OCR
RECOGNISING ACHIEVEMENT

ADVANCED SUBSIDIARY GCE

APPLIED SCIENCE

G622

Monitoring the Activity of the Human Body

Candidates answer on the question paper.

OCR supplied materials:
None

Other materials required:
- Electronic calculator
- Ruler (cm/mm)

Friday 20 May 2011
Morning

Duration: 1 hour 30 minutes

G6222

11LMP06192

Candidate forename		Candidate surname	

Centre number						Candidate number				

MODIFIED LANGUAGE

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. Pencil may be used for graphs and diagrams only.
- 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. Additional paper may be used if necessary but you must clearly show your candidate number, centre number and question number(s).
- Answer **all** the questions.
- 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 **90**.
- You are advised to show all the steps in any calculations.
-  Where you see this icon you will be awarded marks for the quality of written communication in your answer.

  This means, for example, you should:
  - ensure that text is legible and that spelling, punctuation and grammar are accurate so that meaning is clear;
  - organise information clearly and coherently, using specialist vocabulary when appropriate.
- You may use an electronic calculator.
- This document consists of **16** pages. Any blank pages are indicated.

Answer **all** the questions.

1 Drugs have been used in sports for many years. Newspapers sometimes write about sportsmen and women when they take performance-enhancing drugs.

(a) Name one **recreational** drug and one **performance-enhancing** drug that can be detected using blood tests.

recreational drug .....

performance-enhancing drug ..... **[2]**

(b) Name two techniques used to detect drugs in a blood sample.

1. .....

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

(c) State the **principles** of how blood tests are used to confirm that a drug is found in a blood sample taken from an athlete.

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

(d) Blood doping differs from the use of performance-enhancing drugs. During blood doping, red blood cells are injected into the blood of the athlete a few days before the sporting event.

(i) Explain how blood doping gives the athlete an unfair advantage.

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

(ii) A blood sample is taken from an athlete who is suspected of blood doping.

How is the sample analysed?

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

[Total: 12]

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2 A dietician is working in a local hospital. He provides a monitoring and guidance service for patients with diabetes. Some patients have **type 1** diabetes and others have **type 2** diabetes.

(a) High blood-glucose levels, increased thirst, frequent production of urine, tiredness and fatigue can be common symptoms of both types of diabetes.

Describe **two** other features or symptoms for **each** of type 1 and type 2 diabetes.

type 1 diabetes .....

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type 2 diabetes .....

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..... **[4]**

(b) Explain the link between 'early onset' diabetes and obesity in children and young adults.

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

(c) The dietician monitors the blood-glucose levels of his patients with **type 1** diabetes on a regular basis.

(i) The dietician uses a biosensor to monitor blood-glucose levels.

Describe how a biosensor works and how a person with diabetes uses the results.

how a biosensor works .....

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.....

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

use of results by a person with diabetes .....

.....

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

(ii) The dietician finds that one of his patients with **type 1** diabetes has a very high blood-glucose level.

Suggest two pieces of advice that the dietician should give to his patient.

1. .....

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2. .....

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

(d) The dietician is worried about a patient with **type 2** diabetes who finds it difficult to regulate her diabetes. The dietician decides to carry out a **glucose tolerance test** on this patient and then compare the results with normal responses to the test.

The results of the two-hour glucose tolerance test are shown in Fig. 2.1.

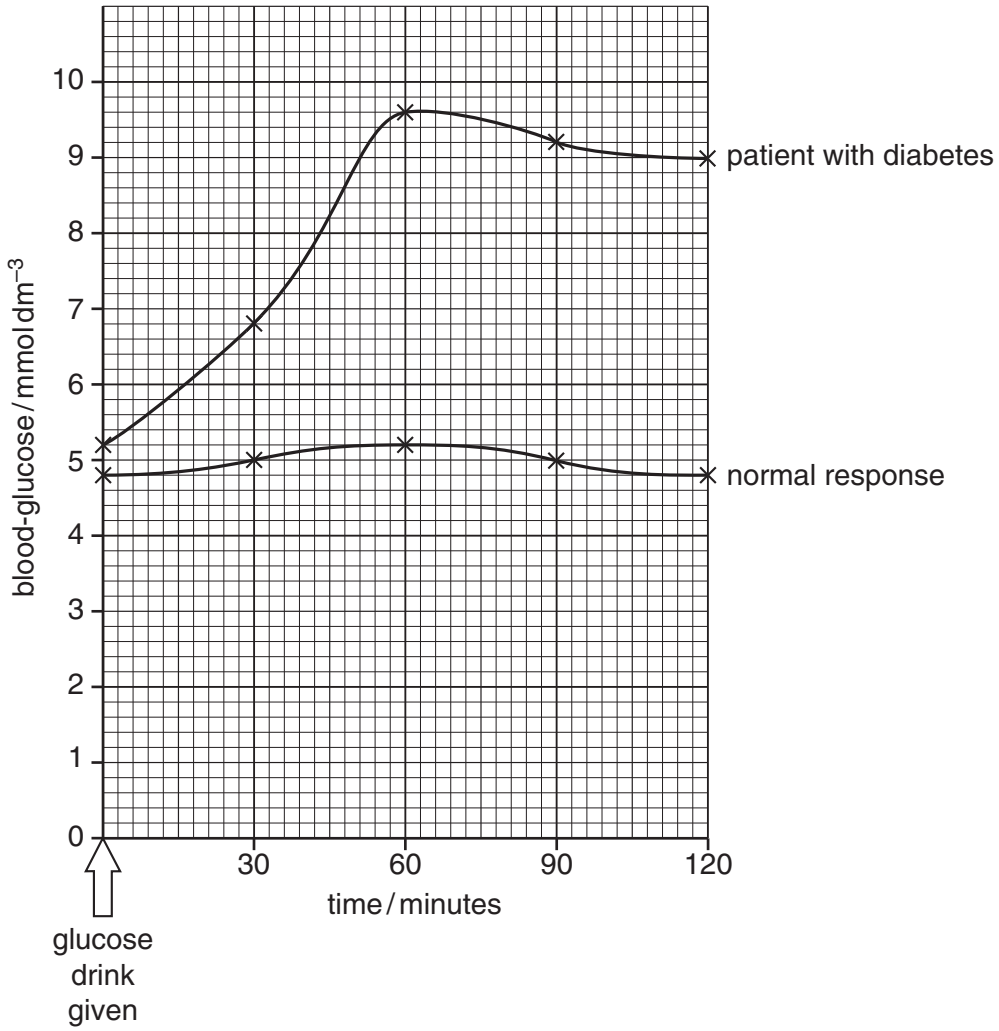

Fig. 2.1

(i) Calculate the percentage increase in the blood-glucose level of the patient with diabetes in relation to the normal response at 60 minutes.
Show your working.

diabetic reading ..... normal reading .....

percentage increase = ... % **[3]**

(ii) Suggest two reasons why there is a drop in the blood-glucose levels for the patient with diabetes during the final 60 minutes of the test period.

1. .....

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2. .....

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

(e) The dietician must know the risks involved when taking a patient's blood.

Complete the risk assessment, Table 2.1, used to safeguard a patient during such blood tests.

Table 2.1

blood test hazard	risk	related procedure to minimise the risk
use of sharps	1.	1.
	2.	2.

[4]

[Total: 20]

3 A group of students is investigating the structure and function of the respiratory system in humans. The students find a slide showing a section through the lung tissue of a person suffering from pulmonary emphysema, Fig. 3.1.

Pulmonary emphysema is a chronic lung condition. The reasons for the onset of this condition include smoking and exposure to air pollution and irritating fumes or dusts. Some of the lung tissue may be destroyed over time.

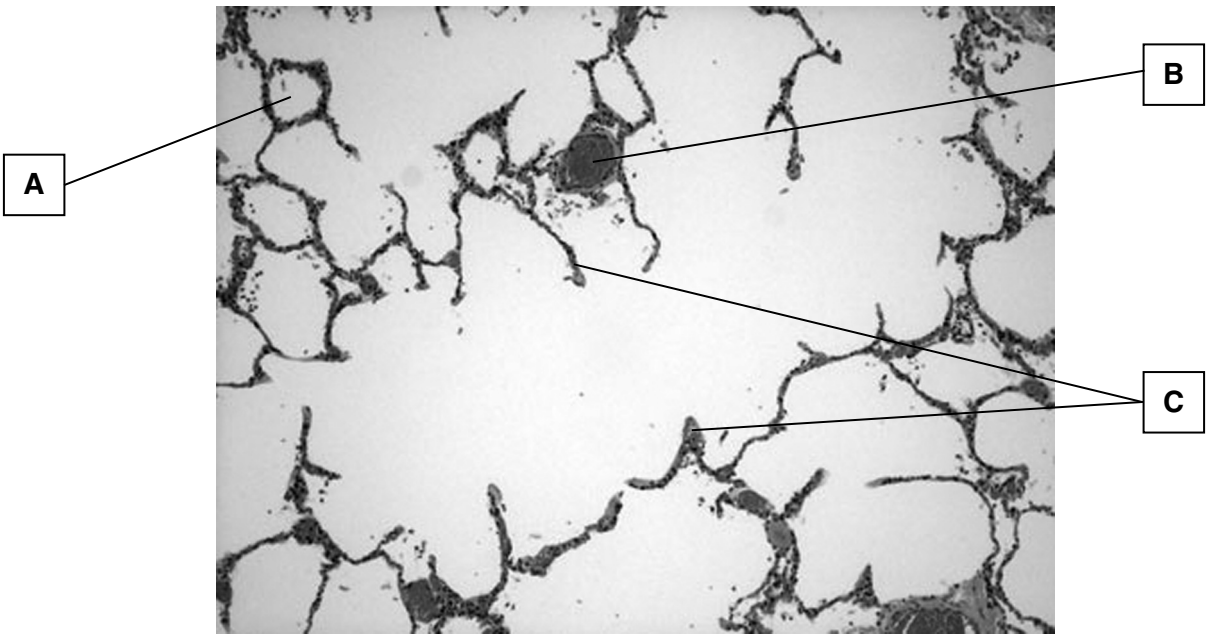

Fig. 3.1

(a) In Fig. 3.1, structure **A** is an alveolus or air sac.

(i) State two features of the alveolus that promote the process of gaseous exchange.

1. .....

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2. .....

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

(ii) Describe what happens during gaseous exchange in the lungs.

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

(b) Name the structure labelled **B** in Fig. 3.1.

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

(c) Diseases such as pulmonary emphysema cause some damage in the lungs as shown at the points labelled **C** in Fig. 3.1. This slows down the rate of gaseous exchange.

Explain this decrease in rate.

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

(d) The peak flow of expired air from a person with pulmonary emphysema is likely to be different from that of a healthy person.

Explain how to measure peak expiratory flow rate using a peak flow meter.

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..... **[4]**

(e) The students also study the process of **ventilation** of the lungs.

Describe how breathing movements cause air to **leave** the lungs.

In your answer, use ideas about the following:

diaphragm **intercostal muscles** **ribs** **sternum**

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

(f) An MRI scanner can be used to examine the lungs.

(i) State why an **MRI scan** is effective for this type of examination.

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

(ii) Complete Table 3.1 to describe **two** hazards of using an MRI scanner **for the patient** and identify the precautions to be taken for each.

Table 3.1

hazard for the patient	precaution
1.	1.
2.	2.

[4]

[Total: 21]

4 An athlete is following a 10-week training programme to increase her running speed.

Her trainer tells her that she must be capable of releasing as much energy as possible in her muscles for rapid and powerful contractions.

(a) Complete the word equations below for aerobic and anaerobic respiration.

(i) aerobic respiration

glucose + …… → …… + …… + …… **[2]**

(ii) anaerobic respiration

glucose → …… + …… **[1]**

(b) Give the **name** of the molecule produced in both aerobic and anaerobic respiration that provides the immediate source of energy for muscle contraction.

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

(c) State the **type** of respiration that releases more energy for each molecule of glucose oxidised and give **two** reasons to explain this.

type of respiration .....

reasons .....

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

(d) Explain why **anaerobic** respiration is a 'useful' process in the muscle cells of an athlete.

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

(e) Name the **site** of anaerobic respiration in muscle cells.

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

(f) The trainer cannot easily test for energy levels in the muscles of the athlete and so he takes the athlete to a clinic to estimate her fitness levels.

The athlete's pulse rate is measured before, during and after exercise, Table 4.1.

Table 4.1

week of training programme	**athlete's pulse rate readings / beats min^{-1}**		
	immediately **before** exercise	**during** exercise	3 minutes **after** exercise
1	76	120	85
10	65	110	67

(i) Describe and explain **two** effects of the 10-week training programme on the athlete's pulse rate readings.

Refer to the **data** in your answer.

effect	**supporting data**	**explanation**
1.		
2.		

[6]

(ii) Explain the link between pulse rate readings and energy levels in muscles.

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

(g) The athlete's **lactic acid** levels are also recorded at the start and end of the training programme at the fitness clinic.

She has blood samples taken when running at different speeds, Table 4.2.

Table 4.2

week of training programme	athlete's running speed / km h^{-1}				
	10	11	12	13	14
	blood lactic acid levels / mmol dm^{-3} at each running speed				
1	2.4	2.6	3.0	3.5	4.0
10	1.6	1.9	2.5	3.4	3.6

(i) State the effect of running speed on the levels of lactic acid in the athlete's blood at the start of the training programme.

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

(ii) State and explain **one** effect that the training programme has on the athlete's blood lactic acid levels when running at different speeds.

effect .....

explanation .....

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

(iii) Give **two** reasons why high levels of blood lactic acid cause problems for athletes.

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

(iv) There is little difference between lactic acid levels recorded at 13 km hr^{-1} from week 1 to week 10.

Suggest how you could improve this test to make the results more reliable.

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

[Total: 24]

5 Matthew was born with a heart defect.

(a) Matthew's doctors monitor his heart using an ultrasound scanner.

(i) A gel is put on the surface of Matthew's skin when the probe is used.

Why is the gel needed?

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

(ii) Why do Matthew's doctors need to avoid his ribs when using the ultrasound probe?

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

(iii) Explain the **principles** of ultrasound scanning.

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..... **[5]**

(b) Matthew's heart defect is a hole between the two ventricles in his heart. This is called a ventricular septal defect (VSD), see Fig. 5.1.

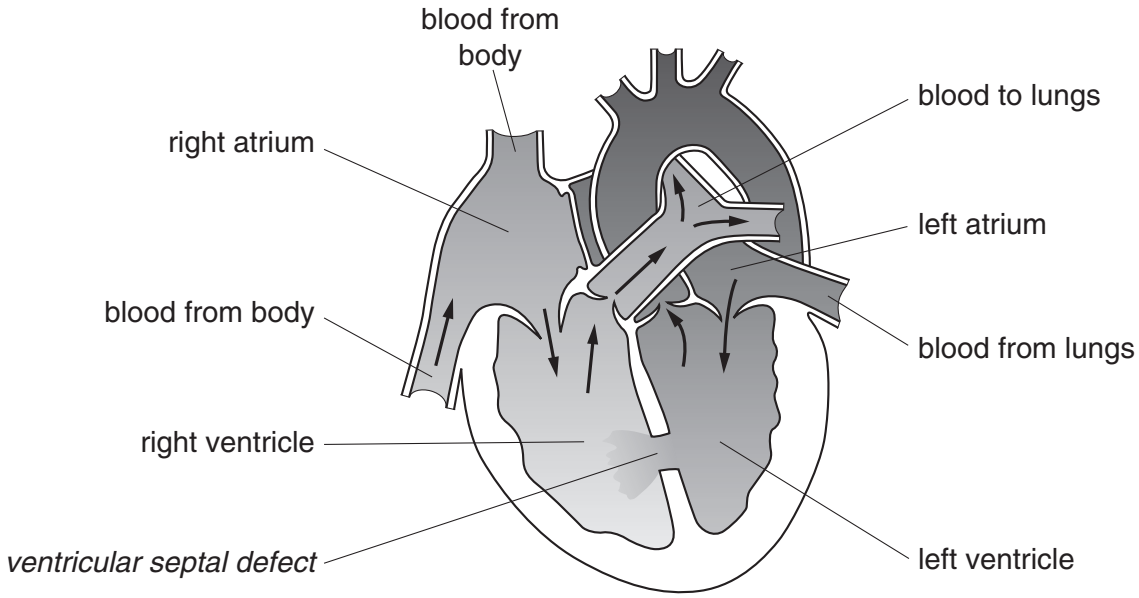

Fig. 5.1

Describe **two** problems the VSD is likely to cause in Matthew's circulatory system.

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

(c) Describe **two** advantages of using an ultrasound scan to diagnose a VSD.

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

(d) Ultrasound scans are used for recording blood flow in the heart.
State two other uses of ultrasound scans.

1. .....

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2. .....

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

[Total: 13]

END OF QUESTION PAPER