

Friday 18 May 2012 – Afternoon

AS GCE APPLIED SCIENCE

G622 Monitoring the Activity of the Human Body

Candidates answer on the Question Paper.

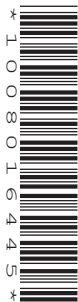
OCR supplied materials:

None

Other materials required:

- Electronic calculator
- Ruler (cm/mm)

Duration: 1 hour 30 minutes




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. 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 **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 Several indicators can be used to monitor the health and general fitness of patients.

(a) The values for indicators obtained from tests are often compared with normal values.

Table 1.1 shows some physiological indicators and their normal values.

Complete the table.

Table 1.1

physiological indicator	normal value	unit of measurement
body temperature (range)
breathing rate	15–18	breaths per minute
tidal volume at rest	dm ³
peak flow	dm ³ min ⁻¹
blood pressure (18-year-old male)	mm Hg
pulse rate (range)	60–80	beats per minute

[5]

(b) Name the piece of equipment used to measure blood pressure.

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

(c) Explain how to take pulse rate measurements.

.....

.....

.....

.....

.....

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

- (d) (i) Fig. 1.1 shows a two-week log of peak flow readings completed by a child who has asthma.

The child started using an inhaler on the Monday of the first week and used it throughout the two weeks.

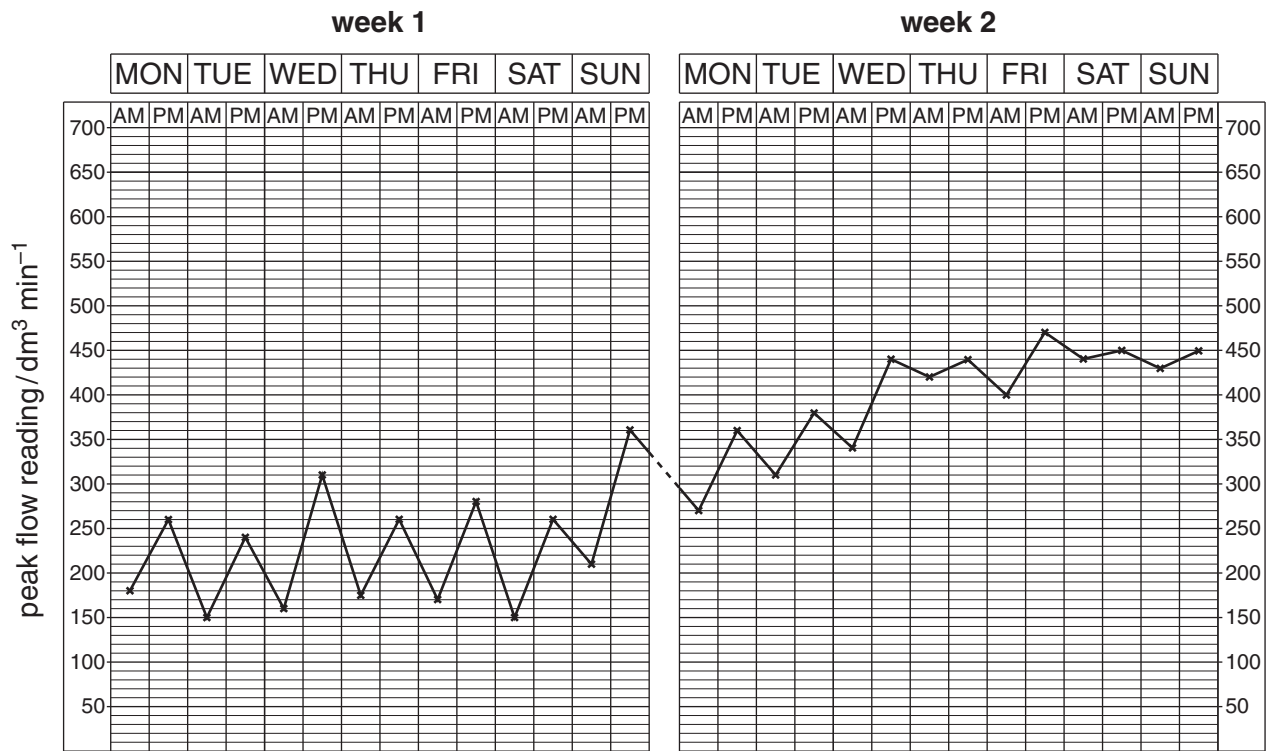


Fig. 1.1

- 1 State when the readings were taken each day.

..... [1]

- 2 Calculate the average peak flow value for the first four evenings (shown as PM) of the first week.

Show your working.

average evening (PM) peak flow = $\text{dm}^3\text{min}^{-1}$ [1]

- 3 Describe **one** way in which the use of the inhaler has affected the child's peak flow rate. Use the data shown in Fig. 1.1 to support your answer.

.....


 [2]

- (ii) Complete the boxes to show the route followed by air **exhaled** from the child's lungs.

A alveoli
B bronchi
C bronchioles
D trachea

Put the letters **A**, **B**, **C** and **D** in the correct order.

--	--	--	--

direction of exhaled air


[2]

- (e) Fig. 1.2 is a trace produced by a piece of equipment used to monitor a person's breathing.

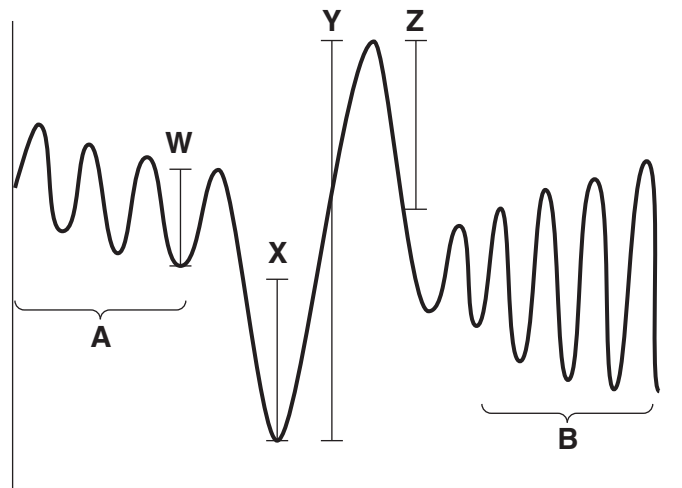


Fig. 1.2

- (i) Name the piece of equipment used to produce this trace.

..... [1]

- (ii) State which region, **W**, **X**, **Y** or **Z**, represents the tidal volume at rest.

region [1]

- (iii) State the reason for the differences in regions **A** and **B**.

..... [1]

[Total: 18]

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QUESTION 2 STARTS ON PAGE 6

- 2 A student is studying the structure and function of the human heart.

Fig. 2.1 shows a section of a human heart.

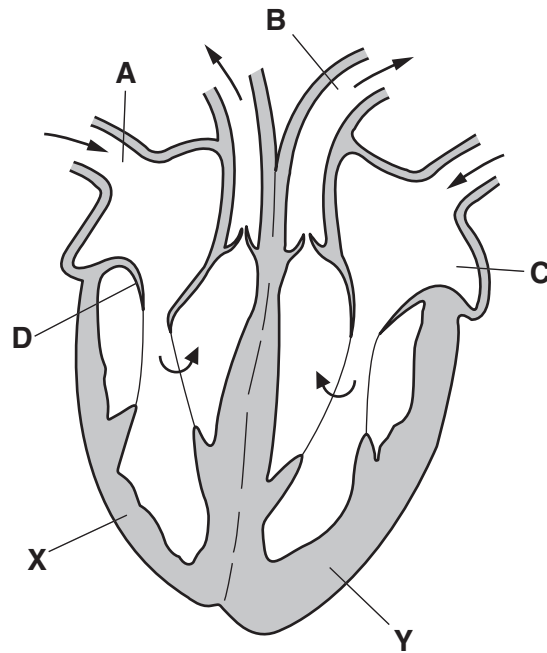


Fig. 2.1

- (a) (i) Name structures **A**, **B**, **C** and **D**.

A

B

C

D

[4]

- (ii) Describe the function of structures **A** and **D**.

function of **A**

.....

.....

..... [2]

function of **D**

.....

.....

..... [2]

- (b) The thickness of the heart wall at **Y** is much greater than at **X**.

This difference affects the circulation of blood leaving the heart. Explain the effect.

.....

.....

.....

..... [2]

- (c) Suggest **two** problems that might occur if structure **D** in Fig. 2.1 does not function properly.

1.

.....

2.

..... [2]

- (d) (i) Name a hormone that regulates the activity of the heart.

..... [1]

- (ii) Explain how this hormone regulates the activity of the heart.

.....

.....

.....

..... [2]

- (e) The student finds that an ultrasound scanner can be used to monitor blood flow through the heart.

Put a tick (✓) in the boxes below next to the correct statements.

An ultrasound scanner is useful for this purpose because it

..... uses a non-invasive technique.	
..... is a disposable piece of equipment.	
..... does not need a trained technician.	
..... shows parts of the heart moving.	
..... gives a three-dimensional image.	
..... gives a clear X-ray image of the heart.	

[3]

- (f)** The student carries out further research on diagnostic methods.

She examines the results obtained when using the following:

- ultrasound images
- ECG traces
- blood pressure readings
- pulse rate readings.



Outline the information which could be obtained from these techniques to identify heart defects.

..... [6]

[Total: 24]

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QUESTION 3 STARTS ON PAGE 10

- 3** An 85-year-old lady has an infection in her lungs. Her GP refers her to the radiography department in her local hospital for an X-ray.

Fig. 3.1 shows an X-ray of the human chest.

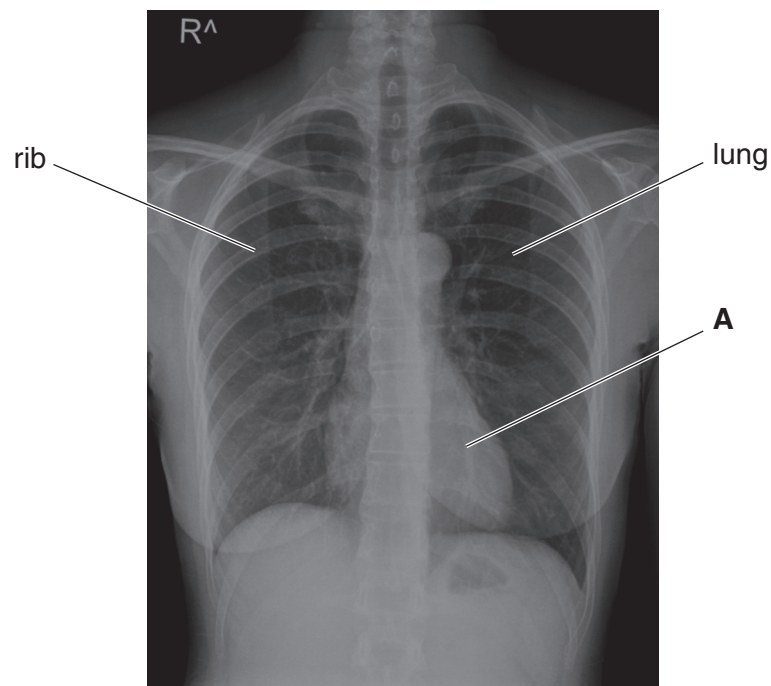


Fig. 3.1

- (a)** Explain why the rib is seen as a white object and the lung as a dark object in the X-ray image shown in Fig. 3.1.

.....

.....

.....

.....

.....

..... [3]

- (b)** Name the organ labelled **A**.

..... [1]

- (c) The X-ray of the lady's chest showed that she may have early signs of cancer.

Some people believe that it would not be appropriate to carry out further diagnosis and treatment of this 85-year-old lady.

State two ethical arguments for, and two against, further diagnosis and treatment of this lady.

ethical arguments for

1.

 2.
 [2]

ethical arguments against

1.

 2.
 [2]

- (d) Some of the activities carried out and the equipment used in a radiography department may be hazardous.

Complete Table 3.1 to show risk analyses for a **radiographer** using a CAT scanner and a **patient** having an MRI scan.

Table 3.1

	hazard	risk	safety precaution
radiographer using a CAT scanner on a daily basis			
patient having an MRI scan			

[6]

[Total: 14]

- 4 A person with diabetes is using a biosensor to monitor their blood sugar levels.

The biosensor shows that the blood sugar levels are too high.

- (a) State **two** ways in which the person with diabetes can use this result to return their blood sugar levels to within the normal range.

.....

.....

.....

.....

..... [2]

- (b) Blood sampling can be used to diagnose other conditions as well as diabetes.

Describe how blood cells counts can be useful in the diagnosis of a **named** condition.

condition [1]

description

..... [2]

- (c) Blood sampling techniques are also used by the police.

- (i) Name **two** substances in the blood of a car driver that the police may need to identify.

1

2 [2]

- (ii) Describe how a car driver could be tested for the presence of an illegal substance in their blood.

.....

.....

.....

.....

.....

.....

.....

.....

..... [3]

(d) Hepatitis is a type of liver disease.

The ELISA test, see Fig. 4.1, is used to find antibody indicators for hepatitis.

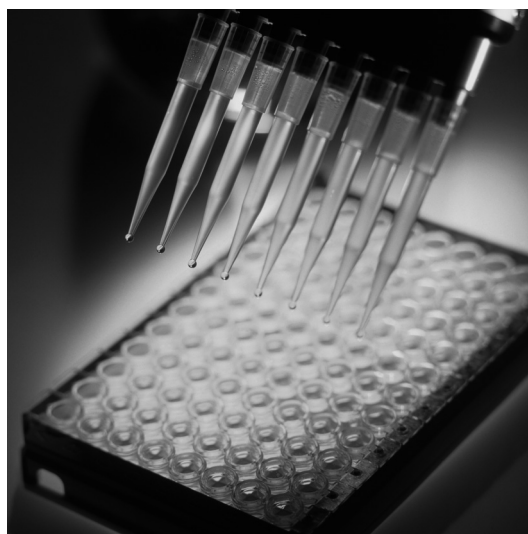


Fig. 4.1



Describe the stages carried out to find antibody indicators for hepatitis during an ELISA test.

..... [5]

[5]

[Total: 15]

Turn over


- 5 Sanjit is studying the process of respiration in muscle cells.

Sanjit's teacher asks him to complete a worksheet.

- (a) Complete the worksheet below.

Respiration worksheet

- (i) Complete the word equation for aerobic respiration.

..... +  + + energy [2]

- (ii) Put a ring around the molecule produced during respiration that acts as an immediate energy source in muscle cells.

ATP **DNA** **glucose** **glycogen** **sucrose** [1]

- (iii) Name the waste product formed during anaerobic respiration in muscle cells.

..... [1]

- (iv) State the two forms in which energy can be released during the **burning of fuel**.

1.

2. [2]

- (v) Write down the sites of aerobic and anaerobic respiration in muscle cells.

aerobic site

anaerobic site [2]

- (b) Sanjit knows that his muscle cells can contract only if they respire.

List three **other** processes needing energy released from respiration.

1.

2.

3. [3]

(c) The respiratory and circulatory systems have an important function in the process of respiration.

- (i) Identify one **problem** of the respiratory system and one **problem** of the circulatory system which could limit the strength of muscle contraction.

respiratory system

.....

circulatory system

..... [2]

- (ii) Explain why these problems would affect the strength of muscle contraction.

.....

.....

.....

..... [2]

(d) Sanjit's teacher tells him that there is a range of equipment to diagnose respiratory and circulatory system problems, including CAT scans and MRI scans.

Describe **two** advantages and **two** disadvantages of using the two types of scanner compared to alternatives.

type of scanner	advantages	disadvantages
CAT	1. 2.	1. 2.
MRI	1. 2.	1. 2.

[4]

[Total: 19]

END OF QUESTION PAPER

[illegible]