Candidate forename		Candidate surname	

Centre number						Candidate number				

OXFORD CAMBRIDGE AND RSA EXAMINATIONS

ADVANCED SUBSIDIARY GCE

G622

APPLIED SCIENCE

Monitoring the activity of the human body

TUESDAY 11 JANUARY 2011: Morning
DURATION: 1 hour 30 minutes

SUITABLE FOR VISUALLY IMPAIRED CANDIDATES

Candidates answer on the question paper.

OCR SUPPLIED MATERIALS:

None

OTHER MATERIALS REQUIRED:

Electronic calculator
Ruler (cm/mm)

READ INSTRUCTIONS OVERLEAF

DC (AC/SW) 11MEP01170 40467/1
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INSTRUCTIONS TO CANDIDATES

- **Write your name, centre number and candidate number in the boxes on the first page. 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.**

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.**

Answer ALL the questions.

1 Hospital patients often have their body temperature recorded on a chart at regular intervals.

(a) What is the range of the NORMAL core body temperature for an adult at rest?

from _____ to _____°C [2]

(b) The maintenance of a stable body temperature involves a number of natural physiological mechanisms.

State two physiological mechanisms used when the body responds to VERY COLD external temperatures.

1. _____

2. _____ [2]

(c) Hyperthermia is when body temperature is much higher than normal.

The graph, Fig. 1.1, shows PULSE RATE READINGS for a patient recovering from hyperthermia over a 6 day period.

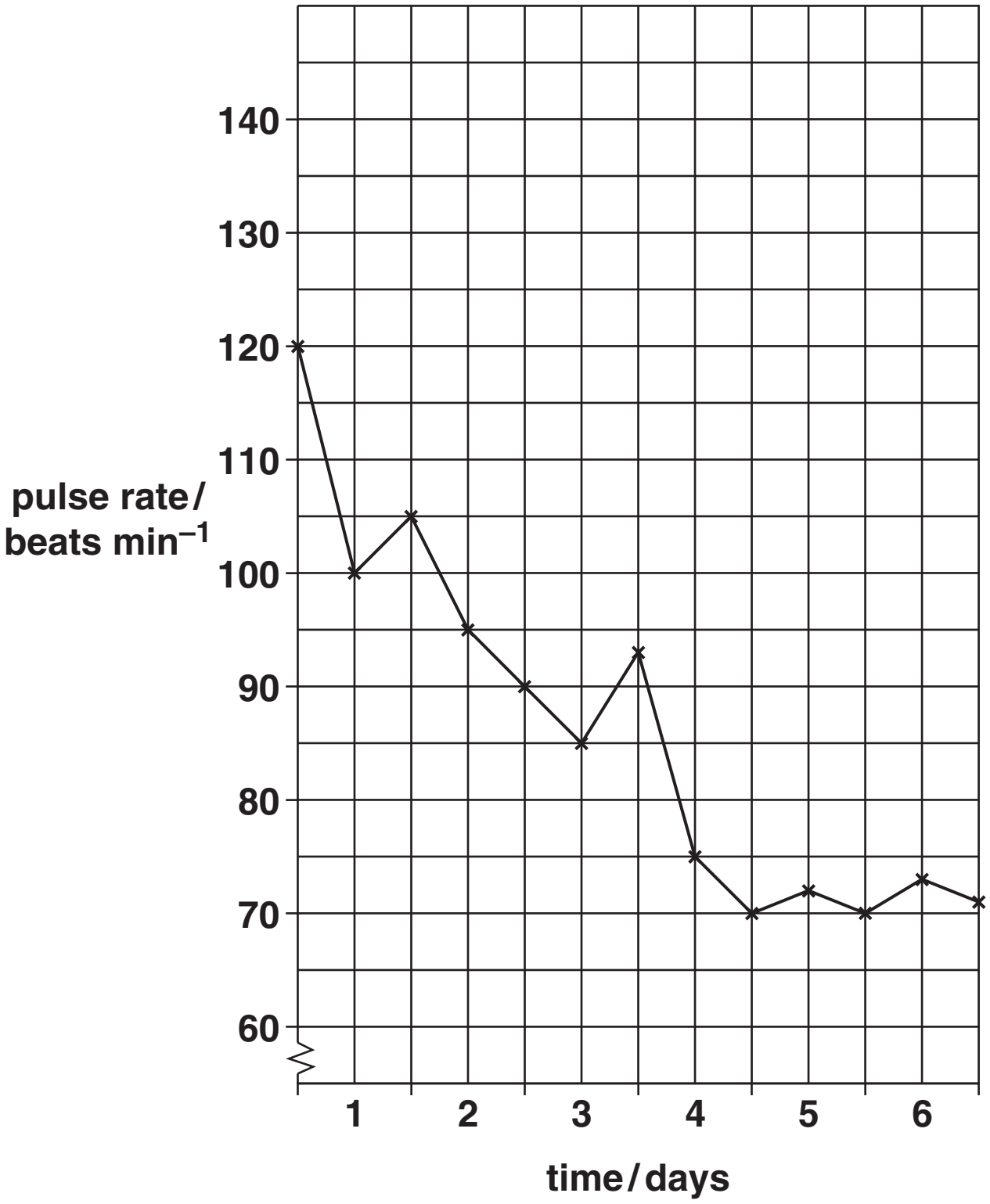


Fig. 1.1

(i) Which day does the graph show that the patient has recovered from hyperthermia?

day = _____ [1]

(ii) What is the evidence for your conclusion?

Use the graph to support your answer.

_____

_____

_____

_____ **[2]**

(iii) Give one explanation for the changes in pulse rate during DAY 6.

_____

_____ **[1]**

(iv) What is the percentage DECREASE in the pulse rate between the highest and lowest readings in the graph, Fig. 1.1?

Show your working.

highest reading _____

lowest reading _____

percentage decrease = _____ % [3]

(v) Explain the link between hyperthermia, vasodilation and pulse rate.

_____

_____

_____

_____

_____

_____ **[3]**

(d) A long-distance runner is suffering from heat exhaustion and needs urgent medical attention from a first aider.

His body temperature is taken using a clinical, glass thermometer.

(i) Describe how to measure the body temperature accurately using this type of thermometer.

_____

_____

_____

_____

_____

_____ **[3]**

(ii) A temperature-sensitive plastic strip can be used to estimate the body temperature of children. The strip can be simply placed on the forehead of the child and a reading is taken.

State one ADVANTAGE and one DISADVANTAGE of using this plastic strip.

advantage _____

_____

disadvantage _____

_____ **[2]**

(iii) Name one other type of thermometer used to measure body temperature.

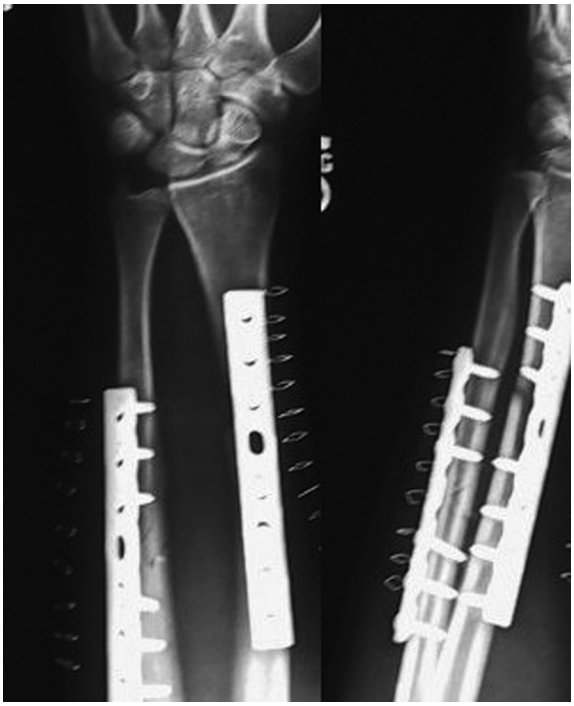
_____ **[1]**

[Total: 20]

2 Andrew has had an accident on his bicycle and has a serious bone fracture in his arm.

Andrew's arm was X-rayed before and after treatment, Fig. 2.1.

before treatment



after treatment

Fig. 2.1

(a) Give two reasons why X-ray radiography is described as 'non-invasive'.

1. _____

_____

2. _____

_____ **[2]**

(b) Describe how X-ray radiography produces the images shown in Fig. 2.1.

You are not required to explain how an X-ray is generated.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____ **[6]**

(c) Andrew is examined AFTER his surgery.

His doctors use a CT or CAT scanner to find out if his arm muscles are damaged.

(i) Give two reasons for using a CT or CAT scanner, rather than a conventional X-ray machine, for this investigation.

1. _____

_____

2. _____

_____ **[2]**

(ii) Andrew has stainless steel implants as part of his treatment.

Explain why an MRI scanner would not be used to examine Andrew AFTER his surgery.

_____

_____

_____

_____ **[2]**

(iii) Andrew's notes indicate that he has a heart defect.

Name two other methods that might have been used to monitor Andrew's heart.

1. _____

_____

2. _____

_____ **[2]**

(d) The use of an X-ray scanner has potential hazards.

Complete Table 2.1 to indicate one risk and a related safety precaution for the RADIOGRAPHER.

Table 2.1

HAZARD	RISK	SAFETY PRECAUTION
X-radiation		

[2]

[Total: 16]

3 Blood pressure is affected by age, health and wellbeing.

(a) Give the blood pressure values for a typical 18-year-old.

_____ / _____ mm Hg [2]

(b) A 40-year-old man has a blood pressure of 135/85 mm Hg.

State what these two values of the blood pressure reading represent.

135 mm Hg _____

85 mm Hg _____ [2]

(c) An 89-year-old lady, Mrs Jones, is referred to her doctor by her care home staff. She does not seem to have much energy and her blood pressure changes dramatically throughout each day.

(i) Explain why the symptoms shown by Mrs Jones may indicate a circulatory problem.

1 lack of energy _____

_____

_____

_____ **[2]**

2 changing blood pressure _____

_____

_____

_____ **[2]**

(ii) The doctor takes readings of Mrs Jones' blood pressure. He uses a digital sphygmomanometer, Fig. 3.1.

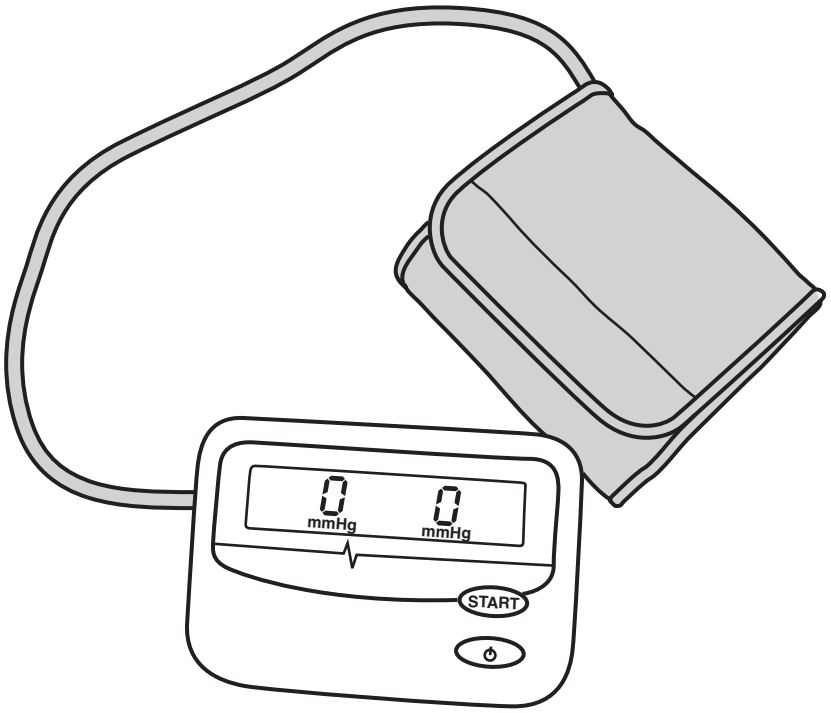


Fig. 3.1

Describe how the doctor would measure Mrs Jones' blood pressure using a digital sphygmomanometer.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____ **[6]**

(iii) An example of the changing blood pressure for Mrs Jones over a 24 hour period is shown in Fig. 3.2.

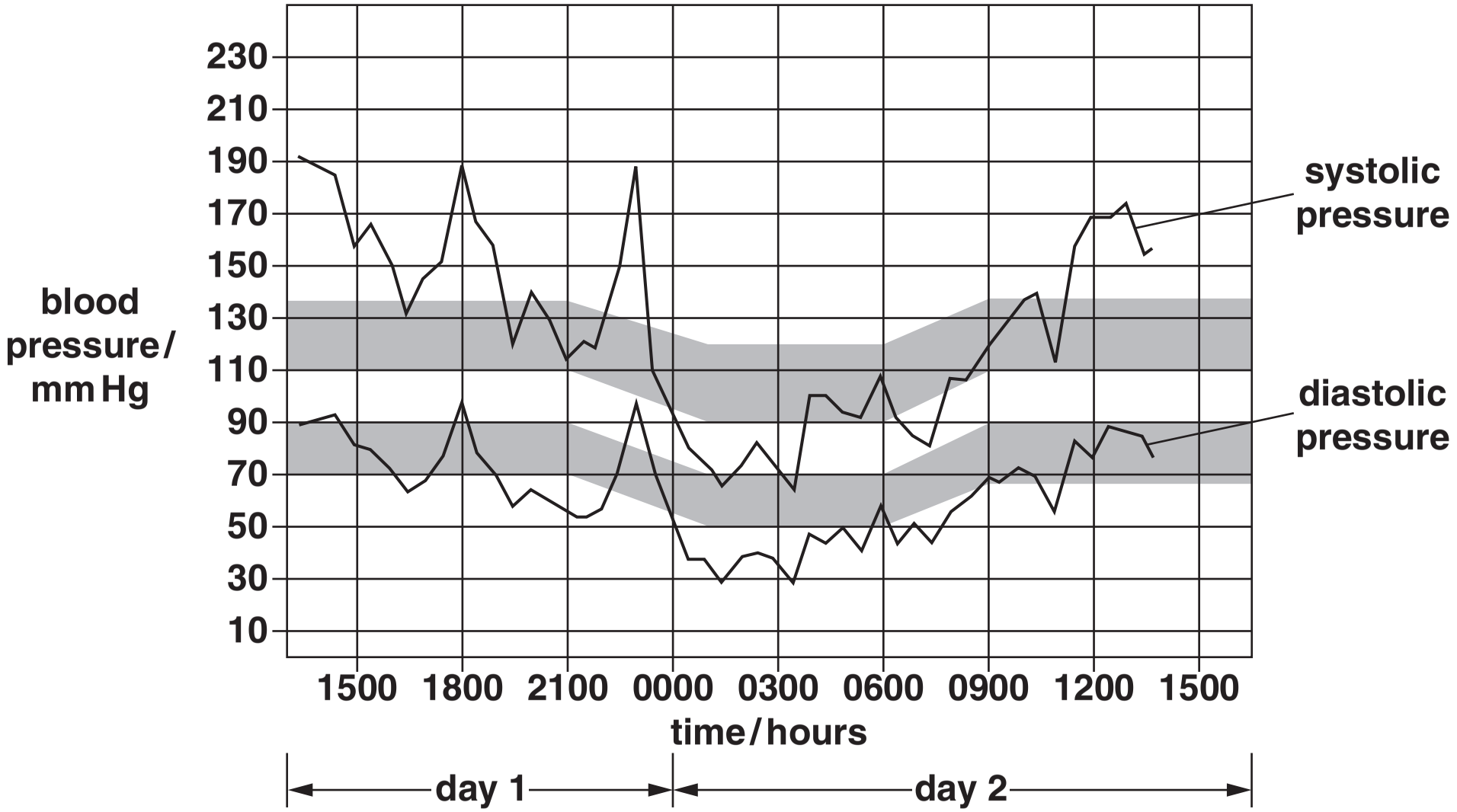

blood pressure / mm Hg
230
210
190
170
150
130
110
90
70
50
30
10
systolic pressure
diastolic pressure
1500
1800
2100
0000
0300
0600
0900
1200
1500
time / hours
day 1
day 2

Fig. 3.2

1 State the blood pressure reading at midnight (0000 hrs).

_____ / _____ mm Hg [2]

2 Explain why the two lines show the same pattern on the graph, Fig. 3.2.

_____

_____ [1]

(d) The doctor decides to take frequent blood samples from Mrs Jones over a two day period. A nurse, working alongside the doctor, carries out a risk assessment for this series of blood tests.

Complete the risk assessment form below. You should consider ONE risk for the NURSE.

RISK ASSESSMENT FORM
1. POTENTIAL HAZARD
Handling patient's blood
2. POTENTIAL RISK
[1]
3. TWO SAFETY PRECAUTIONS
[2]
4. DEALING WITH AN ACCIDENT
[1]
5. LEVEL OF RISK (WITH EXPLANATION)
[1]

(e) The doctor is concerned about the results of Mrs Jones' blood test and considers the option of surgery to correct the circulatory problem.

(i) Identify two potential benefits of surgery for the patient, Mrs Jones.

1. _____

_____

2. _____

_____ **[2]**

(ii) Suggest two reasons why it may be INAPPROPRIATE to treat Mrs Jones.

1. _____

_____

2. _____

_____ **[2]**

[Total: 26]

4 Chronic obstructive pulmonary disease (COPD) is often caused by smoking.

COPD causes airways in the lungs to become narrower and lots of mucus is produced. This makes it harder for air to get in and out of the lungs.

(a) Table 4.1 gives four structures of the airways and the lungs.

Complete the table by putting a TICK (✓) in each box to indicate that the feature is present in the structure or a CROSS (✗) to indicate that the feature is absent.

Table 4.1

STRUCTURE	FEATURE			
	CARTILAGE	GOBLET CELLS	SMOOTH MUSCLE	CILIA
trachea				
bronchus				
large bronchiole				
alveolus				

[4]

(b) What is the LINK between the function of the goblet cells and the cilia?

_____

_____

_____

_____ **[2]**

(c) Suggest how COPD affects the activity of the goblet cells.

_____

_____ **[1]**

(d) State what is likely to happen to the tidal volume of COPD patients and suggest why this happens.

_____

_____

_____

_____ **[2]**

(e) Different types of equipment can be used to measure the effect of COPD on the health of a patient or to reduce their symptoms.

(i) Explain how to use a simple spirometer to measure the vital capacity of a patient.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____ **[5]**

(ii) A peak flow meter can also be used to diagnose COPD symptoms.
Why are three readings usually taken?

_____

_____ **[1]**

(iii) Some COPD patients use a bronchodilator (inhaler) to reduce their symptoms.

This equipment delivers medicine so that the airways are opened wider for the COPD patient.

How will this affect the oxygen AND carbon dioxide levels in the blood of the patient?

_____

_____ **[1]**

[Total: 16]

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5 Suzanne is a volunteer working with a team of exercise physiologists as part of a research programme.

She has the concentration of three substances measured in her MUSCLES when at rest and after sprinting, using exercise equipment.

The results are shown in Table 5.1.

Table 5.1

SUBSTANCE	CONCENTRATION / μmol g^{-1} MUSCLE TISSUE	
	AT REST	AFTER SPRINTING
ATP	4.5	3.3
glycogen	84.0	56.2
lactic acid	1.2	30.8

(a) State and explain the changes taking place in the concentration of the substances listed, after sprinting.

(i) ATP

change _____

explanation _____

_____

_____

_____ **[3]**

(ii) GLYCOGEN

change _____

explanation _____

_____

_____

_____ **[3]**

(iii) LACTIC ACID

change _____

explanation _____

_____ **[1]**

(b) State why lactic acid must be removed or broken down within the body after exercise.

_____

_____ **[1]**

(c) Muscle cell contraction is directly affected by the rate of respiration and ATP levels.

State TWO other biological processes in the body directly affected by ATP levels.

1. _____

2. _____ **[2]**

(d) A sample of Suzanne's blood can be analysed to provide information about her level of fitness.

State TWO features of Suzanne's blood sample, likely to be examined for this purpose.

1. _____

2. _____ **[2]**

[Total: 12]

END OF QUESTION PAPER

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