

OCR AS GCE Biology (17 pages)

F211 Cells, Transport and Exchange

Exam questions from January 2009-June 2012

Topics:

Module 2 Exchange and Transport

1.2.1 Exchange Surfaces and Breathing

Explain, in terms of surface area:volume ratio, why multicellular organisms need specialised exchange surfaces and single-celled organisms do not

Describe the features of an efficient exchange surface, with reference to diffusion of oxygen and carbon dioxide across an alveolus;

Describe the features of the mammalian lung that adapt it to efficient gaseous exchange;

Describe, with the aid of diagrams and photographs, the distribution of cartilage, ciliated epithelium, goblet cells, smooth muscle and elastic fibres in the trachea, bronchi, bronchioles and alveoli of the mammalian gaseous exchange system;

Describe the functions of cartilage, cilia, goblet cells, smooth muscle and elastic fibres in the mammalian gaseous exchange system;

Outline the mechanism of breathing (inspiration and expiration) in mammals, with reference to the function of the rib cage, intercostal muscles and diaphragm;

Explain the meanings of the terms *tidal volume* and *vital capacity*;

Describe how a spirometer can be used to measure vital capacity, tidal volume, breathing rate and oxygen uptake;

Analyse and interpret data from a spirometer

- 4 (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

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	

[3]

Answer all the questions.

1 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.

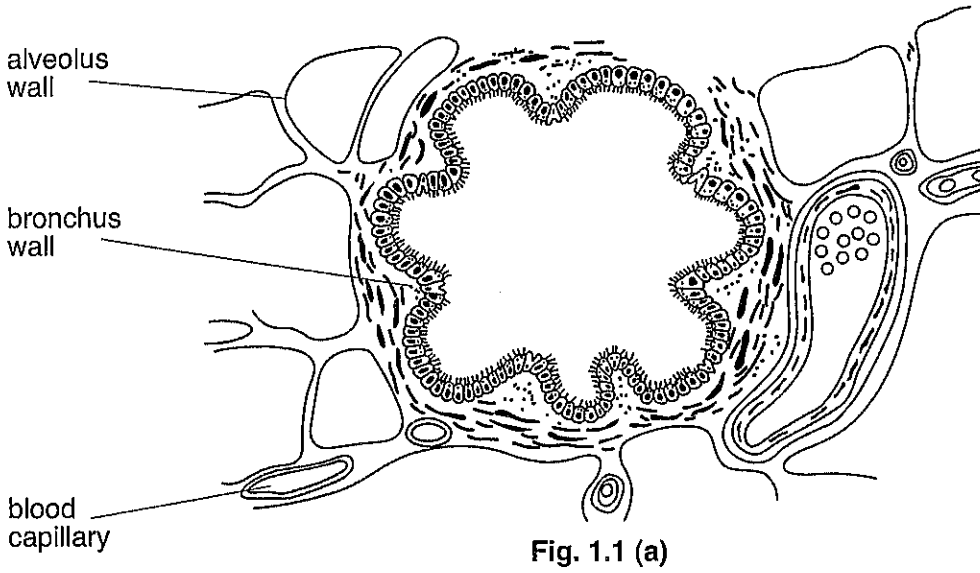


Fig. 1.1 (a)

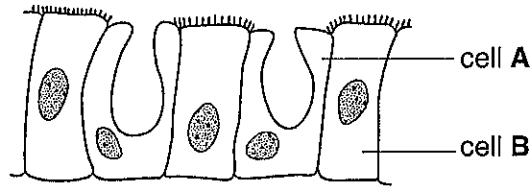


Fig. 1.1 (b)

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

A

B [2]

(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]

2 (a) (i) Explain what is meant by the term *tissue*.

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

(ii) Name **one** type of epithelial tissue found in the lungs.

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

(b) Explain why the lungs can be considered to be an organ.

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

(c) In the lungs, goblet cells secrete mucus. The mucus is then moved by cilia.

Name **one** cellular structure from the list below that is associated with each of the following functions. You must select a structure *once* only.

mitochondria ribosome Golgi vesicle centriole nucleus cytoskeleton

(i) release of energy

(ii) movement of cilia

(iii) secrete mucus [3]

[Total: 8]

6 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.

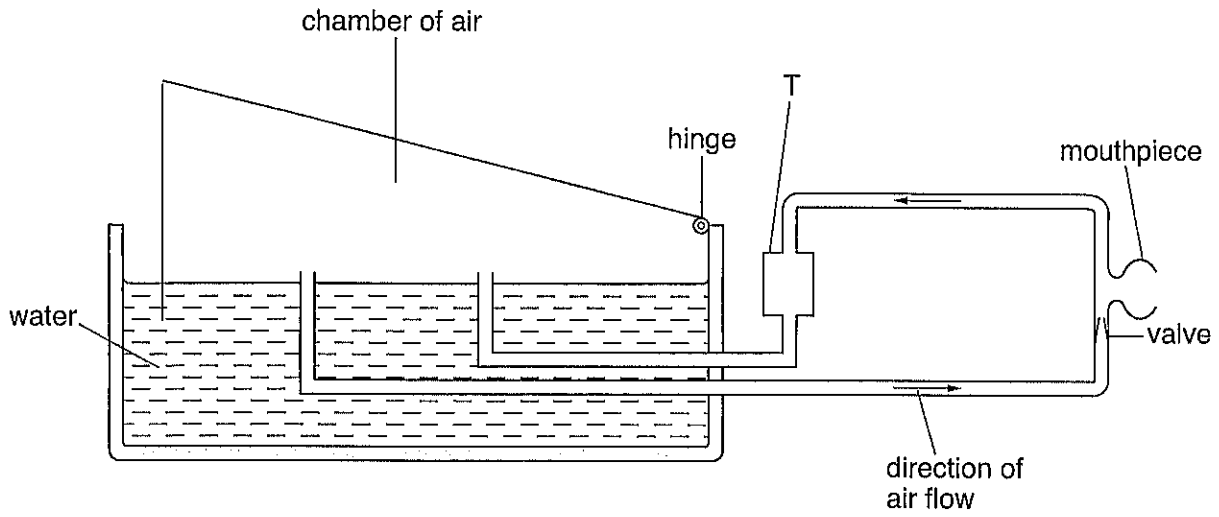


Fig. 6.1

(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]

QUESTION 6(b) STARTS ON PAGE 12

(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.

1

.....

2

..... [2]

[Total: 9]

END OF QUESTION PAPER



Copyright Information

OCR is committed to seeking permission to reproduce all third-party content that it uses in its assessment materials. OCR has attempted to identify and contact all copyright holders whose work is used in this paper. To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced in the OCR Copyright Acknowledgements Booklet. This is produced for each series of examinations, is given to all schools that receive assessment material and is freely available to download from our public website (www.ocr.org.uk) after the live examination series.

If OCR has unwittingly failed to correctly acknowledge or clear any third-party content in this assessment material, OCR will be happy to correct its mistake at the earliest possible opportunity.

For queries or further information please contact the Copyright Team, First Floor, 9 Hills Road, Cambridge CB2 1GE.

OCR is part of the Cambridge Assessment Group; Cambridge Assessment is the brand name of University of Cambridge Local Examinations Syndicate (UCLES), which is itself a department of the University of Cambridge.

(c) The mammalian gas exchange system contains a variety of types of cells and tissues.

Complete Table 1.1, stating the function of each of the cells and tissues. The first row has been completed for you.

Table 1.1

cell / tissue	function
squamous epithelium	to provide a thin surface for a short diffusion distance
elastic tissue
ciliated epithelium
goblet cells
smooth muscle

[4]

[Total: 11]

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

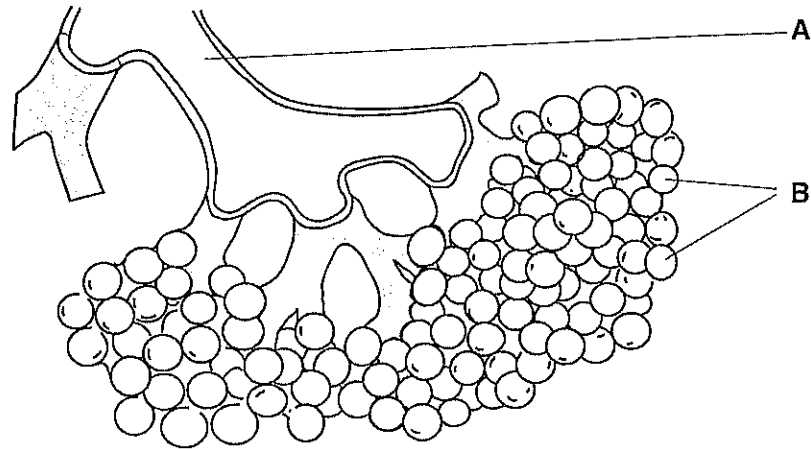


Fig. 2.1

(a) Name the structures labelled A and B.

A

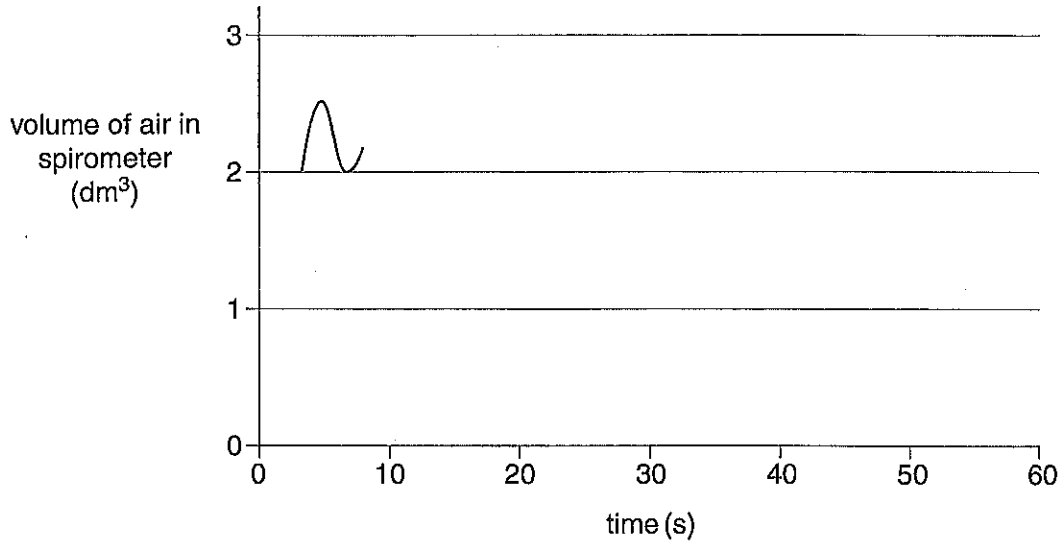
B

[2]

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

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

- (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]

Answer all the questions.

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

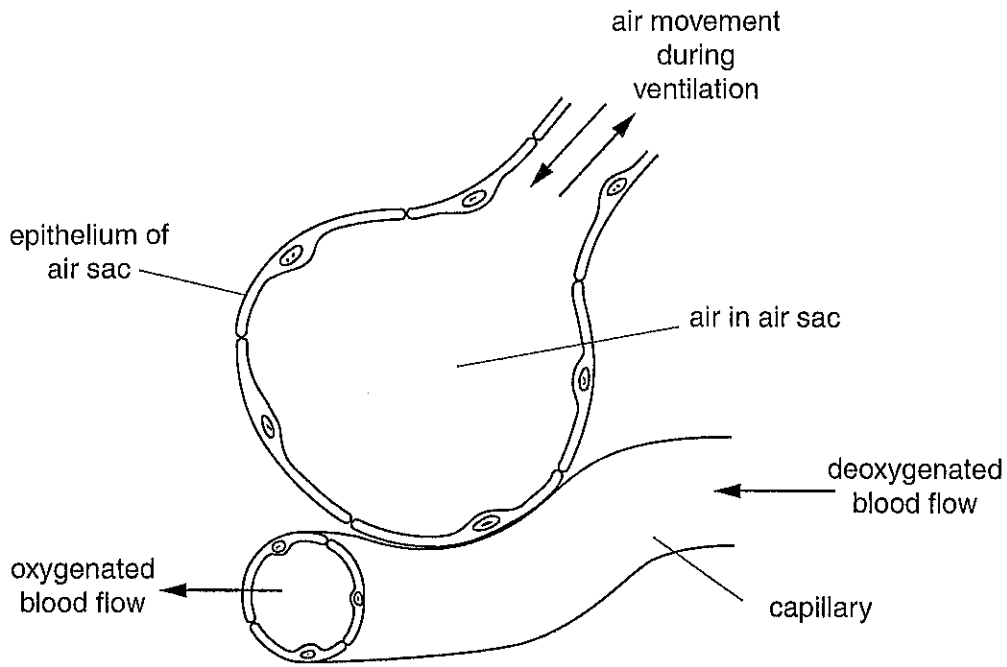


Fig. 1.1

(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]

5 Fig. 5.1 shows the changes in the volume of air in the lungs of a student at rest during one breath.

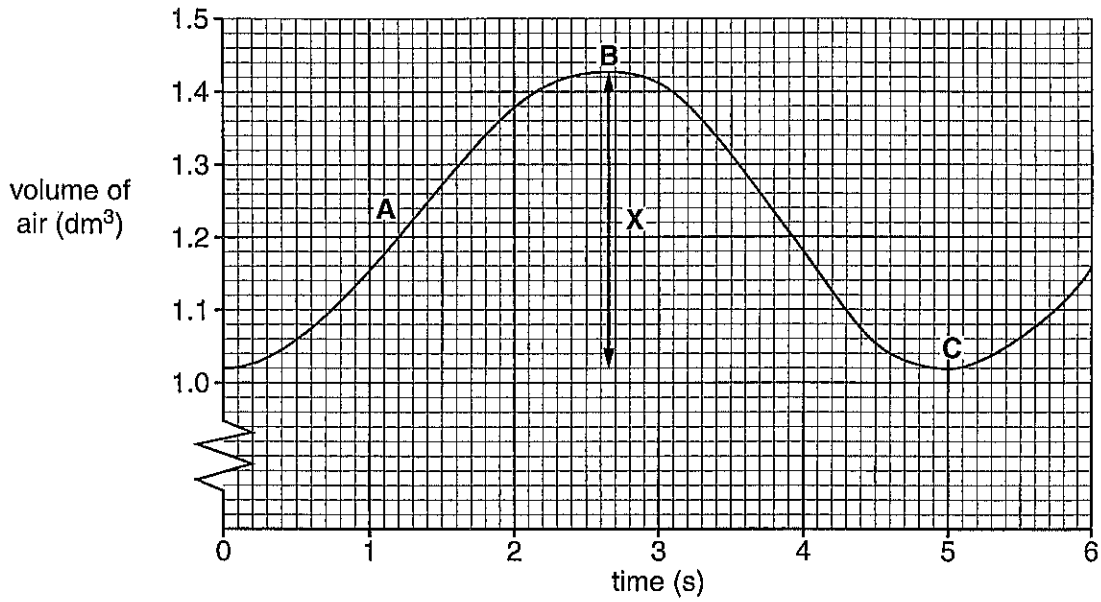


Fig. 5.1

(a) (i) Name the measurement represented by the line X.

..... [1]

(ii) What is happening to the elastic fibres in the walls of the alveoli at point A?

..... [1]

