OCR
RECOGNISING ACHIEVEMENT

Advanced Subsidiary GCE **G622**

APPLIED SCIENCE

Unit 3: Monitoring the activity of the human body

TUESDAY 16 JANUARY 2007 Afternoon

Time: 1 hour 30 minutes

Additional materials: Electronic calculator
Ruler

Candidate Name

Centre Number

Candidate Number

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	19	
2	14	
3	16	
4	17	
5	8	
6	16	
TOTAL	90	

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

[Turn over

Answer **all** the questions.

1 People working in the 'health and fitness' sector monitor indicators of physiological status.

A student was interested in the various meters used and the way data from them is presented.

(a) Values obtained from tests are usually compared with 'average values' for the indicators to see if they are 'normal'.

Table 1.1 lists some physiological indicators and their 'normal' values.

Complete the table.

Table 1.1

physiological indicator	'normal' value	unit
blood pressure, 18 year old male		mm Hg
breathing rate	15 – 18	beats per min
tidal volume at rest		dm^3
peak flow		$dm^3\,min^{-1}$
body temperature, range		

[5]

(b) One of the basic measurements carried out is to establish an individual's blood pressure.

Name the meter used to measure blood pressure.

..... [1]

(c) A doctor may prescribe a peak flow meter if a patient has asthma.

(i) Give **three** instructions that would be given to the patient to make sure they use the meter correctly.

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..... [3]

(ii) Fig. 1.1 shows an example of a two week diary of peak flow readings done by a child who has asthma.

Readings were taken twice a day, in the morning and again in the evening.

A graph has been removed due to third party copyright restrictions

Details:

A graph showing the peak flow readings done by a child who has asthma over a 2 week period

Fig. 1.1

Use the data from Fig. 1.1 to describe two effects of the inhaler on the child's peak flow rate.

1. .....

.....

..... [2]

2. .....

.....

..... [2]

(d) The chart in Fig. 1.2 shows a spirometer trace produced by a 16-year old male who breathed normally, took a deep breath and then exhaled as strongly as he could.

A graph has been removed due to third party copyright restrictions

Details:

A graph showing a spirometer trace produced by a 16 year old male

Fig. 1.2

(i) What was the breathing rate during period X?

..... breaths per minute [2]

(ii) Name lung volume Y.

..... [1]

(e) Fig. 1.3 shows a chart produced by another monitoring device.

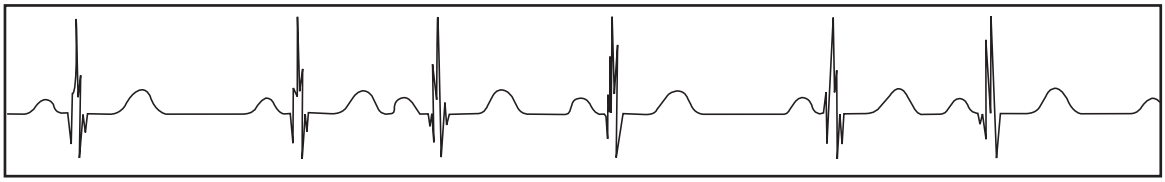

Fig. 1.3

(i) Which monitoring device is likely to have been used to produce this trace?

..... [1]

(ii) This trace is not 'normal'. State **one** irregularity shown in the trace.

..... [1]

(iii) Name the condition which is shown in Fig. 1.3.

..... [1]

[Total: 19]

2 A student was preparing work sheets to use as a test on cellular respiration.

Two of the work sheets are shown below.

(a) **Read all** of the incomplete account in 'WORK SHEET 1' below.

Then fill in the gaps with the most appropriate word, words or numbers chosen from the list.

WORK SHEET 1

Fill in the gaps, in the incomplete account, with the most appropriate word, words or numbers chosen from the list below.

adenosine monophosphate **adenosine triphosphate** **amino**

carbon dioxide **fatty** **lactic**

oxygen **water** **2** **38** **76**

During cellular respiration, …… is produced by the addition of a phosphate group to a molecule of ADP.

A variety of substrates are used for respiration. One example is glucose.

…… is required if the glucose is to be respired by the aerobic process.

The waste products of aerobic respiration are …… and …… .

If glucose is respired anaerobically by a muscle cell the waste product is …… acid.

Aerobic respiration produces …… molecules of ATP and anaerobic produces …… molecules of ATP from one molecule of glucose.

[7]

(b) Complete 'WORK SHEET 2' to:

(i) compare respiration and burning;

(ii) explain why respiration is important to the function of all cells in the body. Name **two** examples to support your answer.

WORK SHEET 2

(i) Compare respiration and burning.

.....

.....

.....

.....

.....

.....

..... [4]

(ii) Explain why respiration is important to the function of all cells in the body.

Name **two** examples to support your answer.

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..... [3]

[Total: 14]

3 An ultrasound scanner was set up to enable a cardiologist to assess blood flow across a valve in her patient's heart.

Special positioning of the scanner was necessary to 'view' the heart through a gap between the ribs.

A special gel was used to fill the space between the probe of the ultrasound scanner and the patient's skin.

(a) Explain why the gel was used to fill the space between the probe and the patient's skin.

..... [1]

(b) Explain why the probe needs special positioning to view the heart.

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..... [1]

(c) Explain the basic principles of how the ultrasound scanner can be used to assess blood flow.

In this part of the question, 2 marks are available for organising relevant information and using scientific vocabulary.

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..... [6]

Quality of Written Communication [2]

(d) State **two** further medical uses of ultrasound, other than assessing blood flow in the heart.

1. .....

2. ..... [2]

(e) State **two** advantages of using ultrasound to make a diagnosis.

1. .....

2. ..... [2]

(f) Whenever possible, a patient is made aware of the risks and benefits involved before imaging methods are used in diagnosis.

State and explain **one** risk which might arise from using **X-rays** to make a diagnosis.

.....

.....

..... [2]

[Total: 16]

4 Sports students were studying human ventilation.

(a) Part of their work involved an investigation into the effect of walking speed on ventilation of athletes.

Some of their results are shown in Table 4.1.

Table 4.1

walking speed / mph	breaths / min (breathing rate)	volume / dm^3 per breath (tidal volume)	ventilation rate / $dm^3 min^{-1}$
2	15	1.27	19.1
3	16	1.54	24.6
4	18	2.06	37.1
5	20	3.16	

Use the data in Table 4.1 to answer questions **(i)** and **(ii)**.

(i) Ventilation rate is calculated using the formula:

ventilation rate = tidal volume X breathing rate

Calculate the ventilation rate for the athlete walking at 5 mph.

ventilation rate ..... $dm^3 min^{-1}$ [2]

(ii) Describe **one** trend shown by the data.

.....

.....

..... [2]

(b) When the students had completed the investigation described in **(a)**, they decided to use the same method for a second investigation. This time they wanted to find out the effect of fast running speed on the ventilation of athletes using a running machine in a gym.

Imagine that you were one of the students. Describe the possible hazards involved in this investigation **and** explain how you would minimise the risks.

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

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..... [8]

Quality of Written Communication [2]

(c) The students also considered the anatomy of the ventilation system.

They produced Table 4.2 to summarise some of the features shown by different parts of the airways.

'✓' means that the feature is shown by that structure and '✗' means that it is not.

Complete Table 4.2 for bronchus, large bronchiole and alveolus.

Table 4.2

	feature			
structure	cartilage	mucus secreting cell	smooth muscle	cilia
trachea	✓	✓	✓	✓
bronchus				
large bronchiole				
alveolus				

[3]

[Total: 17]

5 Table 5.1 shows the concentration of three substances found in muscles at rest and after sprinting (running fast).

Table 5.1

	concentration / μmol g^{-1} muscle	
substance	at rest	after sprinting
glycogen	86.0	55.9
ATP	4.6	3.2
lactic acid (lactate)	1.1	31.5

(a) **Using the data** from Table 5.1 calculate the percentage of glycogen, present in muscle tissue at rest, that was used up during the sprint.

..... % [2]

(b) State **and** explain the changes in concentration that took place in the substances listed in Table 5.1.

glycogen

.....

.....

..... [2]

ATP

.....

.....

..... [2]

lactic acid (lactate)

.....

.....

..... [2]

[Total: 8]

6 Andrew and Joe were each given a drink containing 75g of glucose in 300cm^3 of water. Their blood glucose was measured at intervals for the next two and a half hours.

Table 6.1 shows the results of the investigation.

Table 6.1

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Details:

A table showing the results of Andrew and Joe's investigation

(a) Describe two changes shown in Andrew's blood glucose concentration during the 150 minutes of the investigation.

Use data in your description.

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..... [4]

(b) Explain how blood glucose concentration is controlled.

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..... [3]

(c) The results obtained for Joe differ from those for Andrew.

Use data from Table 6.1 to describe **two** differences.

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..... [4]

(d) State and explain the differences given in **(c)**.

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..... [2]

(e) Fig. 6.1 shows a graph of the results of a similar investigation. The four curves represent the blood glucose and insulin concentrations of two individuals.

A graph has been removed due to third party copyright restrictions

Details:

A graph showing four curves which represent the blood glucose and insulin concentrations of the two individuals

Fig. 6.1

Match graphs A, B, C and D to one each of labels 1, 2, 3 and 4.

	label	graph
1	blood glucose in diabetic person	.....
2	blood glucose in normal person	.....
3	blood insulin in diabetic person	.....
4	blood insulin in normal person	.....

[3]

[Total: 16]

END OF QUESTION PAPER