



ADVANCED SUBSIDIARY GCE
HUMAN BIOLOGY
Molecules, Blood and Gas Exchange

F221

Tuesday 25 May 2010
Morning

Duration: 1 hour

Candidates answer on the Question Paper.

OCR Supplied Materials:
None

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




Candidate Forename		Candidate Surname	
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Centre Number						Candidate Number				
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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. If additional space is required, you should use the lined pages at the end of this booklet. The question number(s) must be clearly shown.

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 Fig. 1.1 is a diagram of the mammalian respiratory system.

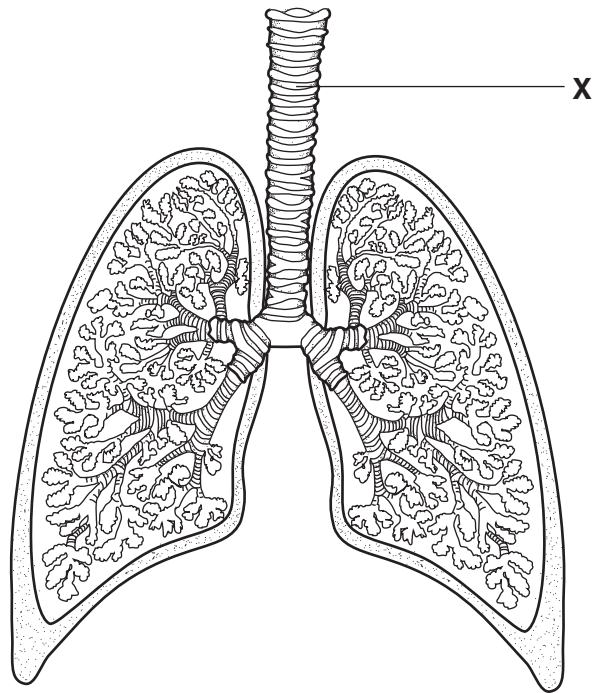


Fig. 1.1

(a) Name organ **X**.

..... [1]

(b) Explain why **X** is described as an organ.

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

(c) Organ **X** is lined with ciliated epithelial tissue, the function of which is to prevent bacteria and dust from entering the lungs.

(i) Define the term *tissue*.

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

- (ii) In addition to ciliated epithelial cells, name one other type of cell present in the tissue lining organ **X** and state the function of this cell.

type of cell

function

..... [2]

- (d) Fig. 1.2 is a photomicrograph of a section through a lung showing alveoli and blood capillaries.

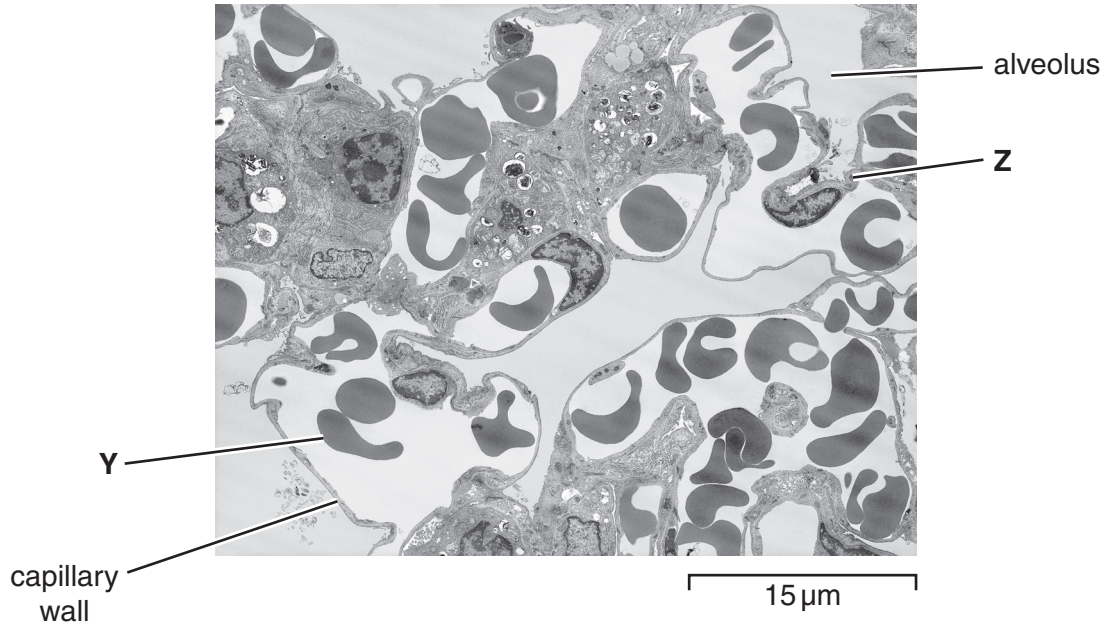


Fig. 1.2

- (i) Identify cells **Y** and **Z**.

cell **Y**

cell **Z** [2]

- (ii) Calculate the magnification of the photomicrograph.

Show your working. Give your answer to the nearest whole number.

Answer = \times [2]

[Total: 10]

Turn over


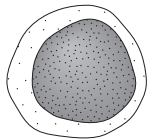
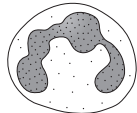
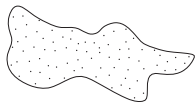
2 Blood consists of several types of cell or cell fragments suspended in plasma.

(a) Complete Table 2 by stating one function for each type of cell or cell fragment.

The first one has been done for you.

The cells are not drawn to scale.

Table 2

cell	diagram	function
erythrocyte		transport of oxygen as oxyhaemoglobin
lymphocyte		
neutrophil		
platelet		

[3]

(b) State **one similarity** between the structure of:

(i) a platelet and an erythrocyte.

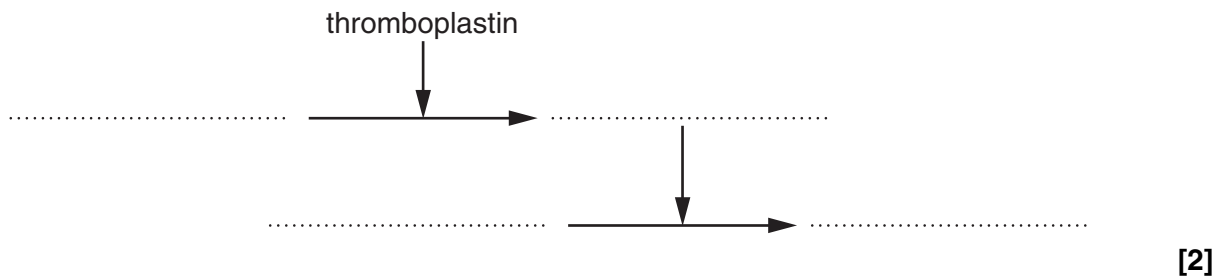
.....
..... [1]

(ii) a platelet and a neutrophil.

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

(c) Damage to blood vessels results in bleeding. When this happens, a cascade of reactions within the blood takes place to seal the wound and prevent continued blood loss. Enzymes in the blood control these reactions.

(i) Complete the diagram below to show the relationship between the enzyme-controlled reactions involved in the clotting process.



(ii) Von Willebrand's disease is an inherited disease that affects the blood clotting process.

In some cases of von Willebrand's disease, a protein clotting factor is present but does not function correctly.

Suggest why a protein clotting factor may not function correctly.

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

[Total: 8]

3 A laboratory technician was helping a trainee to identify abnormal blood cell counts from a blood smear. A microscope and a special counting chamber were used.

(a) Name the counting chamber used by the technician to count blood cells.

..... [1]

(b) Fig. 3.1 is a diagram showing a view of erythrocytes (red blood cells) within the counting chamber as seen by the technician and the trainee.

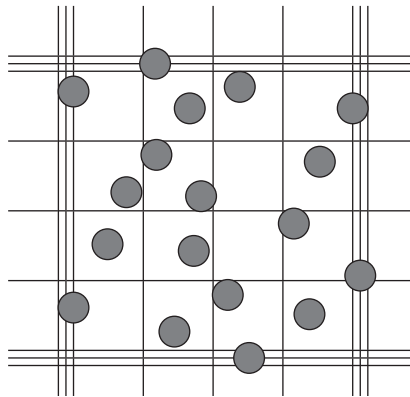


Fig. 3.1

The trainee counted 18 cells, which did not agree with the number counted by the technician.

(i) What is the correct cell count?

..... [1]

(ii) Explain how the number of cells could have been **miscounted** by the trainee.

.....

 [2]

(iii) The volume of diluted blood over one of the squares in the counting chamber was calculated at 0.00025 mm^3 . Describe what other information had to be taken into account by the technician when calculating a **reliable** total for the number of cells in 1 mm^3 of blood.

.....

 [2]

(iv) The technician recorded the final accurate count. This count showed that the blood sample came from a person with a lower number of erythrocytes than expected.

Suggest **one** possible reason a person may have a low erythrocyte count.

..... [1]

(c) The technician then showed the trainee how a similar procedure could be used to count leucocytes (white blood cells).

When preparing a blood sample for viewing leucocytes:

- a diluting fluid is added to the sample
- the diluting fluid causes the erythrocytes to burst
- the sample is then stained using a differential stain.

(i) Suggest why the diluting fluid is used to burst the erythrocytes.

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

(ii) Explain why the technician used a differential stain **in this case**.

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

(d) Describe how a blood film is prepared **and** stained for viewing under a microscope.

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

[Total: 13]

Turn over

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QUESTION 5 STARTS ON PAGE 10

(b) Fig. 5.1 is an internal view of the heart, viewed from above. The atria have been removed to show the valves.

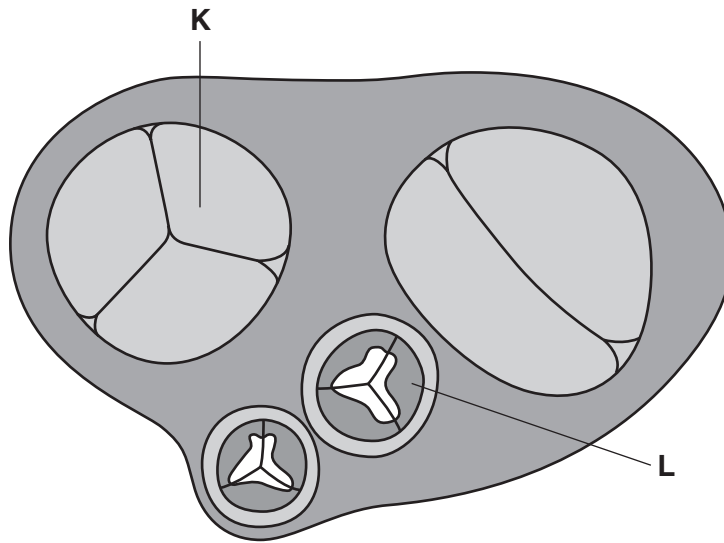


Fig. 5.1

(i) Name the valves labelled **K** and **L**.

K

L [2]

(ii) Heart murmurs are sounds made by blood flowing through the heart's chambers or valves, or through blood vessels near the heart. Some murmurs are due to a narrowing (stenosis) of the atrio-ventricular valves in the heart.

Suggest at which stage of the cardiac cycle murmurs may be heard.

.....
 [1]

[Total: 8]

6 When blood is taken from a donor, it is not always used directly for transfusion.

- Most of the donated blood is processed to produce a number of blood products which can be stored until required.
- Stored **whole blood** may be used for transfusions in cases of severe blood loss.
- Blood for transfusion must be stored in conditions that ensure it is suitable for use when required.
- Field hospitals that are set up in remote areas must provide suitable storage for blood products even when temperatures rise as high as +58 °C or drop as low as –26 °C.

(a) Name **one** other stored blood product **and** state what it is used for.

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

(b) Donated blood must be screened for the human immunodeficiency virus (HIV).

Describe how donated blood is screened for the presence of the HIV virus.

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

(c) (i) Explain why **whole blood** products must not be **stored** at temperatures of -26°C in field hospitals.

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

(ii) Name **one** factor, other than temperature, which must be controlled when storing whole blood **and** explain why this factor must be controlled.

factor

why it must be controlled

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

[Total: 9]

END OF QUESTION PAPER

