



ADVANCED SUBSIDIARY GCE
HUMAN BIOLOGY
Molecules, Blood and Gas Exchange

F221



Candidates answer on the Question Paper

OCR Supplied Materials:

- None

Other Materials Required:

- Electronic calculator
- Ruler (cm/mm)

Tuesday 12 January 2010
Morning

Duration: 1 hour



Candidate Forename					Candidate Surname				
-----------------------	--	--	--	--	----------------------	--	--	--	--

Centre Number						Candidate Number			
---------------	--	--	--	--	--	------------------	--	--	--

INSTRUCTIONS TO CANDIDATES

- Write your name clearly in capital letters, your Centre Number and Candidate Number in the boxes above.
- Use black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully and make sure that you know what you have to do before starting your answer.
- Answer **all** the questions.
- Do **not** write in the bar codes.
- Write your answer to each question in the space provided, however additional paper may be used if necessary.

INFORMATION FOR CANDIDATES

- The number of marks is given in brackets [] at the end of each question or part question.
- The total number of marks for this paper is **60**.
-  Where you see this icon you will be awarded marks for the quality of written communication in your answer.
- You may use an electronic calculator.
- You are advised to show all the steps in any calculations.
- This document consists of **16** pages. Any blank pages are indicated.

Answer **all** the questions.

- 1 (a) The cells in the human body and in plants are eukaryotic cells.

State what is meant by a *eukaryotic cell*.

..... [1]

- (b) The different organelles within a cell may be seen using an electron microscope.

Fig. 1.1 is an electron micrograph of a plant cell showing cell organelles. The organelle labelled **D** is shown at a higher magnification in Fig. 1.2.



Fig. 1.1

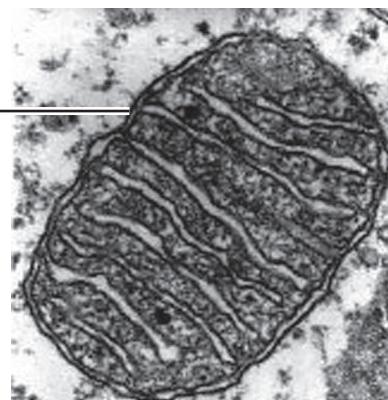


Fig. 1.2

- (i) Name the cell organelles labelled **A** to **C** in Fig. 1.1.

A

B

C

[3]

- (ii) State **one** function of each of the organelles labelled **D** to **F**.

D

E

F [3]

- (c) Fig. 1.3 is an electron micrograph showing a lymphocyte.

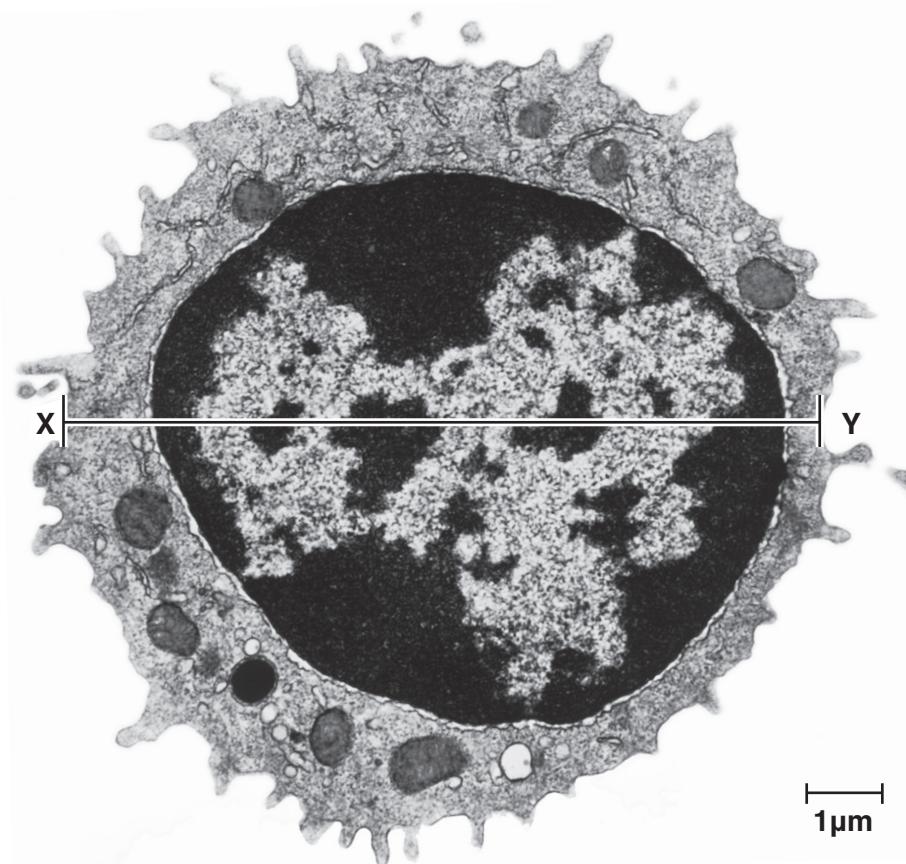


Fig. 1.3

Use the scale bar in Fig. 1.3 to calculate the actual diameter of the cell along the line **X – Y**.

Show your working **and** give your answer **to the nearest whole number**.

Answer = µm [2]

[Total: 9]

Turn over

- 2 A student, Jack, is taking part in an investigation into the effect of exercise on heart rate. Jack started to pedal on an exercise bike and stopped pedalling after 5 minutes.

Jack's heart rate was measured by taking his pulse rate at rest, and then again at one-minute intervals during the five minutes of exercise.

The procedure was repeated three times and the data were recorded in Table 2.1.

Table 2.1

time (min)	pulse rate (beats per minute)			
	replicate 1	replicate 2	replicate 3	mean
0	64	66	65	65
1	68	68	70	69
2	102	92	92	95
3	118	116	124	119
4	138	144	140	141
5	140	148	146	145

- (a) Describe how **pulse rate** can be measured by a method **other than** using a pulse rate monitor.

.....

 [3]

- (b) (i) Using the information in Table 2.1, describe the effect of exercise on Jack's **heart rate**.

.....

 [2]

- (ii) Explain the effect you have described in your answer to (i).

.....
.....
.....
.....
.....
.....
.....
.....

[3]

- (c) (i) State **two** safety precautions that should have been taken before Jack took part in the investigation.

1
.....
.....
2
.....

[2]

- (ii) Suggest **one** reason why the procedure was repeated three times.

.....
.....
.....

[1]

[Total: 11]

- 3 A circulatory system transports many materials around the body.

Fig. 3.1 shows a diagram of the double circulatory system of the human body. This system is an example of a closed circulatory system.

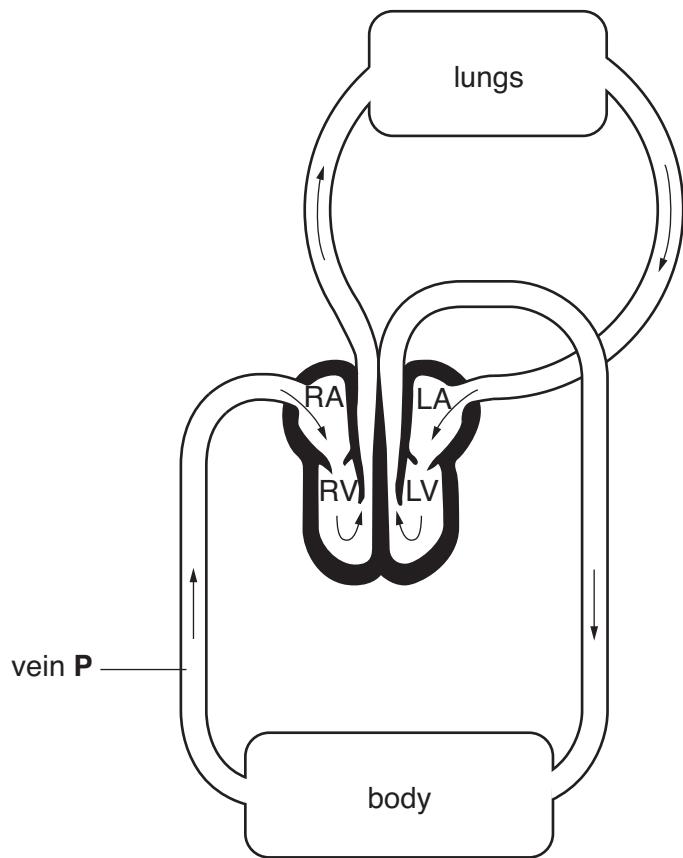


Fig. 3.1

- (a) (i) Explain what is meant by the terms 'double circulatory system' and 'closed circulatory system'.

double circulatory system

closed circulatory system

[2]

- (ii) Give **two** advantages of a double circulatory system.

.....
.....
.....
.....

[2]

- (iii) Give **two** reasons why large organisms such as humans need a circulatory system.

.....
.....
.....
.....

[2]

- (b) Fig. 3.2 is a diagram of a cross section through **vein P** from Fig. 3.1.

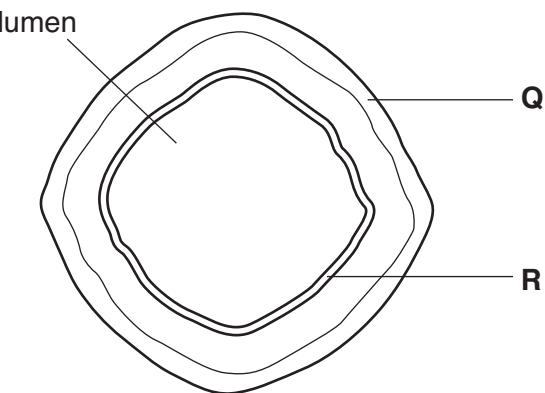


Fig. 3.2

- (i) **Name** vein **P**.

..... [1]

- (ii) Name the parts of the vein labelled **Q** and **R** in Fig. 3.2.

Q

R [2]

- (iii) Explain how a vein is adapted to carry out its function.

[3]

[Total: 12]

BLANK PAGE

PLEASE DO NOT WRITE ON THIS PAGE

QUESTION 4 STARTS ON PAGE 10

- 4 (a)** Proteins are an important component of blood plasma. Some of these proteins are enzymes.

Fig. 4.1 shows a three-dimensional model of the enzyme, thrombin, found in blood plasma, together with its substrate.

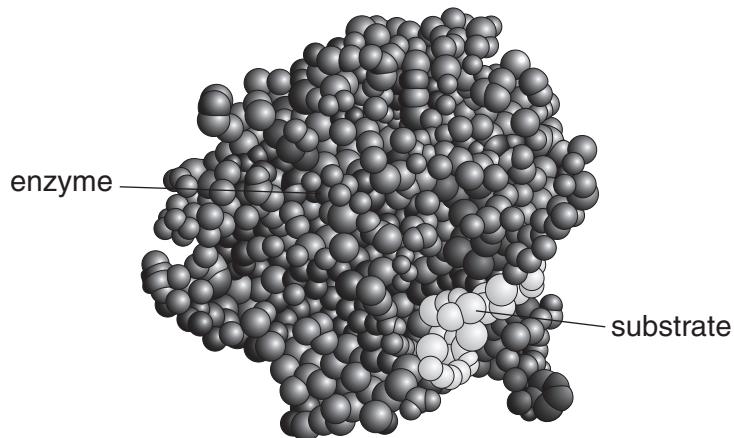


Fig. 4.1

Enzymes such as thrombin are globular proteins.

- (i) Describe the **tertiary** structure of a globular protein.



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

[4]

[4]

- (ii) Explain how the structure of the enzyme thrombin enables it to catalyse the conversion of fibrinogen to fibrin during the blood clotting process.

[3]

- (b) Afibrogenaemia is a rare condition in which there is a low concentration of fibrinogen in the blood.

Describe and explain the effect of a low concentration of fibrinogen on blood clotting time.

[4]

[Total: 11]

- 5 (a) Humans have a specialised gas exchange surface in the lung.

Fig. 5.1 is a photomicrograph of the tissue in the lung.

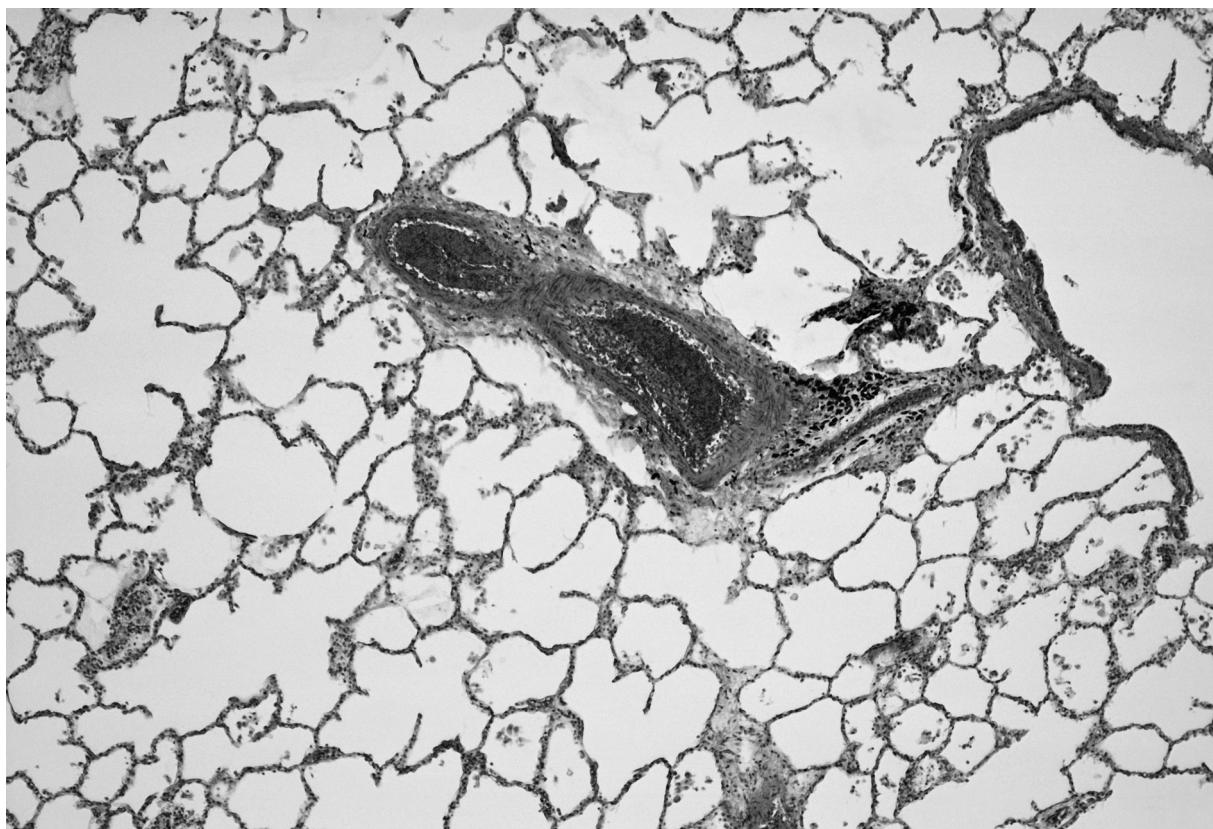


Fig. 5.1

Describe **how** the lung provides each of the following four conditions needed for an efficient gas exchange surface:

- large surface area
- thin surface
- steep diffusion gradient across the surface
- protection from drying out.

large surface area
.....
.....

thin surface
.....
.....

steep diffusion gradient across the surface
.....
.....
.....
.....

protection from drying out
.....
.....

[5]

(b) Elastic fibres are found in the lung.

(i) State where elastic fibres are found in the lung.

..... [1]

(ii) Describe the role of these elastic fibres.

.....
.....
.....

[2]

[Total: 8]

6 Lipids are a group of substances that are insoluble in water.

(a) Triglycerides are examples of lipids that are often used as energy stores in humans.

Fig. 6.1 is a diagram of a triglyceride molecule.

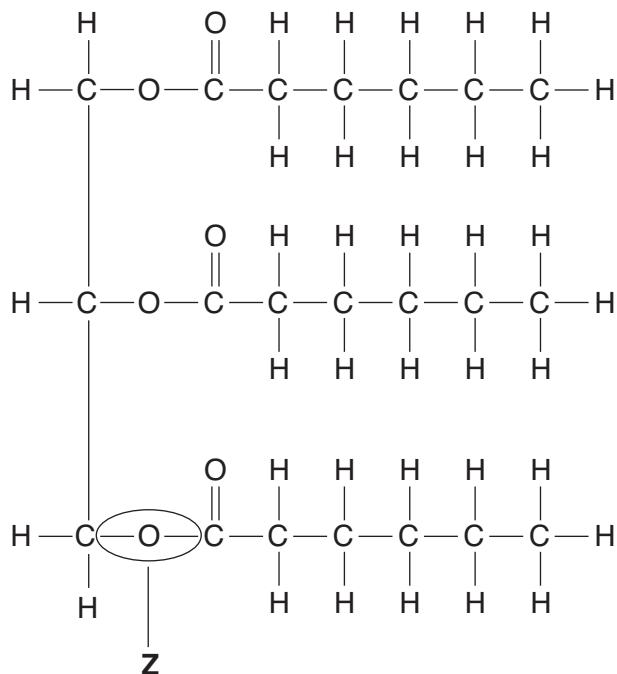


Fig. 6.1

(i) Name the type of bond labelled Z on Fig. 6.1.

..... [1]

(ii) Describe how bond Z is formed.



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

.....
.....
.....
.....

[3]

- (b) A phospholipid is another example of a lipid molecule.
- (i) State **two** ways in which the **structure of a phospholipid** molecule differs from a triglyceride molecule.

1

.....

2

..... [2]

- (ii) Describe the properties of phospholipid molecules that help them to carry out their function in cells.

.....

.....

.....

.....

.....

.....

.....

..... [3]

[Total: 9]

END OF QUESTION PAPER

PLEASE DO NOT WRITE ON THIS PAGE



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.