

**OXFORD CAMBRIDGE AND RSA EXAMINATIONS**  
**AS GCE**  
**F221/01**  
**HUMAN BIOLOGY**  
**Molecules, Blood and Gas Exchange**  
**THURSDAY 21 MAY 2015:**  
**Afternoon**  
**DURATION: 1 hour**  
**plus your additional time allowance**  
**MODIFIED ENLARGED 24pt**

|                               |  |  |  |  |  |                              |  |  |  |  |
|-------------------------------|--|--|--|--|--|------------------------------|--|--|--|--|
| <b>Candidate<br/>forename</b> |  |  |  |  |  | <b>Candidate<br/>surname</b> |  |  |  |  |
| <b>Centre<br/>number</b>      |  |  |  |  |  | <b>Candidate<br/>number</b>  |  |  |  |  |

**Candidates answer on the Question Paper.**

**OCR SUPPLIED MATERIALS:**

**Insert**

**Loose sheet for question 4(b)**

**OTHER MATERIALS REQUIRED:**

**Electronic calculator**

**Ruler (cm/mm)**

**READ INSTRUCTIONS OVERLEAF**

## **INSTRUCTIONS TO CANDIDATES**

**The Insert will be found inside this document.**

**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(s) 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.**

**Any blank pages are indicated.**

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**Answer ALL the questions.**

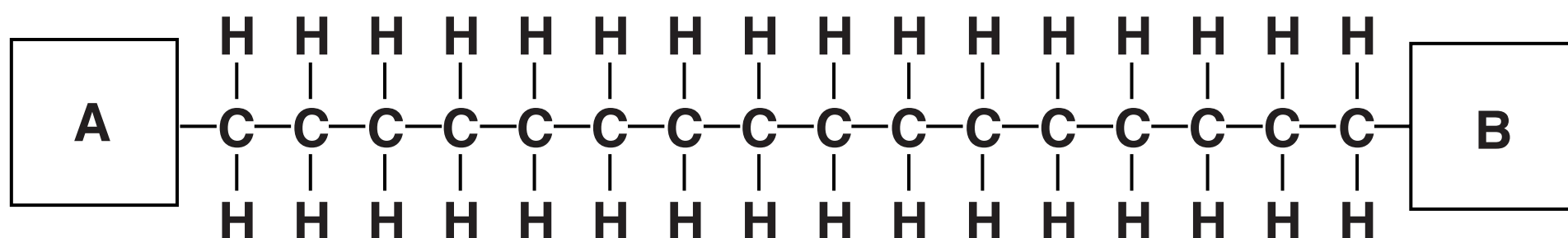
**1 Biological molecules, such as lipids and carbohydrates, are found in dairy products.**

**(a) Lipids differ depending on the type of fatty acid they contain.**

**Stearic acid is a fatty acid commonly found in animal fats. It contains 18 carbon atoms.**

**The structure of stearic acid is shown in Fig. 1.1.**

**FIG. 1.1**



**(i) State the chemical groups labelled A and B in Fig. 1.1.**

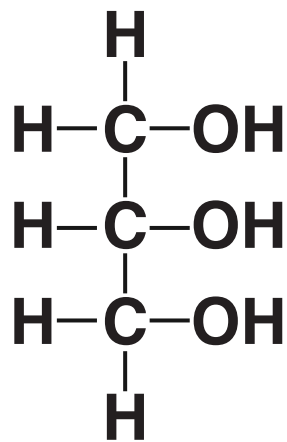
**A** \_\_\_\_\_

**B** \_\_\_\_\_

**[2]**

- (ii) Fig. 1.2 shows another type of molecule also found in lipids.

FIG. 1.2



Name the molecule shown in Fig. 1.2.

\_\_\_\_\_ [1]

- (b) Some of the carbohydrates found in dairy products are broken down in the digestive system to form glucose. Glucose is then absorbed into the bloodstream.

- (i) Describe how glucose is transported in the bloodstream.

\_\_\_\_\_  
\_\_\_\_\_ [1]

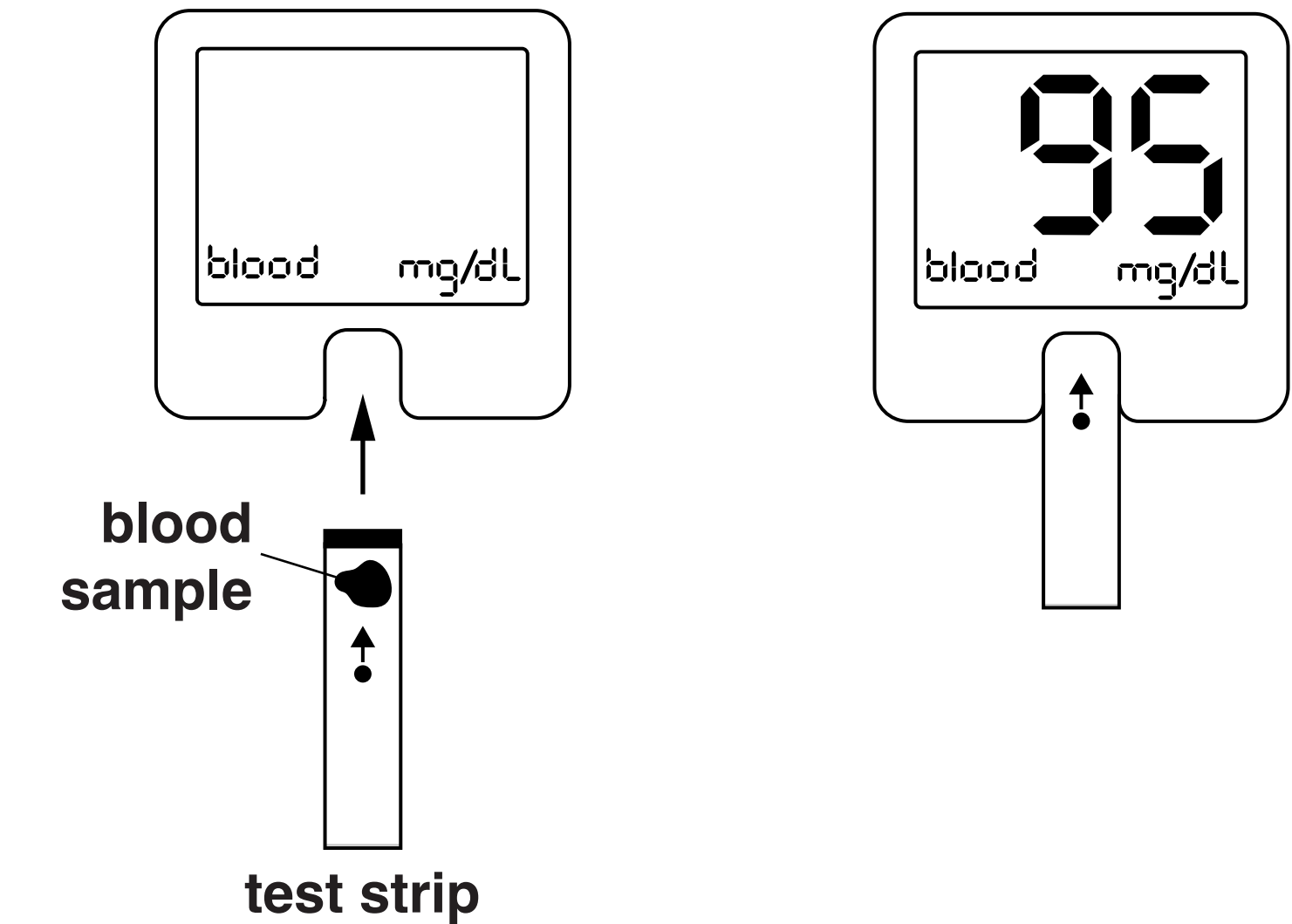
- (ii) Glucose is used by cells as a respiratory substrate. What makes glucose a good respiratory substrate?

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_ [2]

The concentration of glucose in the blood varies. People with the condition diabetes mellitus need to measure the concentration of glucose in their blood regularly.

Fig. 1.3 shows a blood glucose meter which can be used to measure the concentration of glucose in the blood.

FIG. 1.3



(c) Describe TWO precautions that a person should take when using a blood glucose meter.

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[2]

- (d) (i) Explain what happens to the glucose in the blood sample when it comes into contact with the chemicals on the test strip.**

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**[2]**

- (ii) Several factors may affect the results when taking a series of readings using a blood glucose meter.**

**State TWO factors that could affect the results.**

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**[2]**

**[TOTAL: 12]**

- 2 The First Aid procedure for blood loss depends on the severity of the injury and how much blood is being lost.**
- (a) Complete the table below with a tick (✓) to show which statements apply to the procedures for minor or excessive blood loss.**

| Statement   | Applies only to procedure for minor blood loss | Applies only to procedure for excessive blood loss | Applies to both procedures | Does not apply to either of the procedures |
|---|--|--|----------------------------|--|
| Call emergency helpline for an ambulance            |  |  |                            |  |
| Place a clean dressing over the wound               |  |  |                            |  |
| Give the patient a painkiller such as aspirin       |  |  |                            |  |
| Raise the injured limb above the level of the heart |  |  |                            |  |

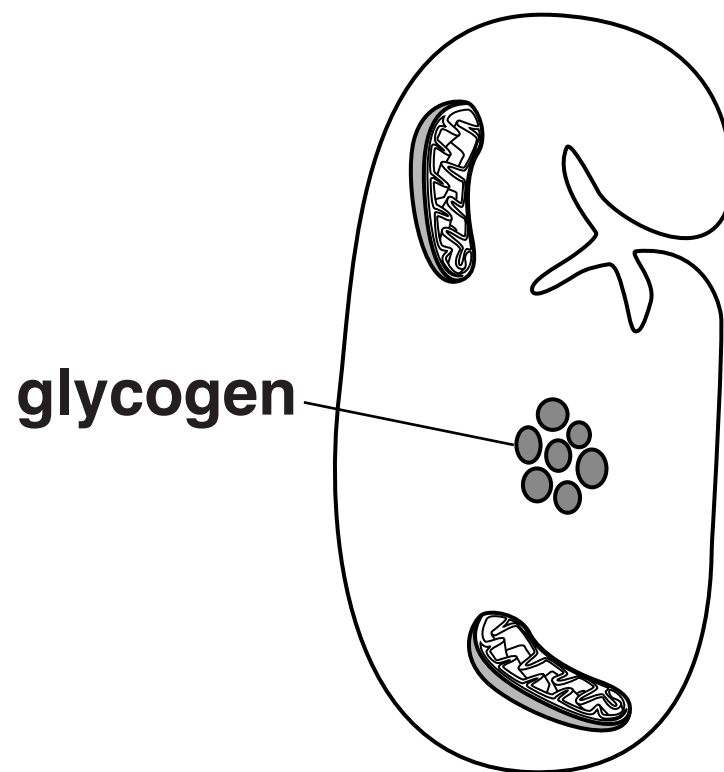
**[4]**



**(b) Platelets are small cell fragments found in blood plasma.**

**Fig. 2.1 is a simplified diagram of a platelet.**

**FIG. 2.1**



**(i) Using Fig. 2.1, compare the cytoplasm of a platelet with that of an erythrocyte.**

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[2]

**(ii) Platelets can be obtained from whole blood following a blood donation.**

**Platelets can be stored and used in blood transfusions, but they are NOT usually used to treat excessive blood loss.**

**Suggest ONE condition that could be treated by a transfusion of platelets.**

\_\_\_\_\_ **[1]**

**(c) Blood products including platelets can be obtained from donated whole blood and stored for future use.**

**DESCRIBE the different types of stored blood products.**

**Do NOT include whole blood or platelets in your answer.** **[4]**



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

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**[TOTAL: 11]**

**3 During the formation of glycogen in the liver, large numbers of glucose molecules are joined together to form polysaccharide chains.**

**(a) (i) Describe the reaction in which glucose molecules are joined together to form the polysaccharide chains.**

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**[3]**

**(ii) The formation of glycogen in liver cells is catalysed by glycogen synthase.**

**Suggest how the structure of glycogen synthase enables it to function as an enzyme in the formation of glycogen.**

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**[3]**

**(b) Glycogen molecules stored in the liver are branched.**

**Glycogen storage disease type IV occurs when the liver is unable to catalyse the addition of branches of glucose molecules. People with this disease may develop liver damage over time.**

**Suggest why this disease may result in liver damage.**

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**[1]**

**[TOTAL: 7]**

**4 In humans, a circulatory system is needed to transport substances around the body by mass transport.**

**(a) Explain why humans need a mass transport system.**

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**[2]**

**(b) The circulatory system in humans is a closed system in which blood flows under pressure within vessels. Medical professionals often need to monitor blood pressure.**

**Diagrams E, F and G in Fig. 4.1 on the loose sheet show the stages in measuring blood pressure using a sphygmomanometer.**

**(i) Name the blood vessel labelled H in Fig. 4.1.**

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**[1]**

**(ii) Korotkov sounds are the tapping sounds heard in the stethoscope.**

**At which stage, E, F or G, are Korotkov sounds most likely to be heard?**

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**[1]**

**(iii) At which stage, E, F or G, is the DIASTOLIC pressure being measured?**

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**[1]**

**(iv) At which stage, E, F or G, will blood be flowing freely in blood vessel H?**

\_\_\_\_\_ **[1]**

**(v) Using the readings shown in Fig. 4.1, give the blood pressure measurement for this person.**

**Answer = \_\_\_\_\_ mm Hg [1]**

**(c) Pressure must be maintained as blood flows through organs and vessels of the circulatory system.**

**Describe TWO features of the circulatory system that could affect blood pressure.**

**1** \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**2** \_\_\_\_\_

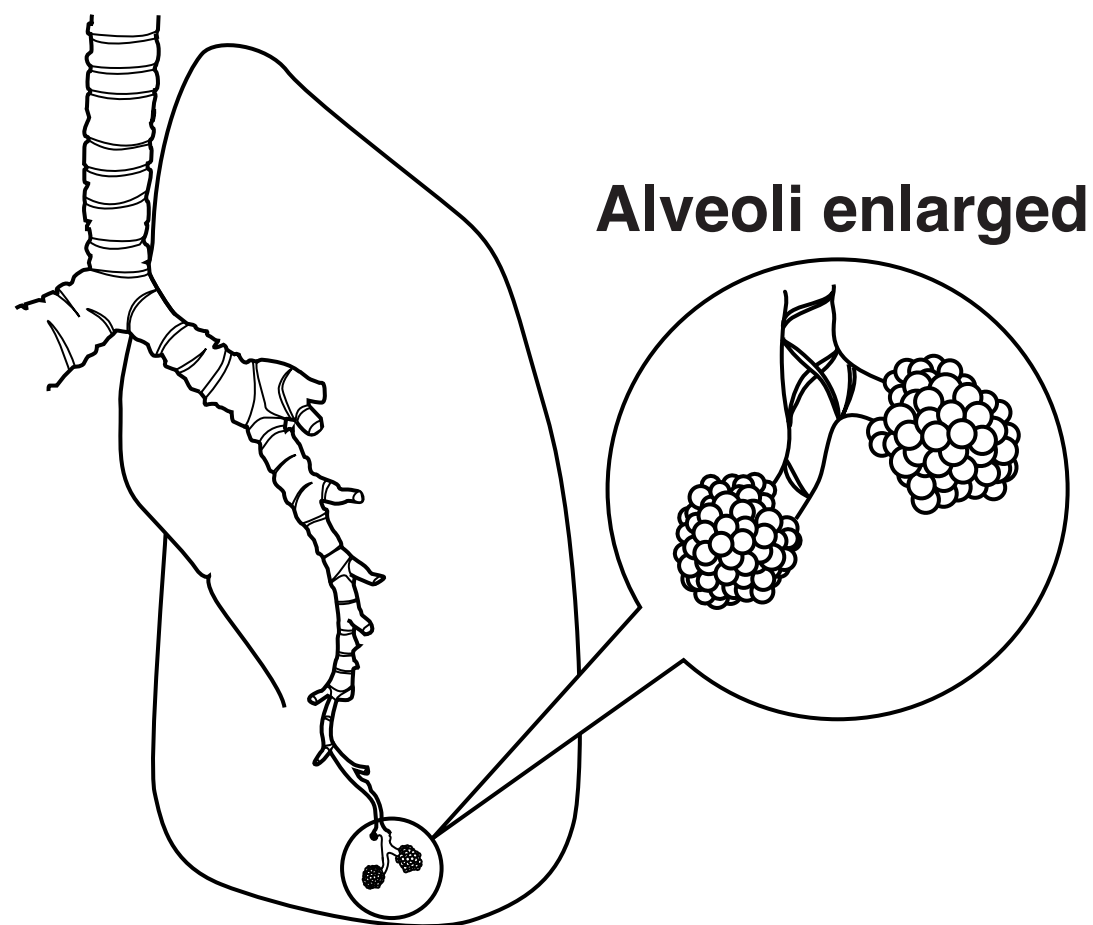
\_\_\_\_\_

\_\_\_\_\_ **[2]**

**[TOTAL: 9]**

- 5 Fig. 5.1 is a diagram showing the structure of part of the human respiratory system. The lungs provide an efficient gaseous exchange surface.

**FIG. 5.1**



- (a) Using Fig. 5.1, explain how the structure of the lungs provides humans with an efficient gaseous exchange surface. [5]



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

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[illegible]

- (b) The lungs continuously take in air from the environment and may be damaged by pollutants such as cigarette smoke.**

**Fig. 5.2, ON THE INSERT, shows the lung tissue of a healthy person and the lung tissue of a person with lung damage, as seen under a light microscope. Both images are at the same magnification.**

- (i) The photomicrograph of healthy lung tissue in Fig. 5.2 shows the length of an alveolus between positions X and Y.**

**Calculate the actual length of the alveolus between X and Y.**

**Show your working. Give your answer to ONE decimal place.**

**Answer = \_\_\_\_\_ mm [2]**

- (ii) Using ONE feature shown in Fig. 5.2, explain why the person with lung damage is more likely to have a higher breathing rate than the healthy person.**

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**[2]**

- (iii) Measurements such as breathing rate and vital capacity may be used by doctors to monitor the lung function of a person with lung damage.**

**Name a piece of apparatus that may be used to monitor lung function AND outline how a VITAL CAPACITY measurement may be taken USING THIS APPARATUS.**

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**[3]**

**[TOTAL: 12]**

- 6 (a) The table below shows statements about ions found in blood plasma.

Some of these statements are true and some are false.

Complete the table by writing True (T) or False (F) in the box next to each statement.

| STATEMENT   | TRUE (T)<br>OR<br>FALSE (F) |
|---|-----------------------------|
| ions found in blood plasma are known as electrolytes                                      |                             |
| increasing the concentration of ions in the blood increases the water potential of plasma |                             |
| the concentration of ions in the blood can be measured using a haemocytometer             |                             |
| ions can be transported across cell membranes by facilitated diffusion                    |                             |

[3]

**(b) Box jellyfish are extremely poisonous to humans.**

**The venom of the box jellyfish produces changes in cell membranes that result in high concentrations of potassium ions in blood plasma. This may lead to the death of cells.**

**(i) Suggest why the venom of the box jellyfish causes the concentration of potassium ions in blood plasma to increase.**

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[2]

**(ii) Explain how the LOSS of potassium ions from the cell may lead to CELL DEATH.**

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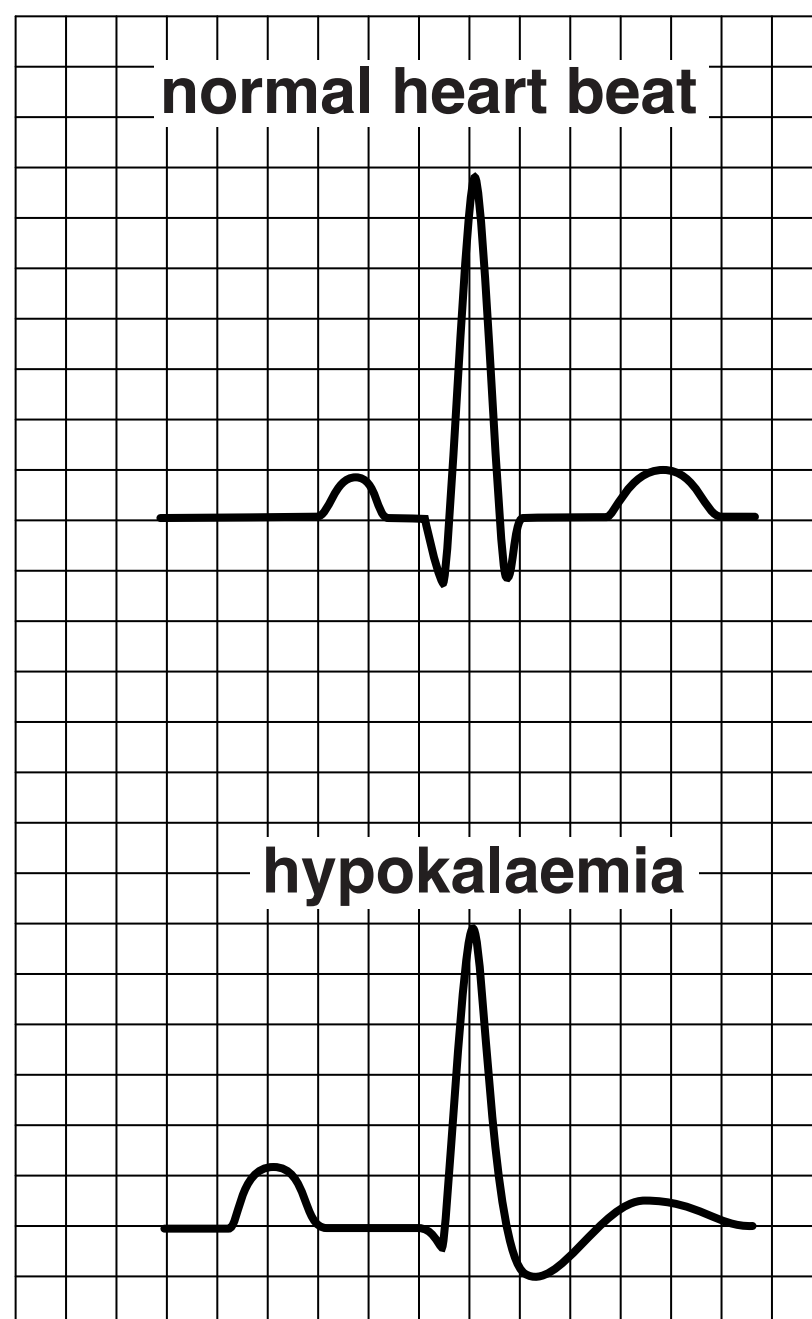
[2]

- (c) A low concentration of potassium ions in the blood is known as hypokalaemia. Hypokalaemia may cause an abnormal heart beat.

This abnormal heart beat or arrhythmia can be detected using an electrocardiogram (ECG). An ECG represents the electrical activity of the heart during the cardiac cycle.

Fig. 6.1 is a diagram that shows part of the ECGs of a person with a normal heart beat and a person with hypokalaemia.

**FIG. 6.1**



**Describe the differences between the two waves shown in Fig. 6.1.**

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**[2]**

**[TOTAL: 9]**

**END OF QUESTION PAPER**

### ADDITIONAL ANSWER SPACE

**If additional answer space is required, you should use the following lined page(s). The question number(s) must be clearly shown in the margins.**

[illegible]











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