THIS IS A NEW SPECIFICATION

OCR
RECOGNISING ACHIEVEMENT

ADVANCED SUBSIDIARY GCE

HUMAN BIOLOGY

Molecules, Blood and Gas Exchange

F221

Candidates answer on the question paper

OCR Supplied Materials:
- Insert (inserted)

Other Materials Required:
- Electronic calculator
- Ruler (cm/mm)

Thursday 8 January 2009
Morning

Duration: 1 hour

CUP/T70637

Candidate Forename		Candidate Surname	

Centre Number						Candidate Number				

INSTRUCTIONS TO CANDIDATES

- Write your name in capital letters, your Centre Number and Candidate Number in the boxes above.
- Use blue or 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.

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**.
- You may use an electronic calculator.
- You are advised to show all the steps in any calculations.
- Where you see this icon you will be awarded marks for the quality of written communication in your answer.
- This document consists of **16** pages. Any blank pages are indicated.

FOR EXAMINER'S USE		
Qu.	**Max.**	**Mark**
1	**10**	
2	**10**	
3	**9**	
4	**15**	
5	**7**	
6	**9**	
TOTAL	**60**	

SPA SHW 00240 4/08 T70637/3

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Answer **all** the questions.

1 **(a)** Leucocytes and palisade mesophyll cells are examples of eukaryotic cells.

Complete the table below to **compare** the structure of a leucocyte and a palisade mesophyll cell.

Give **two** structural differences and **two** structural similarities.

	leucocyte	palisade mesophyll cell
structural differences	1	....
	2	....
structural similarities	1	
	2	

[4]

(b) Fig. 1.1 is a diagram of a leucocyte.

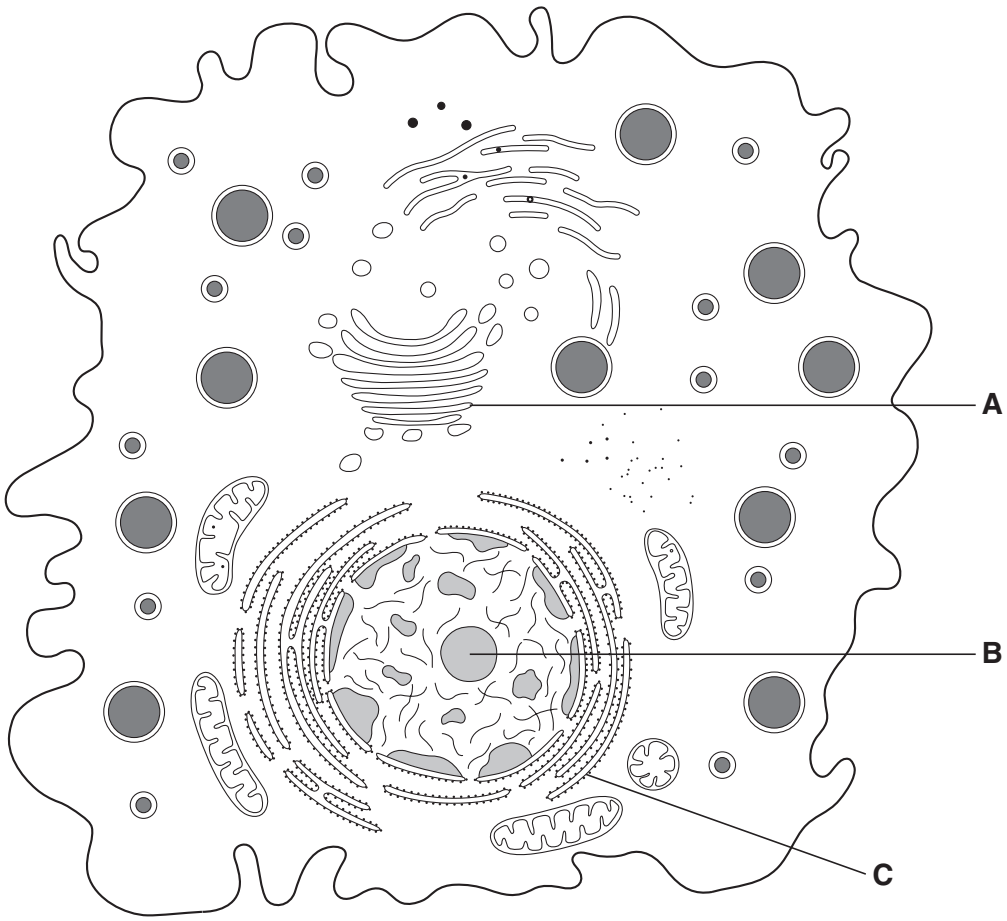

Fig. 1.1

The structures labelled **A**, **B** and **C** in Fig. 1.1 are involved in protein production and secretion.

Outline the roles of these structures in the production and secretion of protein.

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

(c) Fig. 1.2, **on the insert**, is an electronmicrograph of an erythrocyte (red blood cell).

Describe how the structure of this cell is related to its function.

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

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

[Total: 10]

2 Many different types of molecule are present in the structures of the human body.

(a) Biological molecules contain different elements.

Complete the table below, indicating with a tick (✓) the elements that are **present** in each of the molecules listed.

	element				
molecule	carbon	hydrogen	nitrogen	oxygen	phosphorus
amino acid					
glucose					
glycogen					
phospholipid					

[4]

(b) Proteins in cell surface membranes are involved in the transport of molecules into and out of cells.

Name **one** method by which glucose is transported across membranes.

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

(c) Ornithine is one of the amino acids that combine to form protein in hair.

(i) Name the type of bond that joins adjacent amino acids to form the **primary** structure of a protein molecule and describe the type of reaction that creates this bond.

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

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

In post-menopausal women, the growth of excessive facial hair can occur. One treatment to slow down the growth of this hair is the use of a cream containing eflornithine.

Eflornithine acts to inhibit the enzyme ornithine decarboxylase by attaching permanently to the enzyme. This prevents the formation of the proteins that form hair.

(ii) Eflornithine may attach to ornithine decarboxylase at a position away from the active site.

Suggest how eflornithine inhibits the action of the enzyme.

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

[Total: 10]

3 Emma works in a wine bar. When she was collecting empty glasses from the tables, she tripped and fell. As she fell, she landed heavily on the wine glasses, breaking them and cutting her arm badly, leaving pieces of glass in the wound. Emma was given first-aid treatment before being taken to hospital.

(a) Describe the procedure that a first-aider should carry out to prevent Emma losing too much blood.

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

(b) When Emma was taken to hospital, the doctor decided that she needed a transfusion of whole blood.

Suggest why it would be more appropriate for Emma to be given a transfusion of whole blood rather than one consisting of packed red cells.

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

(c) The blood given to Emma would **not** have contained calcium ions. Explain why the National Blood Service (blood transfusion service) removes calcium ions from donated blood before it is stored.

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

[Total: 9]

4 **(a)** Fig. 4.1, **on the insert**, is a drawing of an external view of a human heart.

Name the structures labelled **D** to **H**.

D .....

E .....

F .....

G .....

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

(b) Fig. 4.2 shows pressure changes in the **left** side of the heart and the aorta during one cardiac cycle.

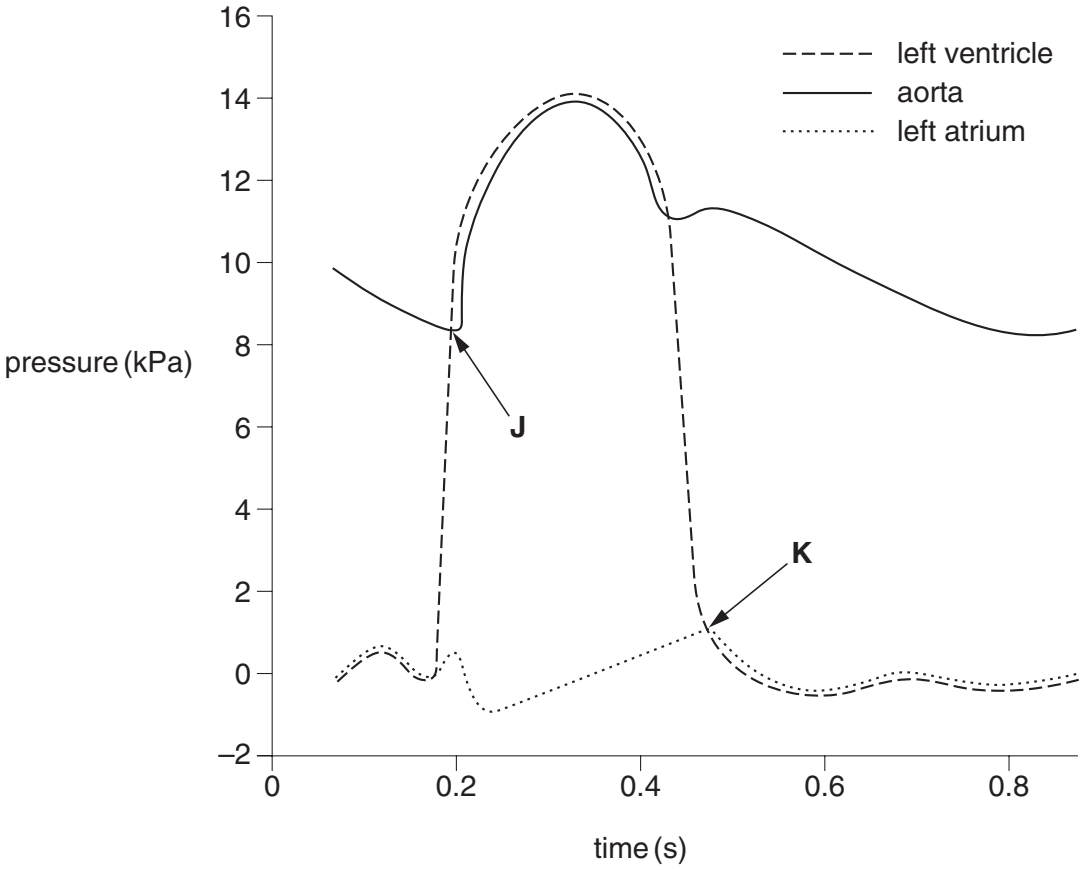

Fig. 4.2

(i) State what is happening at **J** and **K**.

J .....

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

(ii) A similar, but not identical, pattern would be seen if the pressures in the **right** side of the heart had been measured.

State how the pressures in the right side of the heart would differ from those on Fig. 4.2 **and** explain why.

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

(iii) Soon after the **left** ventricle begins to contract, the pressure in the **left** atrium begins to increase.

State why the pressure in the **left atrium** increases.

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

(c) An investigation was carried out using two student volunteers, Sam and David.

- Sam is a sports science student and trains on a regular basis.
- David takes little exercise.

Their heart rates and stroke volumes were measured while they were at rest and when undergoing a period of exercise at the local gym. The results are shown in Table 4.3.

Table 4.3

	heart rate (beats min^{-1})	stroke volume (cm^3)	cardiac output ($cm^3\,min^{-1}$)
Sam at rest	55	98	5390
Sam during exercise	127	146	
David at rest	76	70	5320
David during exercise	148	105	15540

(i) Calculate the cardiac output for **Sam** during exercise.

Show your working.

Answer = ... $cm^3\,min^{-1}$ **[2]**

(ii) Table 4.3 shows that, at rest, Sam has a low heart rate.

Explain why he has a higher cardiac output than David **under the same conditions**.

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

[Total: 15]

5 An understanding of the structure and function of the lungs and associated organs is important to people working in the emergency services and to those training for sport.

Complete the passage by selecting the most suitable word(s) from the list below.

ciliated	**oil**	**surfactant**
collagen	**osmosis**	**three**
contract	**recoil**	**two**
diffusion	**squamous**	**volume**
elastic	**surface area**	

The bronchi and bronchioles are lined with …… epithelium. In the lungs, the alveoli provide a very large …… for gas exchange. The air in the alveoli is separated from the blood in the capillaries by …… layers of very thin cells. The gases carbon dioxide and oxygen are exchanged between the blood and the air by the process of …… .

The connective tissue between the alveoli contains …… fibres which …… when the air is breathed out. The inner surfaces of the alveoli are lined with fluid produced by the epithelium. The fluid keeps the epithelium moist and contains …… to reduce surface tension and prevent the alveoli from sticking together. **[7]**

[Total: 7]

6 Fig. 6.1 is a diagram showing the structure of a capillary.

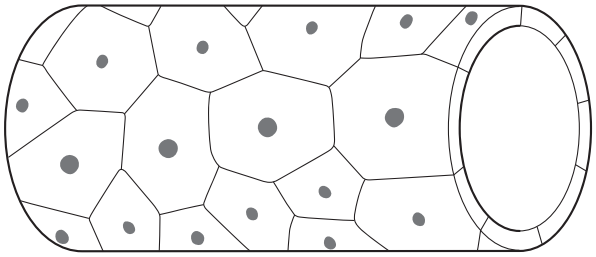

Fig. 6.1

(a) Using Fig. 6.1, complete the table below by:

- stating **three** features that help capillaries to carry out their function effectively
- explaining how each feature helps with the exchange of materials between the blood and tissue fluid.

feature of capillary	explanation of how feature helps in exchange

[6]

(b) Hydrostatic pressure (HP) is the pressure of the blood in a capillary pressing against the wall of the capillary. A high hydrostatic pressure tends to force fluid out of the capillary.

Fig. 6.2 shows some hydrostatic pressures, measured in arbitrary units, which contribute to the exchange of materials between the blood in the capillary and the surrounding tissue fluid.

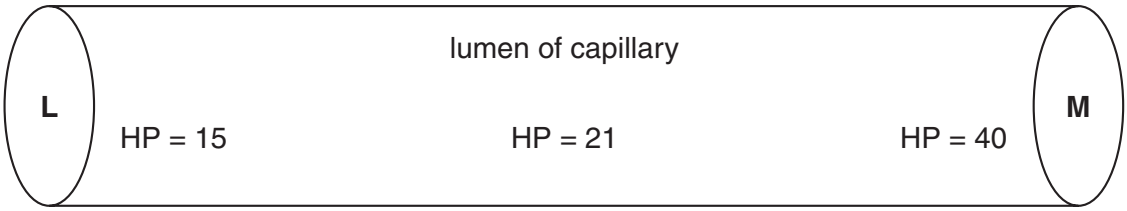

Fig. 6.2

(i) State, **with a reason**, which end, **L** or **M**, represents the venous end of the capillary.

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

(ii) People who spend long periods of time sitting without walking around can suffer from swollen ankles. This condition is known as oedema.

Suggest how oedema might be caused by this inactivity.

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

[Total: 9]

END OF QUESTION PAPER

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