Candidate forename		Candidate surname	

Centre number						Candidate number				

OXFORD CAMBRIDGE AND RSA EXAMINATIONS

AS GCE

F221

HUMAN BIOLOGY

Molecules, Blood and Gas Exchange

MONDAY 14 MAY 2012: Morning
DURATION: 1 hour
plus your additional time allowance

MODIFIED ENLARGED

Candidates answer on the Question Paper.

OCR SUPPLIED MATERIALS:

None

OTHER MATERIALS REQUIRED:

Electronic calculator
Ruler (cm/mm)

READ INSTRUCTIONS OVERLEAF

DC (RW/SW) 12MEP06415 64815/1
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INSTRUCTIONS TO CANDIDATES

- **Write your name, centre number and candidate number in the boxes on the first page. 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.**

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.**

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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, opposite, shows how a blood clot forms when tissue is damaged.

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

damage to tissue_____

_____

_____

platelets _____

_____

_____

fibrin _____

_____

_____ **[3]**

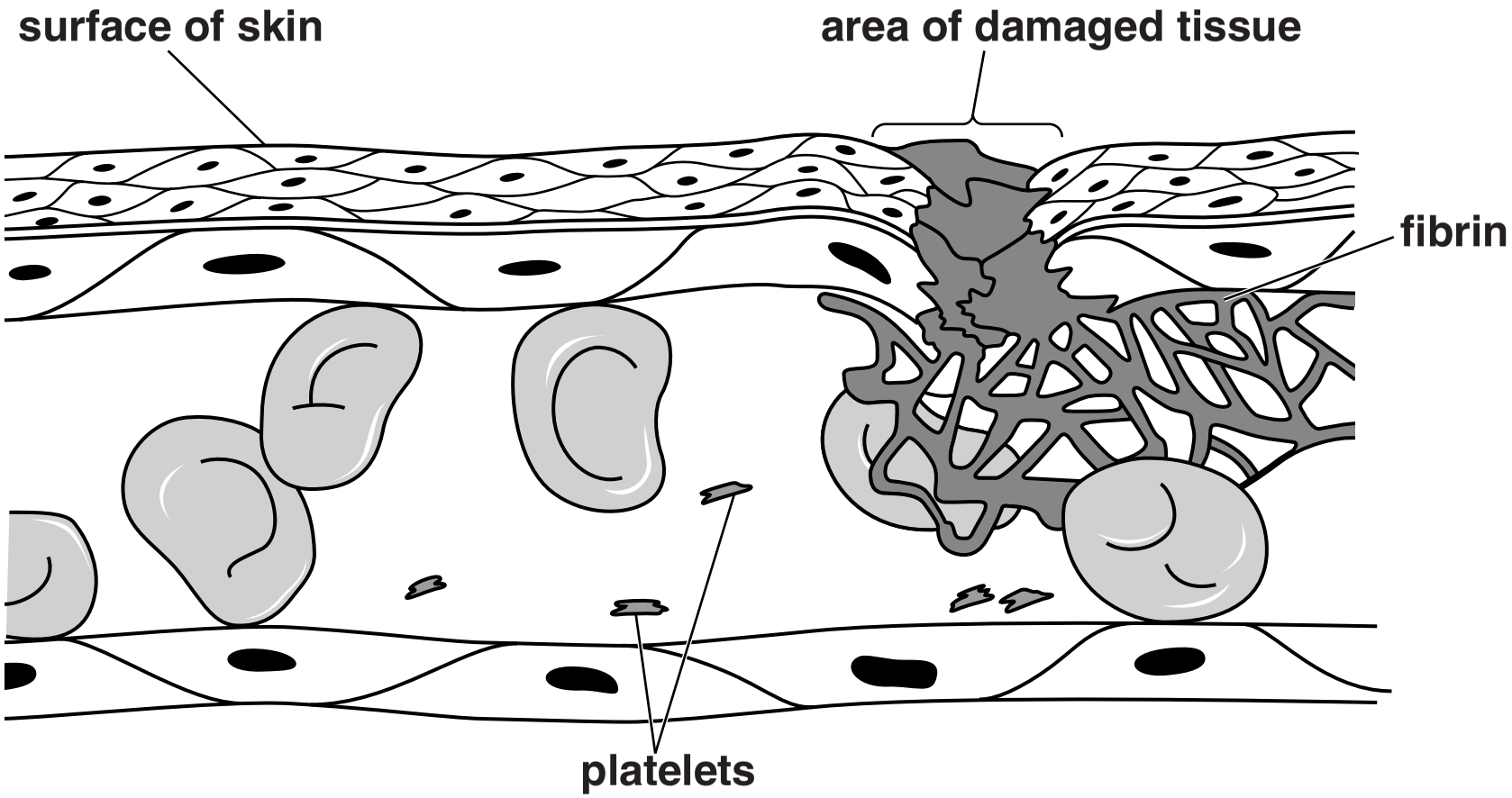

Fig. 1.1

(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, opposite, shows thrombin with its substrate and the molecule, heparin.

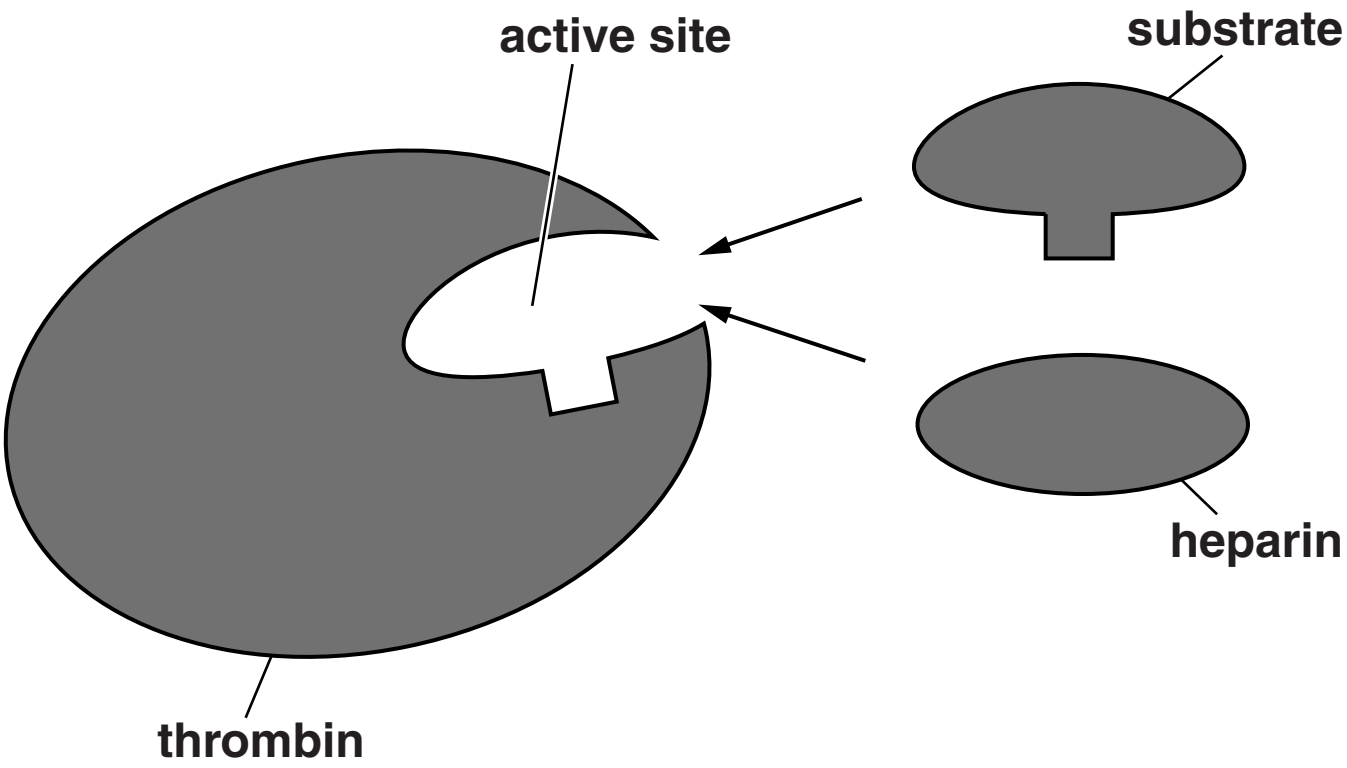

Fig. 1.2

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

_____

_____

_____

_____

_____

_____ **[2]**

[Total: 11]

2 The volume of gases breathed in and out of the lungs varies from person to person. A spirometer is a piece of apparatus that measures lung volumes and breathing rates.

Fig. 2.1 shows a spirometer.

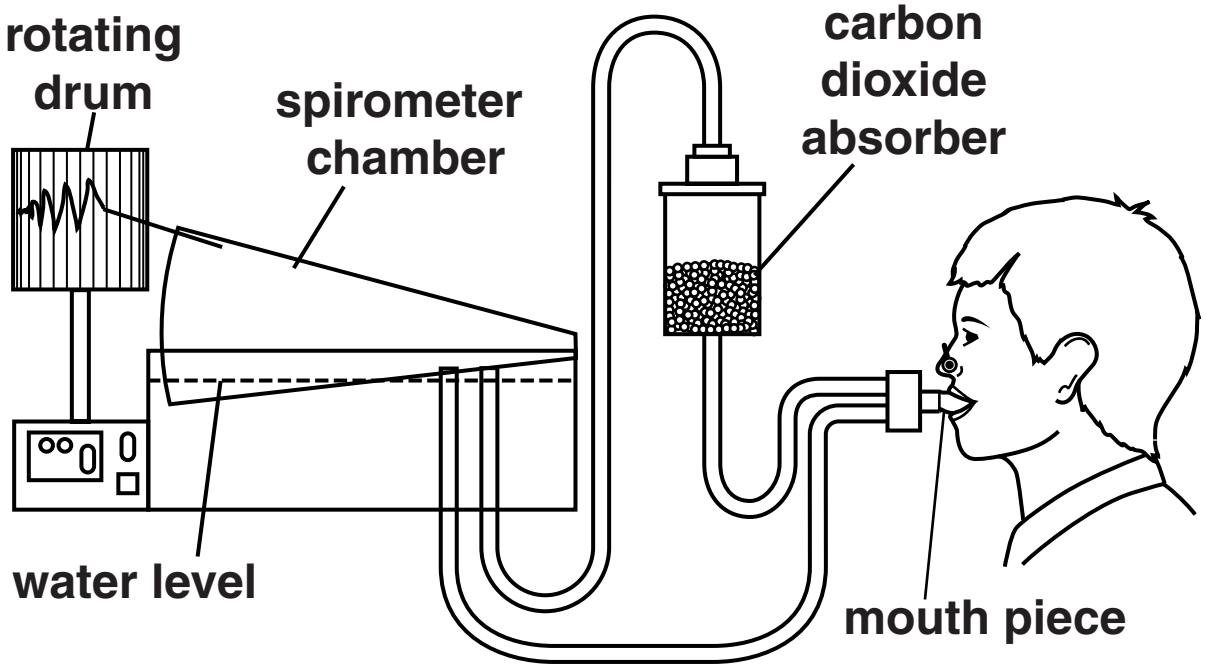

Fig. 2.1

(a) Describe how the spirometer shown in Fig. 2.1 is used to measure tidal volume at rest.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____ **[4]**

(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, on the insert, shows the results obtained whilst he was sitting down.

(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]

(ii) Describe his pattern of breathing between points X and Y.

_____

_____

_____

_____

_____

_____

_____

_____

_____ **[3]**

(iii) The teenage male was then asked to exercise for five minutes and a spirometer trace was obtained during exercise.

Describe how the TRACE during exercise may differ from the trace shown in Fig. 2.2.

_____

_____

_____

_____

_____

_____ **[2]**

[Total: 13]

3 Eukaryotic cells contain membranes.

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

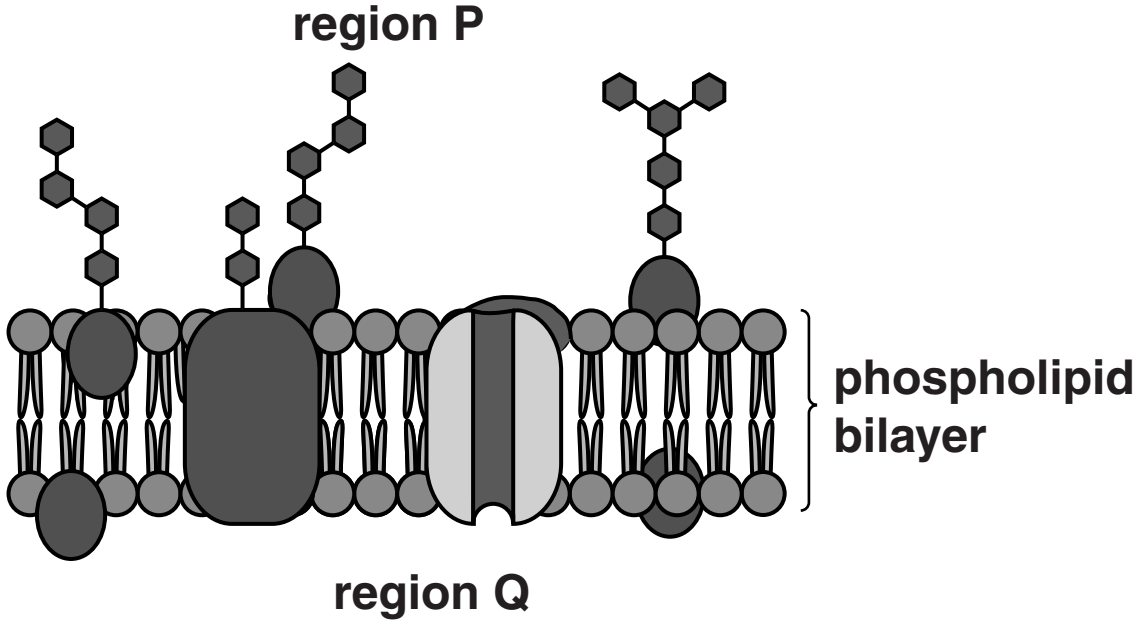

Fig. 3.1

(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.

State one membrane system, other than RER, that is found WITHIN eukaryotic cells AND outline the role of this membrane system.

membrane system _____

role _____

_____

_____ **[2]**

(c) There are different types of protein found within cell surface membranes which may be involved in transporting substances across the membrane.

Describe how PROTEINS in the cell surface membrane are involved in transporting substances across the membrane.

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

_____

_____

_____

_____

_____

_____ **[5]**

(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]

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.

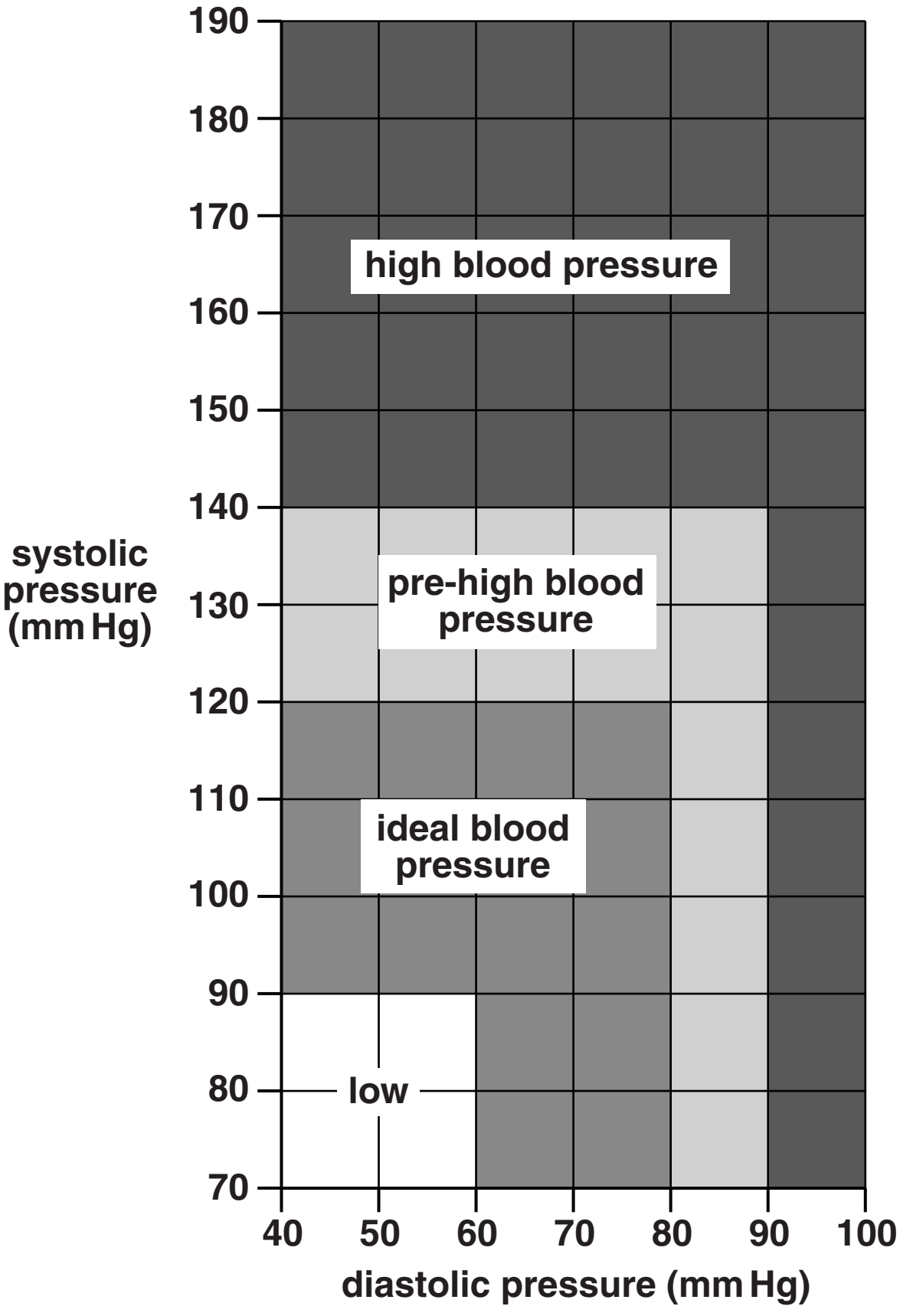

Fig. 4.1

(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]

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

(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.

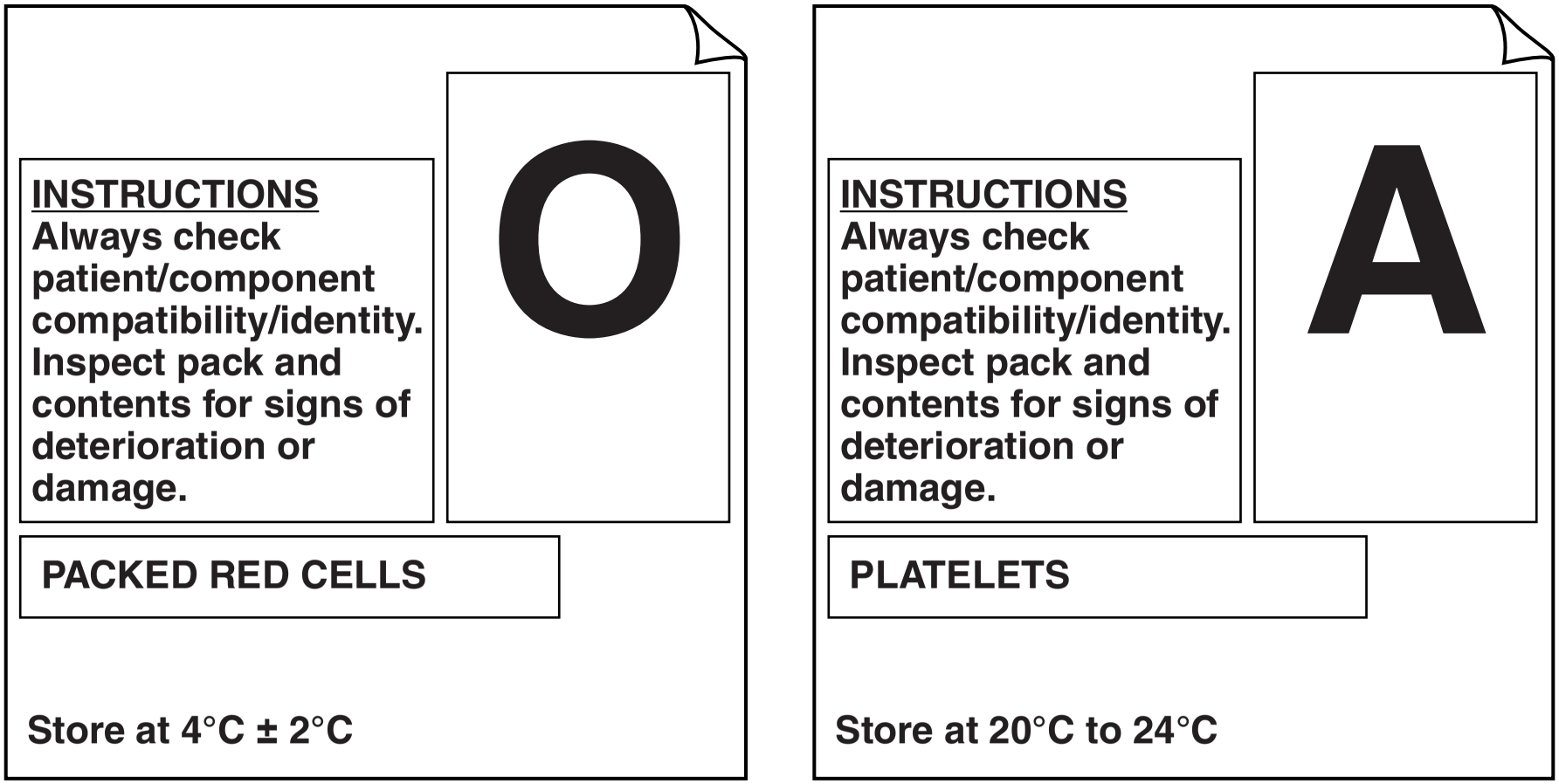
_____

_____

_____

_____ **[2]**

[Total: 9]



LABEL 1 LABEL 2

Fig. 5.1

6 Carbohydrates are an important part of the human diet and are found in many different foods. They carry out a variety of roles within the body.

(a) Describe the ROLES of named carbohydrates in the human body.

_____

_____

_____

_____

_____

_____

_____

_____ **[3]**

(b) Food such as milk and cereals contain disaccharides.

Describe how a disaccharide molecule is formed.

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

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____ **[4]**

(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

ADDITIONAL PAGE

IF ADDITIONAL SPACE IS REQUIRED, YOU SHOULD USE THE LINED PAGE BELOW. THE QUESTION NUMBER(S) MUST BE CLEARLY SHOWN.

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