

**ADVANCED SUBSIDIARY GCE  
 APPLIED SCIENCE**

**G622**

Unit 3: Monitoring the activity of the human body

**TUESDAY 15 JANUARY 2008**

Afternoon

Time: 1 hour 30 minutes

Candidates answer on the question paper.

**Additional materials:** Electronic calculator  
 Ruler (cm/mm)



Candidate Forename

Candidate Surname

Centre Number

Candidate Number

**INSTRUCTIONS TO CANDIDATES**

- Write your name in capital letters, your Centre Number and Candidate Number in the boxes above.
- Use blue or 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.
- Do **not** write outside the box bordering each page.
- Write your answer to each question in the space provided.

**INFORMATION FOR CANDIDATES**

- The number of marks for each question is given in brackets [ ] at the end of each question or part question.
- The total number of marks for this paper is 90.
- You will be awarded marks for the quality of written communication where this is indicated in the question.
- You may use an electronic calculator.
- You are advised to show all the steps in any calculations.

FOR EXAMINER'S USE		
Qu.	Max.	Mark
1	13	
2	12	
3	22	
4	17	
5	17	
6	9	
<b>TOTAL</b>	<b>90</b>	

This document consists of **16** printed pages.

Answer **all** the questions.

- 1 Two students were preparing a presentation on the topic 'Respiration'. They included sections **(a)**, **(b)** and **(c)** to test how well their audience had understood their presentation.

**(a)** Complete Table 1.1. Select your answers from the following list.

Part of the table has been completed for you.

<b>2</b>	<b>16</b>	<b>32</b>	<b>38</b>
<b>carbon dioxide</b>		<b>glucose</b>	<b>lactic acid</b>
<b>oxygen</b>		<b>nitrogen</b>	<b>water</b>

**Table 1.1**

<b>feature</b>	<b>anaerobic respiration in muscle cells</b>	<b>aerobic respiration in muscle cells</b>
substrate(s)	glucose	..... .....
product(s)	.....	..... .....
number of molecules of ATP per molecule of glucose	.....	.....

[7]

**(b)** Why is respiration important in all cells in the body?

Give an example to support your answer.

importance .....

.....

example .....

..... [2]

**(c)** Describe how the respiratory and circulatory systems work together to meet the needs of a respiring muscle cell.

.....

.....

.....

.....

.....

.....

.....

..... [4]

[Total: 13]

2 A pathologist was dissecting a human heart.

Fig. 2.1 shows a diagram of a section through the heart drawn to scale.

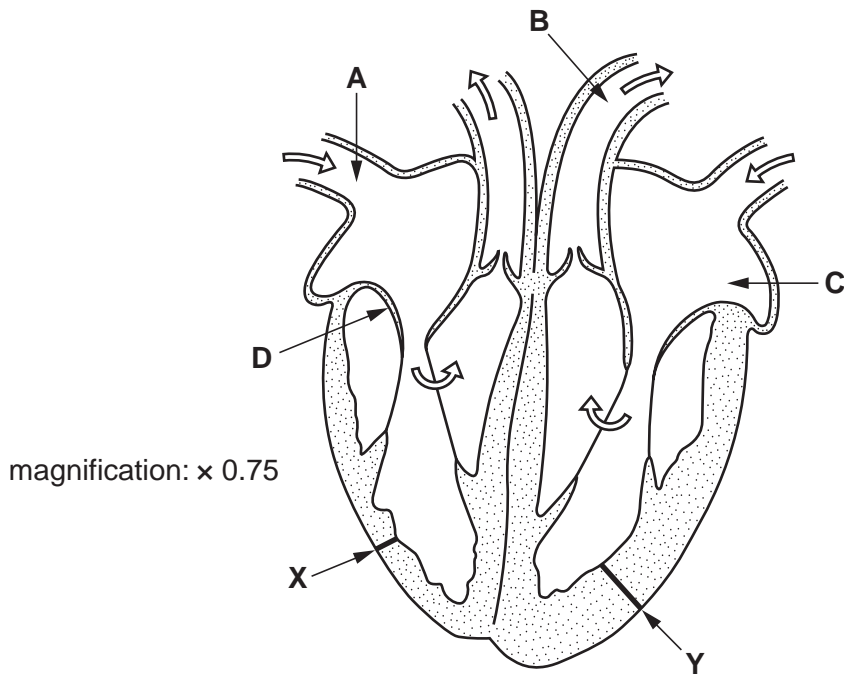


Fig. 2.1

(a) (i) Name structures **A** and **B**.

Name of **A** .....

Name of **B** ..... [2]

(ii) Give the names and functions of structures **C** and **D**.

Name of **C** .....

Function of **C** .....

.....

Name of **D** .....

Function of **D** .....

.....

..... [4]

(b) (i) The diagram in Fig. 2.1 is drawn to scale.

The magnification is  $\times 0.75$ .

What is the **actual** thickness of the wall at **X**?

..... mm [1]

(ii) The thickness of the walls at **X** and **Y** differ.

Give **one** reason why the wall is thicker at **Y**.

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

(c) Describe how heart rate is affected by nervous and hormonal inputs.

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

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

[Total: 12]

3 Students were researching different uses of physiological monitoring.

(a) One group of students was looking at the use of monitoring to assess athletic performance.

(i) Complete Table 3.1 to show the normal values for male and female adults at rest.

**Table 3.1**

feature	value	
breathing rate / min <sup>-1</sup>	.....	
tidal volume / dm <sup>3</sup>	0.40 - 0.50	
vital capacity / dm <sup>3</sup>	male: 6.00	female: .....
peak flow / dm <sup>3</sup> min <sup>-1</sup>	.....	

[3]

(ii) Peter Reed, a world class rower, has a vital capacity of 9.38 dm<sup>3</sup>.

1. How many times greater is Peter Reed's vital capacity compared to 'Mr. Average'.

..... [2]

2. During a race Peter Reed is likely to take 200 breaths.

What is the maximum volume of air likely to be inhaled during the race?

..... dm<sup>3</sup> [1]

3. Inhaled air contains 21% oxygen.

Calculate the maximum volume of oxygen that would be available for gas exchange in Peter Reed's lungs over the period of the whole race.

..... dm<sup>3</sup> [2]

(iii) The students were asked to describe gas exchange.

Complete the following passage with the most appropriate words.

The internal surface area of the human lungs is greatly increased by large numbers of structures called ..... They provide the sites for gas exchange.

Gases are exchanged by a process called .....

The walls of these structures are very ..... and ..... to the gases being exchanged.

Gases dissolve in .....

The gases pass across cell membranes in .....

Once oxygen has entered a capillary it passes into ..... via the plasma. It is then rapidly transported away from the site of exchange.

This maintains the ..... needed for efficient exchange.

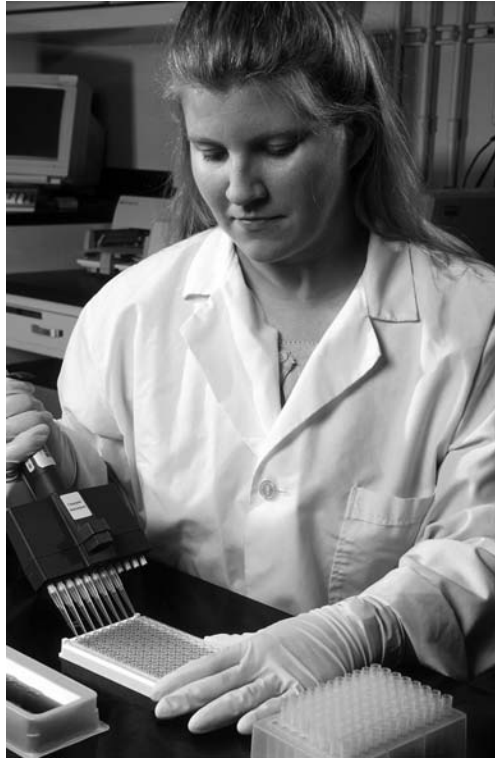
[8]

(b) Another group of students was interested in diagnostic testing.

One of the tests they investigated was ELISA.

This test is carried out in an ELISA plate.

Each tiny well in the plate is a separate test.



USDA/ARS

**Fig. 3.1** ELISA test in progress

The following statements summarise the processes involved in an ELISA test that would **confirm** that a particular antigen was present in a sample of blood serum.

The statements **A – M** are recorded in alphabetical order.

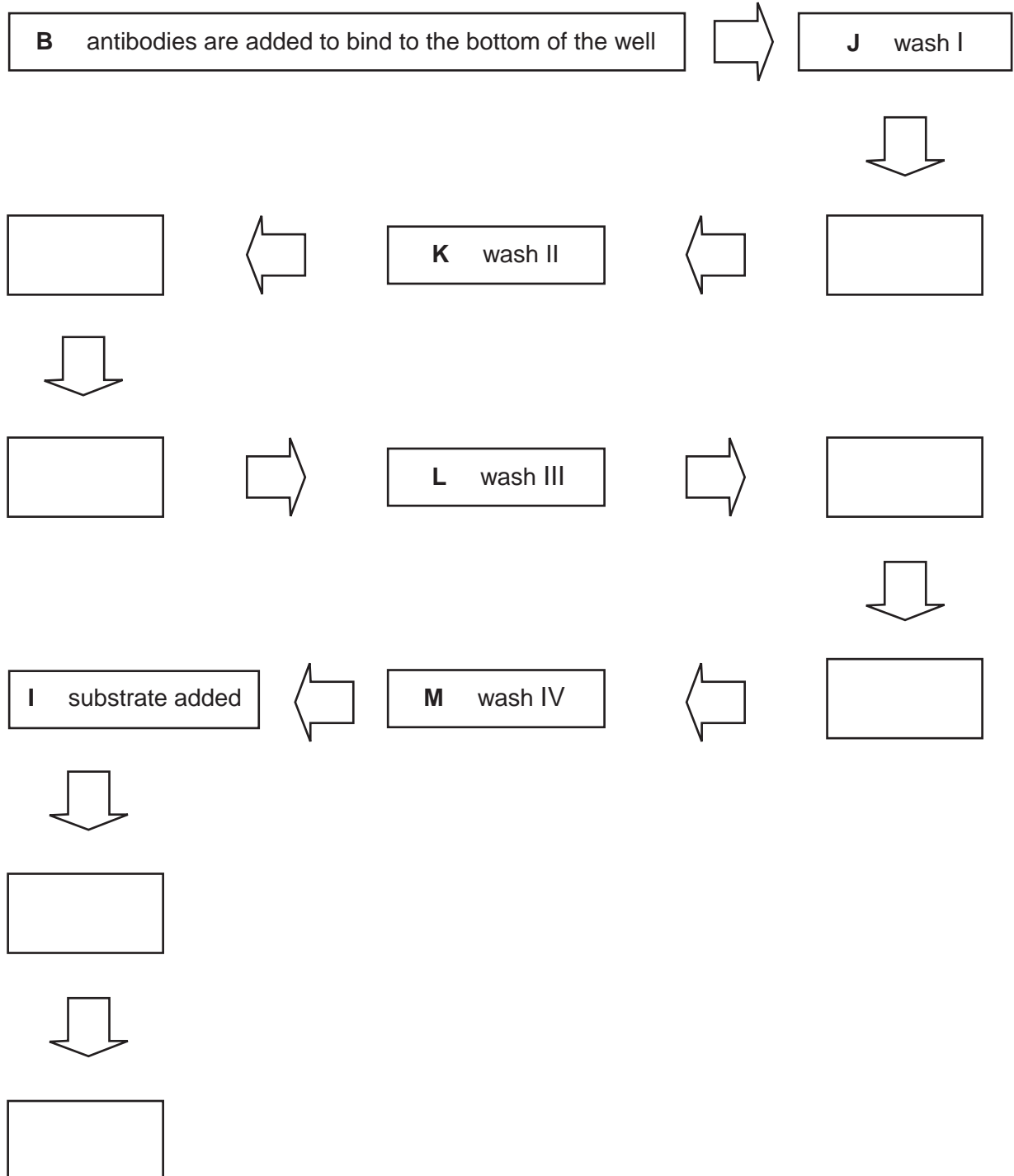
- A** an agent is added that binds to areas of the well wall not occupied by antibody
- B** antibodies are added to bind to the bottom of the well
- C** antigen binds to antibody
- D** antibody–enzyme complex added
- E** colour change
- F** complex binds to antigen
- G** enzyme reaction occurs
- H** serum sample added
- I** substrate added
- J** wash I
- K** wash II
- L** wash III
- M** wash IV



Complete the flow diagram in Fig. 3.2 to describe the correct sequence of events.

Use the letters only.

Some of the stages have been done for you.



[6]

Fig. 3.2 Flow Diagram for a confirmatory ELISA test

[Total: 22]

4 Two measurements commonly made in hospital are body temperature and blood pressure.

(a) Body temperature can be measured in different ways.

Figs. 4.1 and 4.2 show clinical and electronic thermometers in use.



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**Fig. 4.1**



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**Fig. 4.2**

- Body temperature may be measured using a clinical thermometer (Fig. 4.1) or by an electronic temperature probe (Fig. 4.2).
- The probe measures temperature by registering the amount of infra-red radiation from the ear drum.
- The ear drum shares a blood supply with the area of the brain that acts as the body's thermostat.

(i) Suggest **two** reasons why body temperature is monitored.

.....

.....

.....

..... [2]

- (ii) Using an electronic temperature probe rather than a clinical thermometer gives a more accurate measurement of body temperature.

Suggest **two** practical advantages of using an electronic temperature probe rather than a clinical thermometer.

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

- (iii) Suggest why recording temperature inside the ear canal provides a more accurate indication of body temperature than recording mouth temperature.

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

- (b) (i) Name the equipment used to measure blood pressure.

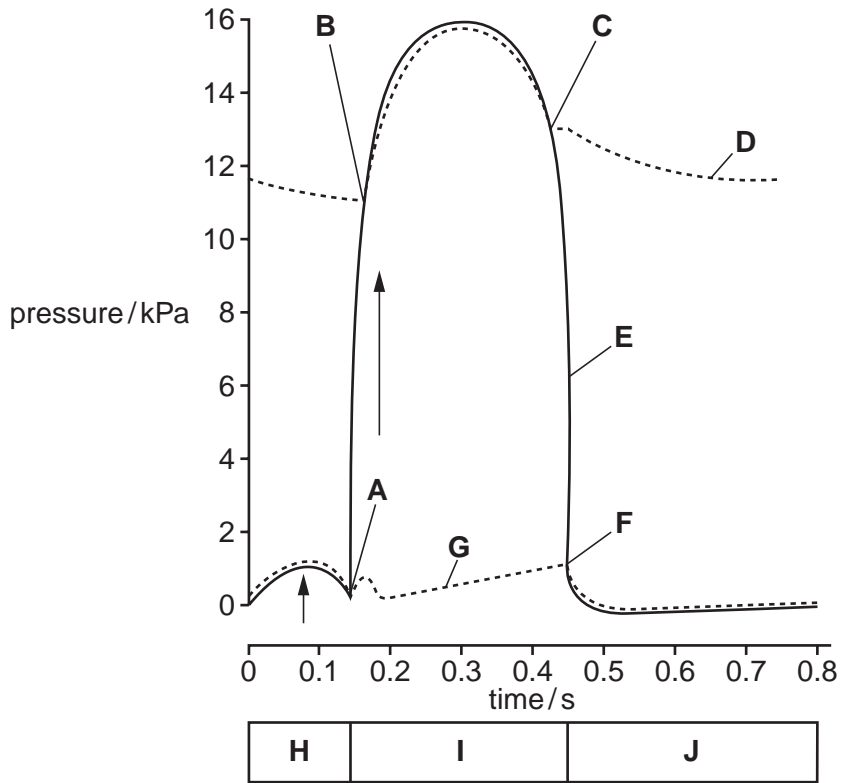
..... [1]

- (ii) Describe how this equipment is used to measure blood pressure.

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

(iii) Changes in blood pressure can be related to changes taking place in the heart and circulatory system during one heart beat.

↑ The arrows show rising pressure caused by the contraction of cardiac muscle, first in the atrial wall and then in the ventricle wall.



**Fig. 4.3** Blood pressure changes in the left atrium, left ventricle and associated blood vessels.

1. Label the curves **D**, **E** and **G**.

**D** .....

**E** .....

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

2. Match the labels **A, B, C, F, H, I** and **J** in Fig. 4.3 to the following descriptions **1 – 7**.

Three of them have been done for you.

- |   |                      |          |
|---|----------------------|----------|
| 1 | aortic valve opens   | <b>B</b> |
| 2 | aortic valve shuts   |          |
| 3 | atrial systole       | <b>H</b> |
| 4 | bicuspid valve opens |          |
| 5 | bicuspid valve shuts | <b>A</b> |
| 6 | diastole             |          |
| 7 | ventricular systole  |          |

[4]

[Total: 17]

5 An elderly gentleman is worried about a lump in his neck. He goes to see his GP. The GP arranges for him to see a consultant at a local hospital.

(a) An ultrasound scan was used to help the consultant make an initial diagnosis.

(i) Suggest why the consultant would have used an ultrasound scan to make her initial diagnosis.

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

(ii) Explain the basic principles of ultrasound scanning in diagnosis.

*In this part of the question, two marks are available for the use of appropriate scientific terms and for a clear and ordered answer.*

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

Quality of Written Communication [2]

(b) The consultant decided that an MRI scan would be helpful to obtain more evidence.

However, MRI scans are not suitable for everyone.

A risk assessment was carried out to see whether the procedure was appropriate for the elderly gentleman.

Complete the following form to identify **two** of the possible hazards, risks and appropriate safety precautions associated with an MRI scan.

<b>RISK ASSESSMENT FORM</b>		
<b>Procedure:</b> Initial assessment of patient for an MRI scan		
<b>Hazard</b> to be discussed	<b>Risk</b> to the patient	<b>Safety</b> precaution necessary
1 ..... .....	1 ..... .....	1 ..... .....
2 ..... .....	2 ..... .....	2 ..... .....

[6]

[Total: 17]

6 Gladys, an 88-year-old lady, was taken to the casualty department at a hospital. She had fallen over in the care home where she lived. The manager of the home thought she had damaged her hip.

(a) The doctor who examined her was concerned about possible internal injuries. A full body scan was carried out.

Before this scan Gladys was asked to sign a consent form.

Suggest the purpose of the consent form.

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

(b) The scan showed that there was no bone damage but there was evidence of cancerous tissue in part of Gladys' gut.

Discuss the ethical and moral dilemmas faced by the doctor about whether to tell Gladys about her cancer and the possible treatments available.

*In this part of the question two marks will be given for appropriate use of English, spelling, punctuation and grammar.*

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

Quality of Written Communication [2]

[Total: 9]

**END OF QUESTION PAPER**

*Copyright Acknowledgements:*

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