

Monday 14 May 2012 – Morning

AS GCE HUMAN BIOLOGY

F221 Molecules, Blood and Gas Exchange

Candidates answer on the Question Paper.

OCR supplied materials:

None

Other materials required:

- Electronic calculator
- Ruler (cm/mm)

Duration: 1 hour




Candidate forename		Candidate surname	
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Centre number						Candidate number				
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INSTRUCTIONS TO CANDIDATES

- Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
- Use black ink. HB pencil may be used for graphs and diagrams only.
- Answer **all** the questions.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- Write your answer to each question in the space provided. If additional space is required, you should use the lined page at the end of this booklet. The question number(s) must be clearly shown.
- Do **not** write in the bar codes.

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 **20** pages. Any blank pages are indicated.

Answer **all** the questions.

1 Blood is a liquid tissue. It consists of cells suspended in the watery fluid called plasma.

(a) Explain why blood can be described as a *tissue*.

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

(b) The following blood components are all found suspended or dissolved in plasma.

- | | | | |
|--------------------|-------------------|-------------------|-------------------|
| erythrocyte | lymphocyte | monocyte | |
| prothrombin | urea | fibrinogen | neutrophil |

Answer the following questions using the terms provided from the list above.

(i) Name **one** soluble component.

..... [1]

(ii) Name **two** components involved in blood clotting.

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

(iii) Name the component that is a cell which produces antibodies.

..... [1]

(c) If skin is damaged due to injury, a blood clot forms at the site of the wound.

Fig. 1.1 shows how a blood clot forms when tissue is damaged.

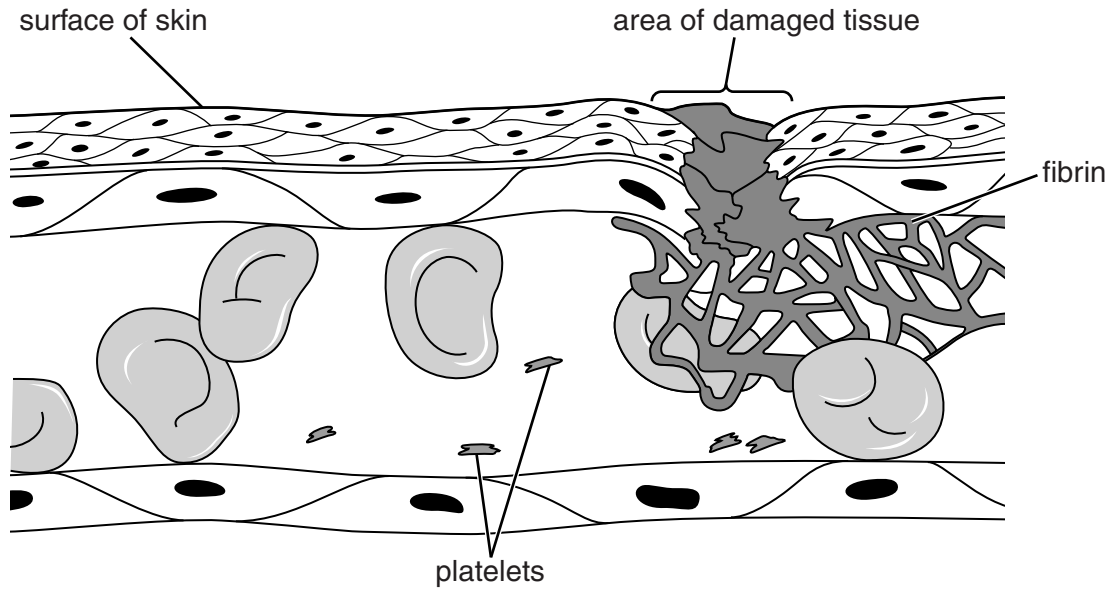


Fig. 1.1

Outline how each of the following is involved in the blood clotting process:

damage to tissue

.....

.....

platelets

.....

.....

fibrin

.....

..... [3]

- (d) The blood clotting process is controlled by a series of reactions involving enzymes. The reaction that produces fibrin is catalysed by the enzyme, thrombin. Thrombin does not catalyse any other reaction in the blood clotting process.

Explain why thrombin does not catalyse any other reaction in the blood clotting process.

.....

.....

.....

.....

.....

.....

.....

..... [2]

- (e) Some anti-clotting substances, such as heparin, work by inactivating thrombin in the clotting process. The inactivation of thrombin stops the formation of fibrin and so blood does not clot.

Fig. 1.2 shows thrombin with its substrate and the molecule, heparin.

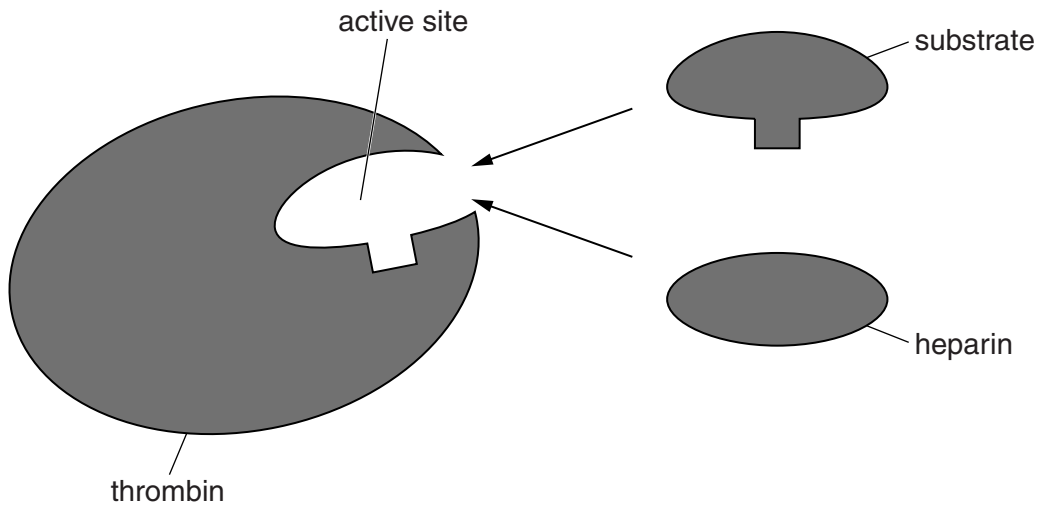


Fig. 1.2

Using the information in Fig. 1.2, suggest how heparin may inactivate thrombin.

.....

.....

.....

.....

.....

.....

..... [2]

[Total: 11]

QUESTION 2 STARTS ON PAGE 6

(b) The volume of the thorax and size of lungs affects the volume of gases breathed in and out.

Suggest **two other** reasons why the volume of gases breathed in and out varies from person to person whilst at rest.

.....

.....

.....

..... [2]

(c) The lung function of a teenage male was investigated using a spirometer.

Fig. 2.2 shows the results obtained whilst he was sitting down.

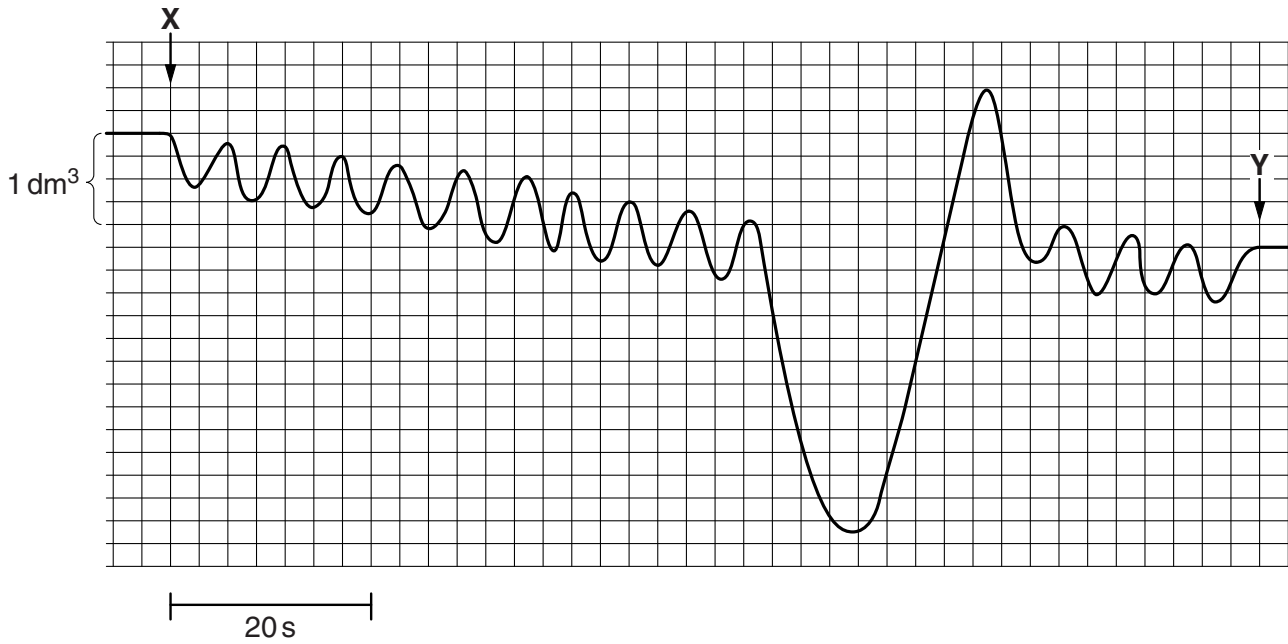


Fig. 2.2

(i) Using the information in Fig. 2.2, determine the breathing rate for this male.

Give your answer and state the correct units.

Answer = Unit = [2]

3 Eukaryotic cells contain membranes.

Fig. 3.1 shows the cell surface (plasma) membrane of an erythrocyte.

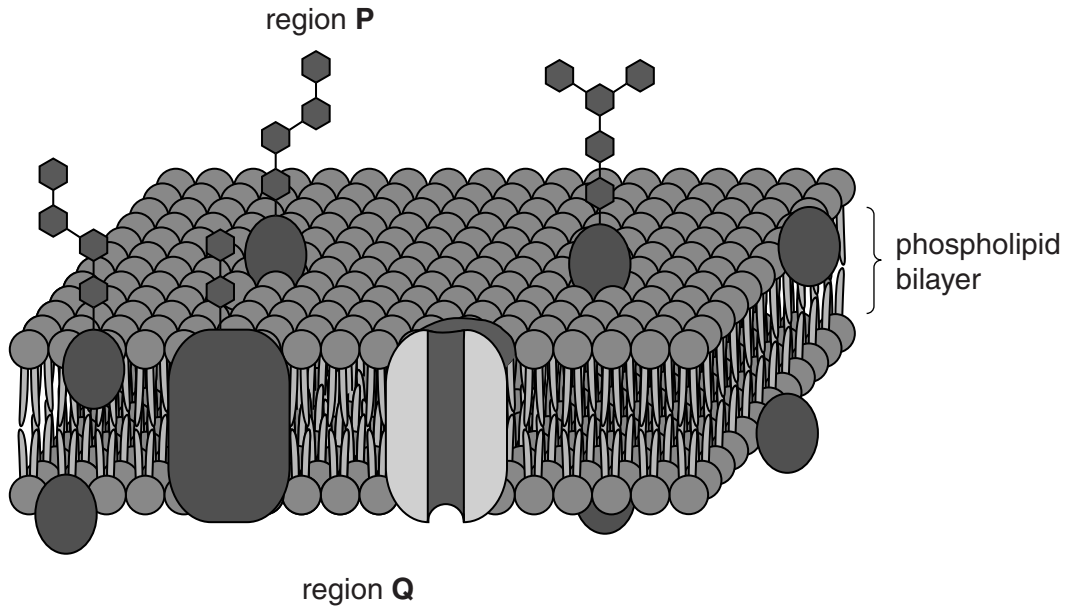


Fig. 3.1

(a) Using Fig. 3.1, state **one** reason why region **P** indicates the **exterior** of the cell.

.....

..... [1]

(b) The cytoplasm of eukaryotic cells contains both organelles and membrane systems. Rough endoplasmic reticulum (RER) is an example of a membrane system.

Fig. 3.2 represents rough endoplasmic reticulum (RER).

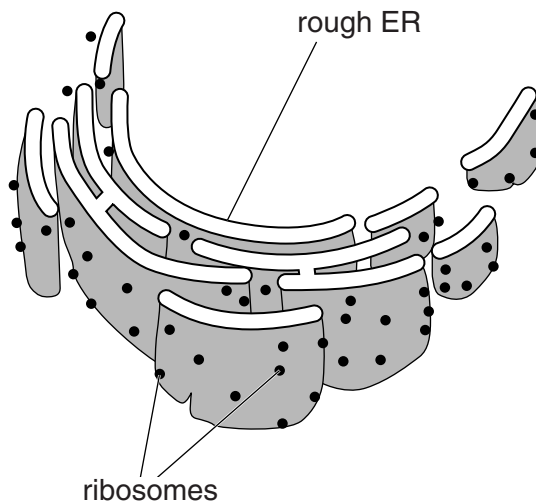


Fig. 3.2

(d) Liddle's syndrome is a rare, inherited disorder caused by defective transport proteins in the cell surface membranes of cells in the kidney.

- Cells in the kidney help to maintain the water potential of the blood by controlling the concentration of ions in the blood.
- The water potential of the blood is lower in patients with Liddle's syndrome.
- A lower water potential leads to extremely high blood pressure in these patients.

Suggest how defective transport proteins may lead to extremely high blood pressure.

.....

.....

.....

..... [1]

[Total: 9]

13
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PLEASE DO NOT WRITE ON THIS PAGE
QUESTION 4 STARTS ON PAGE 14

4 Accident and Emergency units in hospitals regularly monitor the blood pressure of a patient when admitted following an injury. Blood needs to flow through the circulatory system at a certain pressure to ensure that there is efficient exchange of oxygen and nutrients between the blood and body cells.

(a) Name the instrument used to measure blood pressure.

..... [1]

(b) Explain why a person's blood pressure should be measured when they are resting.

.....

 [1]

Fig. 4.1 shows blood pressure measurements and how they may be interpreted.

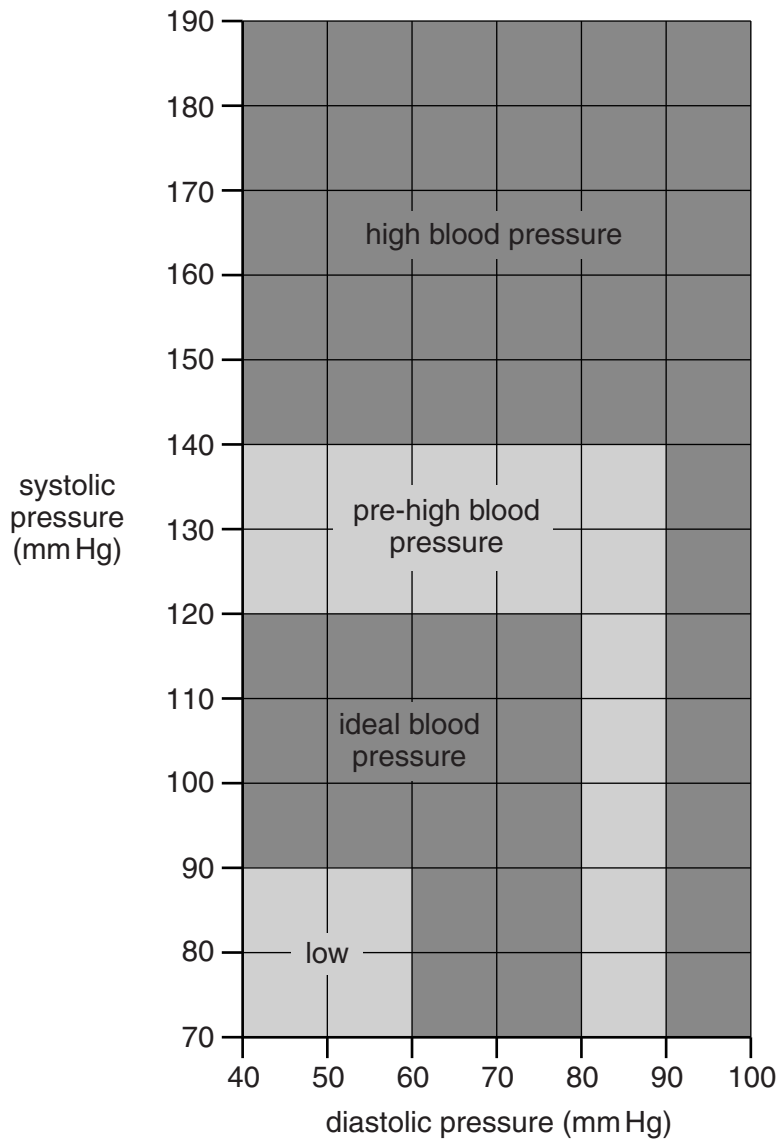


Fig. 4.1

(c) Describe what is meant by systolic pressure.

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

(d) Using Fig. 4.1, give a blood pressure measurement for a person who may:

(i) have hypertension

..... mm Hg [1]

(ii) have suffered severe blood loss.

..... mm Hg [1]

[Total: 6]

5 In 1937, the first blood bank was opened in the UK. At that time, blood donation was not common practice but by 2008, the number of donations had reached 1.9 million.

Before donors give blood, they are asked questions about their health. All donated blood is then screened and labelled.

(a) State **one** virus which donated blood must be screened for.

..... [1]

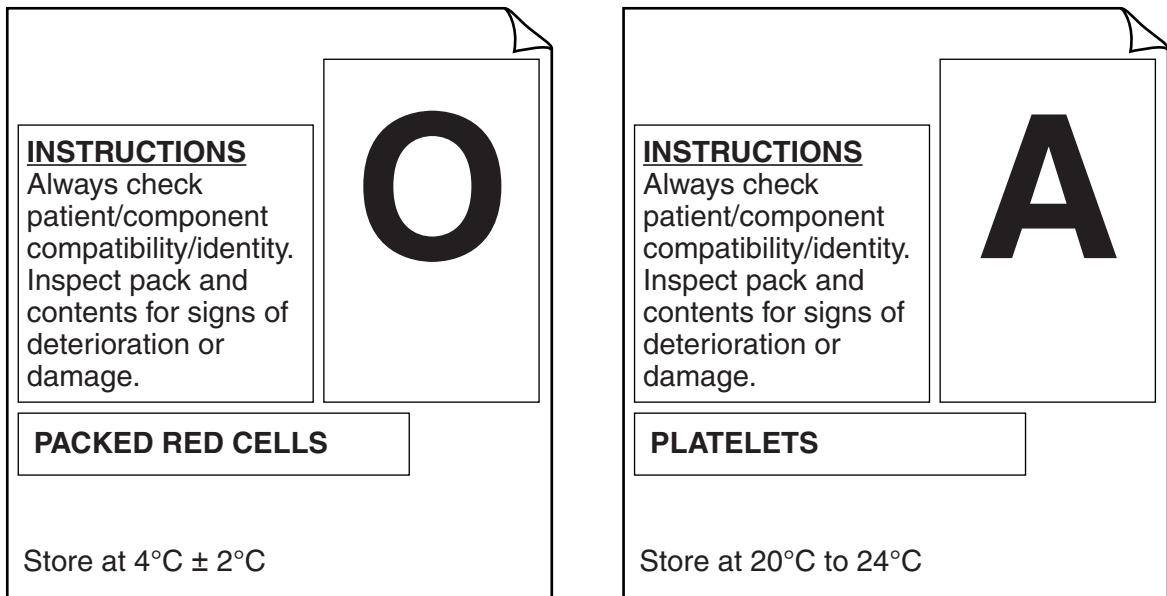
(b) People with viral infections cannot donate blood.

State **two other** medical reasons why a person may **not** be allowed to donate blood.

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

(c) Special bags are used to store donated blood.

Fig. 5.1 shows two examples of blood bag labels, stating important storage information.



label 1

label 2

Fig. 5.1

(i) State **one** medical use for **each** of the stored blood components shown in Fig. 5.1.

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

(ii) In Fig. 5.1, the storage temperature on **label 2** is higher than that on **label 1**.

Suggest why the blood components shown in **label 1** are not stored at 20° C to 24° C.

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

(iii) Suggest other information that may be useful to include on blood bag labels that is not shown on the **labels** in Fig. 5.1.

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

[Total: 9]

(c) Some people are unable to digest the disaccharide lactose.

- One symptom of being unable to digest lactose is diarrhoea.
- Diarrhoea results in the production of watery faeces.
- Large amounts of water can be lost from cells, causing dehydration of the body.

Complete the paragraph below, using the most appropriate word(s) to explain how people that cannot digest lactose may develop diarrhoea.

Lactose is in water. The presence of lactose in the intestine the water potential of the fluid in the intestine.

As a result, the cells lining the intestine will have a water potential than the intestinal fluid and moves out of these cells by..... resulting in diarrhoea.

[5]

[Total: 12]

END OF QUESTION PAPER

