

**ADVANCED SUBSIDIARY GCE
APPLIED SCIENCE**

G622

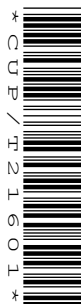
Unit 3: Monitoring the activity of the human body

TUESDAY 5 JUNE 2007

Afternoon

Time: 1 hour 30 minutes

Additional materials: Electronic calculator
Ruler (cm/mm)



Candidate
Name

Centre
Number

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Candidate
Number

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INSTRUCTIONS TO CANDIDATES

- Write your name, Centre number and Candidate number in the boxes above.
- Answer **all** the questions.
- Use blue or black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully and make sure you know what you have to do before starting your answer.
- Do **not** write in the bar code.
- Do **not** write outside the box bordering each page.
- **WRITE YOUR ANSWER TO EACH QUESTION IN THE SPACE PROVIDED. ANSWERS WRITTEN ELSEWHERE WILL NOT BE MARKED.**

INFORMATION FOR CANDIDATES

- The number of marks for each question is given in brackets [] at the end of each question or part question.
- 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	11	
2	28	
3	17	
4	15	
5	19	
TOTAL	90	

This document consists of **14** printed pages and **2** blank pages.

Answer **all** the questions.

- 1 Traces **A**, **B** and **C** in Fig. 1.1 have been recorded on a special machine that monitors the electrical activity of the heart.

They have been transferred to paper with an appropriate time scale.

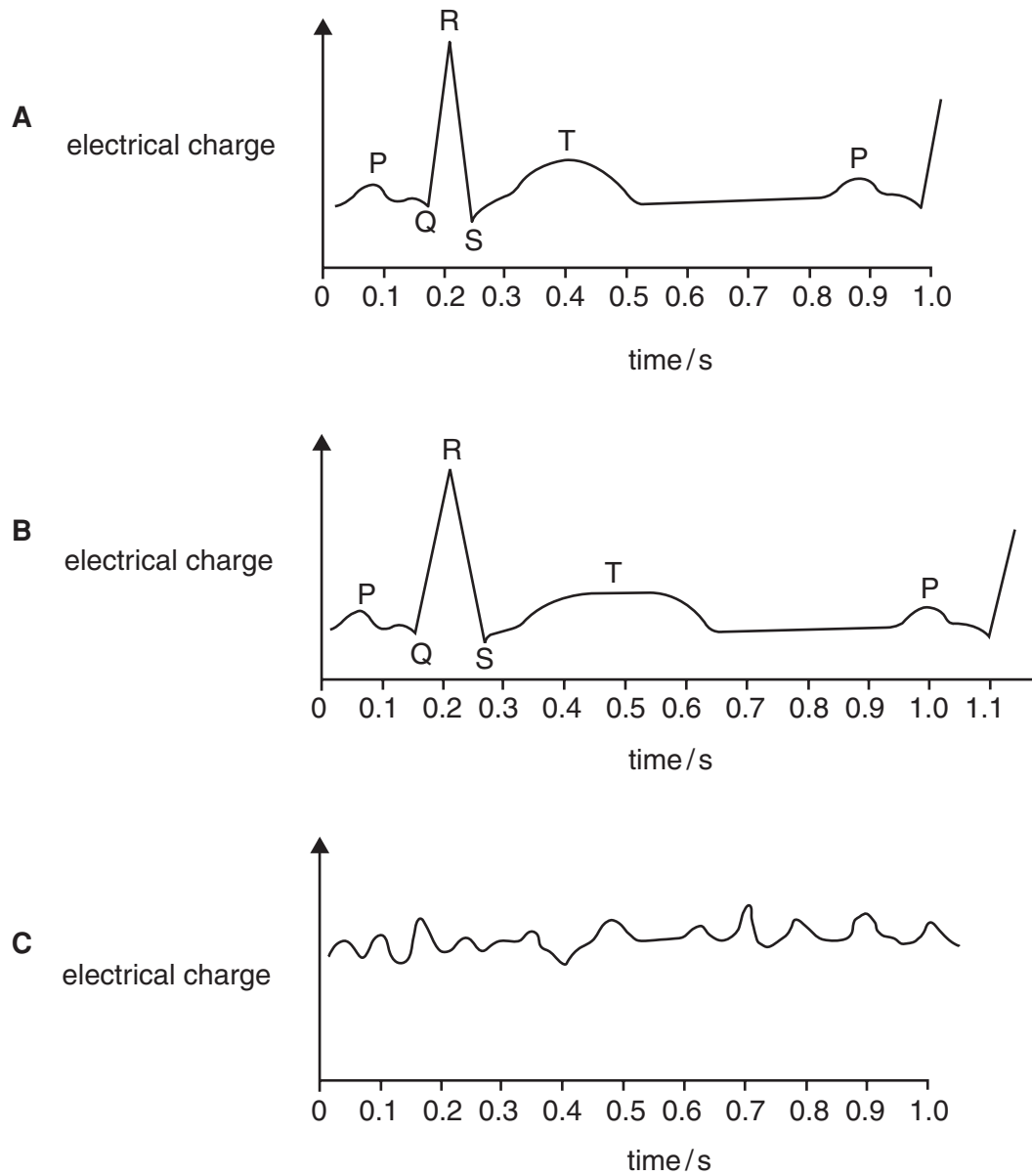


Fig. 1.1

(a) Name the machine used.

..... [1]

(b) Trace **A** is from a normal, healthy person.

Calculate the heart rate for the person who produced trace **A**, in beats per minute.

..... beats per minute [3]

(c) The contraction time is measured from Q to the **end** of the T wave.

Find the contraction time for trace **A**.

..... seconds [1]

(d) Trace **B** is from someone who has taken a drug called digoxin (digitalis).

Use traces **A** and **B** to describe **two** differences that this drug may have caused in **B**'s heart activity.

Use data values in your answers.

1.

.....

.....

2.

.....

..... [4]

(e) (i) Name the condition that would produce trace **C**.

..... [1]

(ii) A patient's heart activity produces a trace like **C**.

Complete the following sentence to describe a nurse's response.

'Immediate action is necessary to prevent ' [1]

[Total: 11]

- 2 (a) The volumes of air breathed in and out of the lungs are measured in order to monitor lung health.

Fig. 2.1 shows a trace produced by a 17 year-old female student. She was sitting down when the trace was made.

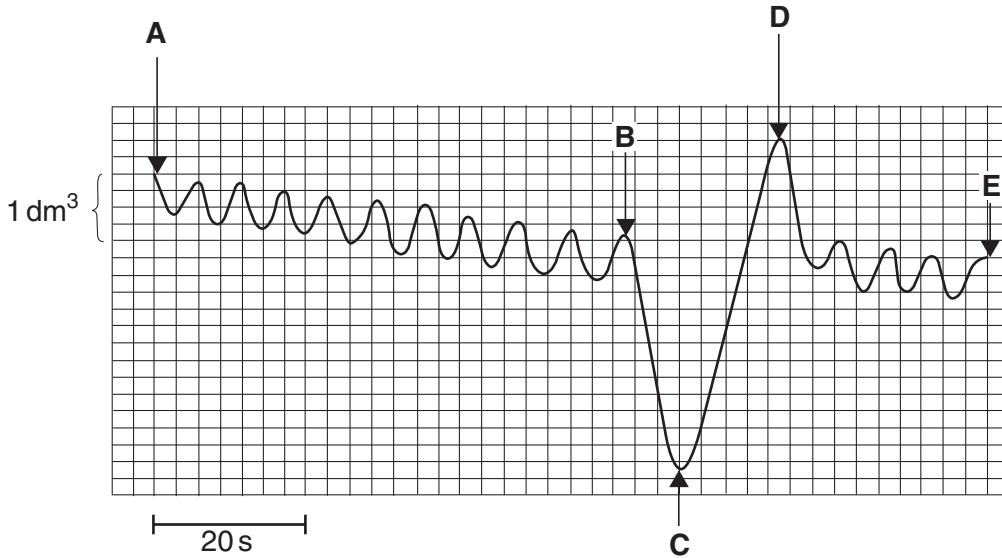


Fig. 2.1

A spirometer can be used to obtain this type of data.

- (i) Using Fig. 2.1 calculate the breathing rate during the period A to B.
 unit..... [2]
- (ii) Use Fig. 2.1 to estimate the student's tidal volume at rest and her vital capacity.
 tidal volume unit
 vital capacity unit..... [2]
- (iii) State the normal values for breathing rate and tidal volume.
 breathing rate unit
 tidal volume unit..... [2]
- (iv) State and explain the conclusions you can make about the health of the student's lungs using the values recorded in (i), (ii) and (iii).

 [2]

(b) Describe how inhalation is brought about in humans.

.....

.....

.....

.....

..... [4]

(c) Fig. 2.2 shows sections through normal, healthy lung tissue and diseased lung tissue.

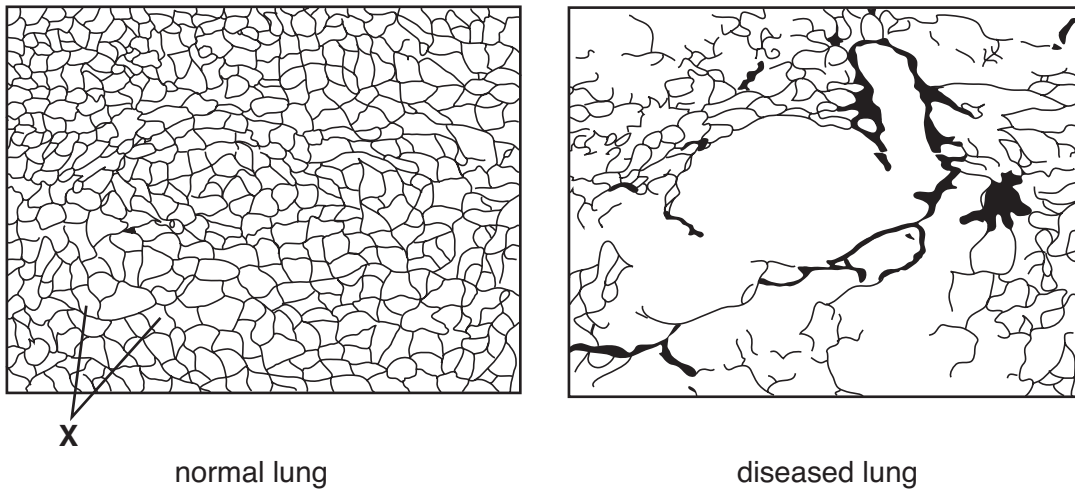


Fig. 2.2

(i) Name the air sacs labelled X.

..... [1]

(ii) Describe **two** differences between the diseased and normal lung tissue that are obvious in the sections.

1.

.....

2.

..... [2]

(iii) Explain how oxygen and carbon dioxide are exchanged between the atmosphere and the blood, through the respiratory surfaces of lungs.

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

(iv) Suggest how breathing rate and tidal volume will be different for diseased lungs.

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

(d) A doctor wishes to know tidal volume and vital capacity values for a patient who has lung disease.

Describe how the patient's lung volumes are measured using a simple spirometer.

In this part of the question 2 marks are available for appropriate use of spelling, punctuation and grammar and organising relevant information.

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

Quality of Written Communication [2]

[Total: 28]

7
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3 An athlete was interested to find out about the body's muscles and their blood supply. She did a search on the internet. Most of the information she found was about respiration.

(a) Complete Table 3.1 to summarise the differences between aerobic and anaerobic respiration.

Table 3.1

feature	anaerobic	aerobic
substrates		
products	lactic acid (lactate)	
number of molecules of ATP per molecule of substrate		

[5]

(b) Describe and explain the changes that take place in the blood flowing through the muscles of an athlete when she runs a 100m race.

In your answer, refer to rate of blood flow, composition of blood and oxygen debt.

rate of blood flow

.....

.....

.....

composition of blood

.....

.....

.....

oxygen debt

.....

.....

.....

[6]

(c) 'Drugs In Sport' is a topic which makes headline news.

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

recreational drug

performance-enhancing drug [2]

(ii) There are some performance-enhancing methods however, which do not use illegal substances. One of them involves the use of blood cells in a practice called 'blood doping'. During this process, red blood cells are injected into an athlete's circulatory system several days before a sporting event.

Describe how an athlete could be tested and how the results could be analysed to check if they had undergone 'blood doping'.

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

[Total: 17]

4 Most people are familiar with conventional X-ray machines. More recently CAT and MRI scanners have been used. These are large machines that look very similar.

(a) State **one similarity** shown by a CAT scanner and a conventional X-ray machine in the way that they produce images.

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

(b) State **one difference** between an MRI scanner and a CAT scanner in the production of images.

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

(c) (i) A radiographer leaves the room once the patient has been set up for a CAT scan. Explain why this is necessary.

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

(ii) Explain why the source rotates during a CAT scan.

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

(d) State **one** advantage and **one** disadvantage of using a CAT scanner rather than a conventional X-ray machine.

advantage [1]

disadvantage [1]

- (e) MRI scans are considered to be a safe form of diagnosis. However, all medical procedures carry some risk.

Complete Table 4.1 for an MRI scanner.

Table 4.1

hazard	risk	safety precaution(s)
noise		

[5]

- (f) MRI scans are in high demand and short supply.

Discuss the ethical issues that arise as a result.

.....

.....

.....

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.....

.....

..... [3]

[Total: 15]

5 A student was researching the effect of exercise on blood pressure.

(a) (i) Explain how blood pressure is increased inside the heart.

.....

.....

..... [2]

(ii) Explain why blood must be put under pressure in the body.

.....

.....

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.....

.....

..... [2]

(b) Fig. 5.1 shows information about blood pressures in parts of the human circulatory system during one cardiac cycle.

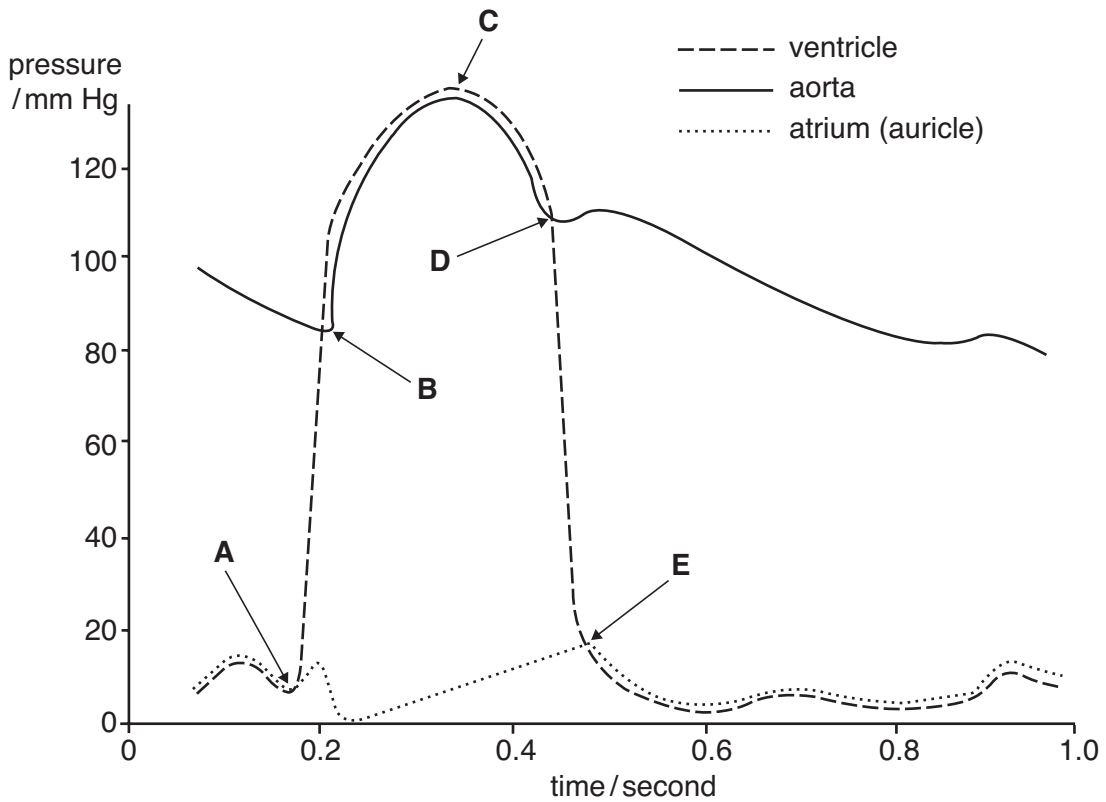


Fig. 5.1

(i) Using Fig. 5.1 explain why this information relates to the left side of the heart.

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

(ii) At point **A** in Fig. 5.1 the bicuspid or mitral valve closes. Describe the changes taking place in the heart at points **A – E**, during the cardiac cycle.

Include blood pressure and time values in your description.

In this part of the question, 2 marks are available for using spelling, punctuation and grammar and scientific vocabulary.

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..... [5]

Quality of Written Communication [2]

(c) The changes shown in Fig. 5.1 occur every time the heart contracts.

The student's research showed that during exercise blood pressure rises automatically to meet the body's increased needs.

(i) State **two** locations for the pressure sensors involved in controlling blood pressure.

- 1.
- 2. [2]

(ii) Name the part of the brain that receives impulses from these sensors.

..... [1]

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