbon dioxide can diffuse
the epithelium of the alveoli is very thin	
there are capillaries running over the surface of the alveoli	
the lungs are surrounded by the diaphragm and intercostal muscles	

(c) Outline how the diaphragm **and** intercostal muscles cause **inspiration**.

[4]

(d) Fig. 4.1 shows the trace from a spirometer recorded from a 16-year-old student.



**Fig. 4.1**

(i) **Label on the trace**, using the letter **X**, a point that indicates when the student was inhaling. [1]

(ii) At the end of the trace the student measured his vital capacity. This is indicated by the letter **Y**.  
State the vital capacity of the student. [1]

[Total: 11]