



**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)

**Monday 1 June 2009**

**Afternoon**

**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.

<b>FOR EXAMINER'S USE</b>		
Qu.	Max.	Mark
1	13	
2	10	
3	14	
4	8	
5	9	
6	6	
<b>TOTAL</b>	<b>60</b>	

Answer **all** the questions.

1 (a) The human body contains many different cells and molecules.

Place the following in order of **increasing** size, starting with the smallest.

- amino acid
- enzyme
- epithelial cell
- phospholipid
- water molecule

*smallest* .....

.....

.....

.....

*largest* ..... [3]

(b) Taking blood samples may pose risks.

Explain why each of the following precautions is necessary when a blood sample is taken.

(i) Sterile equipment is used.

.....

..... [1]

(ii) A tourniquet is placed around the arm, above the sampling point.

.....

..... [1]

(iii) The blood sample is taken from a vein, rather than an artery.

.....

..... [1]

- (c) Once a blood sample has been taken, a blood smear (film) may be prepared and then stained.

Fig. 1.1, **on the insert**, is a light micrograph of a blood smear.

- (i) The cell labelled **A** in Fig. 1.1 is a monocyte.

Monocytes are a type of leucocyte. Other types of leucocyte include neutrophils and lymphocytes.

Describe how monocytes can be distinguished from other types of leucocyte in a stained blood smear such as the smear shown in Fig. 1.1.

.....

.....

.....

..... [2]

- (ii) Monocytes develop into macrophages. One role of macrophages is to engulf and break down nuclei from maturing red blood cells (erythrocytes).

Suggest **where** the digestion and breakdown of red blood cell nuclei may occur.

..... [1]

- (iii) State **one** advantage of removing the nuclei from maturing red blood cells.

..... [1]

Blood smears may appear different from that shown in Fig. 1.1. The appearance of a smear can reveal information about the person from whom the blood sample was taken.

- (d) Suggest why a blood smear may show:

- (i) a large number of leucocytes;

..... [1]

- (ii) a large number of platelets.

..... [1]

- (e) Suggest **one** reason why an abnormally large number of erythrocytes may be found in a blood sample.

..... [1]

[Total: 13]



Table 2.1 shows data relating to three patients, **C**, **D** and **E**, before and after treatment with a bronchodilator drug.

**Table 2.1**

patient	age (years)	before treatment			after treatment		
		vital capacity (dm <sup>3</sup> )	FEV1 (dm <sup>3</sup> )	percentage lung function	vital capacity (dm <sup>3</sup> )	FEV1 (dm <sup>3</sup> )	percentage lung function
<b>C</b>	18	5.5	3.8	69	5.6	4.5	
<b>D</b>	45	5.3	3.6	68	5.5	4.0	73
<b>E</b>	78	3.8	2.2	58	3.8	2.2	58

- (c) (i) Calculate the percentage lung function for patient **C** after treatment with the bronchodilator drug.

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

Answer = ..... % [2]

- (ii) Using the information in Table 2.1 and your answer to (c)(i), indicate with a tick (✓) in the table below a diagnosis for each patient.

patient	diagnosis	
	asthma	COPD
<b>C</b>		
<b>D</b>		
<b>E</b>		

[3]

[Total: 10]

3 (a) Fig. 3.1 is a diagram showing the conduction pathways in the human heart.

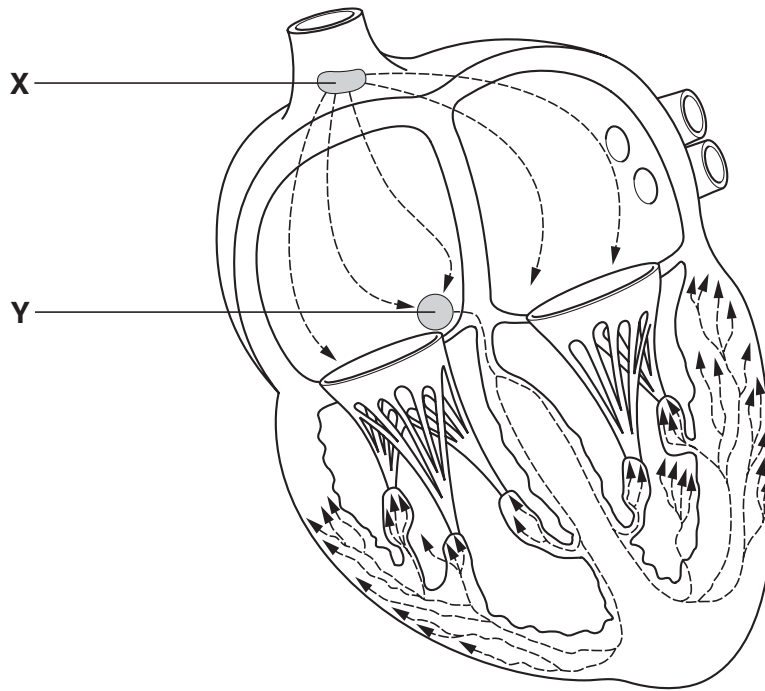


Fig. 3.1

(i) Identify X and Y.

X .....

Y ..... [2]

(ii) Describe the roles of X and Y in the coordination of the heartbeat.

.....

.....

.....

.....

.....

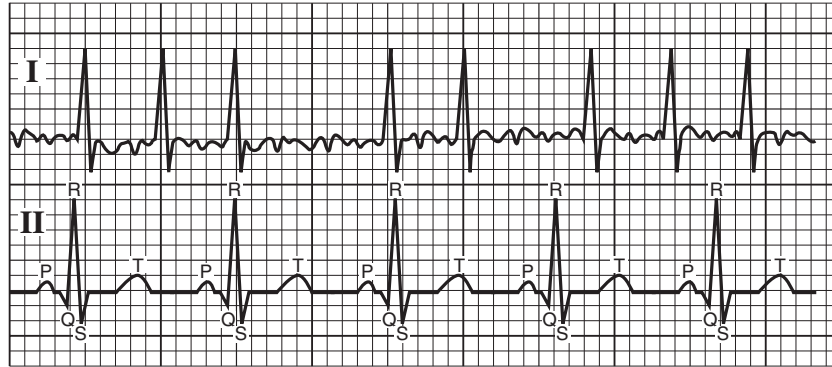
.....

.....

..... [3]

(b) An electrocardiogram (ECG) can be used to detect certain heart abnormalities.

Fig. 3.2 shows two ECG traces.



key:

**I** trace showing heart abnormality – atrial fibrillation

**II** normal trace

**Fig. 3.2**

(i) State **three** ways in which trace **I** differs from trace **II**.

- 1 .....
- .....
- 2 .....
- .....
- 3 .....
- ..... [3]

(ii) In atrial fibrillation, blood flow slows and can even stop. This can result in ‘pooling’ of the blood in certain places in the circulatory system.

Using the information in Fig. 3.2 to help you, suggest why blood flow slows.

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







5 (a) Fig. 5.1, **on the insert**, is a light micrograph of a section through two blood vessels.

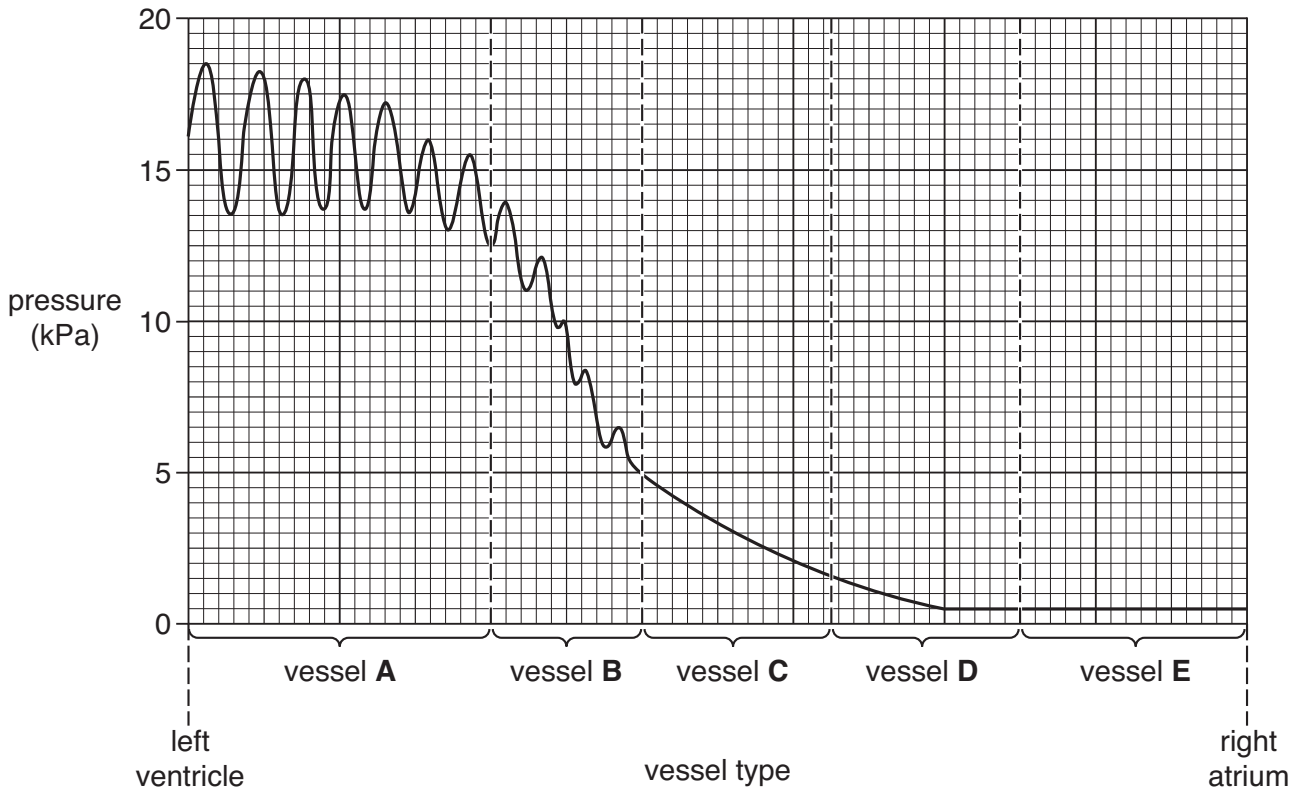
(i) Name the type of blood vessel labelled **G**.

..... [1]

(ii) How does the structure of the vessel type labelled **H** relate to its function?

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

(b) Fig. 5.2 shows the changes in blood pressure as blood passes through the circulatory system.



**Fig. 5.2**

Complete the following passage by writing the most appropriate word or term in each of the spaces.

Use the information in Fig. 5.2 to help you.

Blood is distributed around the human body by mass flow. The blood flow in the circulatory system is contained within blood vessels and the system is therefore said to be a ..... system. The pressure in the different vessels varies with the type of vessel. The pressure is lowest in vessels of type **E**, which are called ....., and which return blood to the heart. These vessels have ..... to prevent the backflow of blood. Pressure fluctuates in vessels of type **B**, which are known as ....., because of the pulsing of blood from the heart. Pressure then falls as the blood passes through vessels of type **C**, known as ....., where materials are exchanged between the blood and tissue fluid. [5]

[Total: 9]

- 6 (a) Table 6.1 shows the concentration of certain ions inside an erythrocyte and in the plasma surrounding it.

**Table 6.1**

ion	concentration (arbitrary units)	
	erythrocyte	plasma
chloride	7	121
hydrogencarbonate	15	34
potassium	136	5
sodium	12	138

Using the information in Table 6.1, suggest which of these ions corresponds to each of the statements below.

Write 'none' if none of these ions corresponds to the statement.

- (i) Enters the erythrocyte by active transport.

..... [1]

- (ii) Leaves the erythrocyte by active transport.

..... [1]

- (iii) Moves through the cell surface membrane by exocytosis.

..... [1]



**14**  
**BLANK PAGE**

**PLEASE DO NOT WRITE ON THIS PAGE**

15  
BLANK PAGE

PLEASE DO NOT WRITE ON THIS PAGE

**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](http://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 1PB.

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.