Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										

For Examiner's Use	
Examiner's Initials	
Question	Mark
1	
2	
3	
4	
5	
6	
7	
TOTAL	

General Certificate of Secondary Education
Foundation Tier
January 2012

Biology

BLY3F

Unit Biology B3

F

Written Paper

Tuesday 24 January 2012 9.00 am to 9.45 am

For this paper you must have:
- a ruler.

You may use a calculator.

Time allowed
- 45 minutes

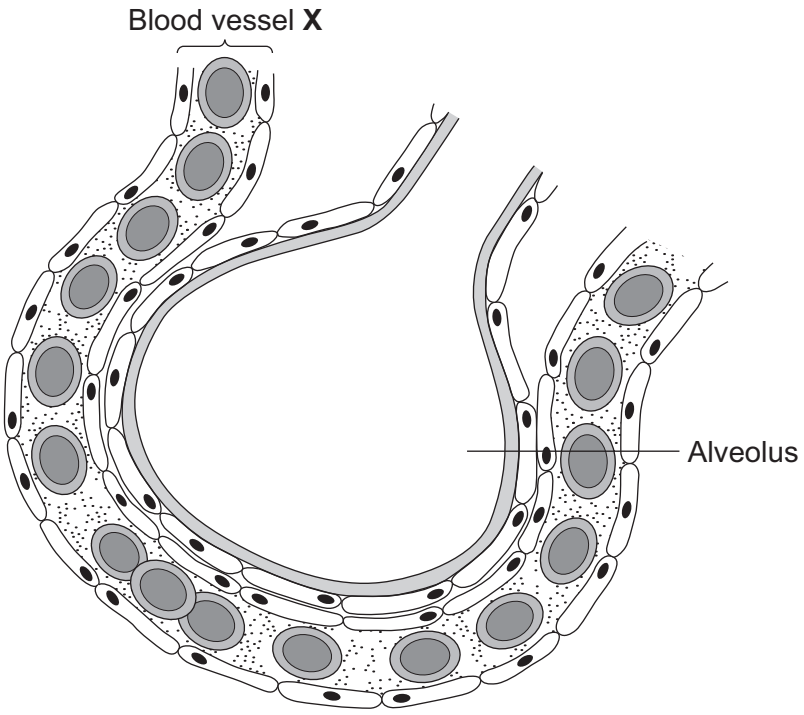
Instructions
- Use black ink or black ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- Do all rough work in this book. Cross through any work you do not want to be marked.

Information
- The marks for questions are shown in brackets.
- The maximum mark for this paper is 45.
- You are expected to use a calculator where appropriate.
- You are reminded of the need for good English and clear presentation in your answers.

Advice
- In all calculations, show clearly how you work out your answer.

Answer **all** questions in the spaces provided.

1 The diagram shows an alveolus and a blood vessel in the lung.



1 (a) Draw a ring around the correct answer to complete each sentence.

1 (a) (i) Blood vessel **X** is

an artery.

a capillary.

a vein.

(1 mark)

1 (a) (ii) Gases pass across the wall of the alveolus by

diffusion.

evaporation.

fermentation.

(1 mark)

1 (a) (iii) The table compares the concentrations of some gases in inhaled air and exhaled air.

Complete the table.
Write 'lower' **or** 'higher' in each box.
One line has been completed for you as an example.

Gas	Concentration	
	Inhaled air	**Exhaled air**
Water vapour	lower	higher
Carbon dioxide		
Oxygen		

(2 marks)

1 (b) Draw a ring around the correct answer to complete each sentence.

1 (b) (i) Oxygen is carried in the blood mainly in

blood plasma.

red blood cells.

white blood cells.

(1 mark)

1 (b) (ii) In the blood, the oxygen combines with

carbon dioxide.

haemoglobin.

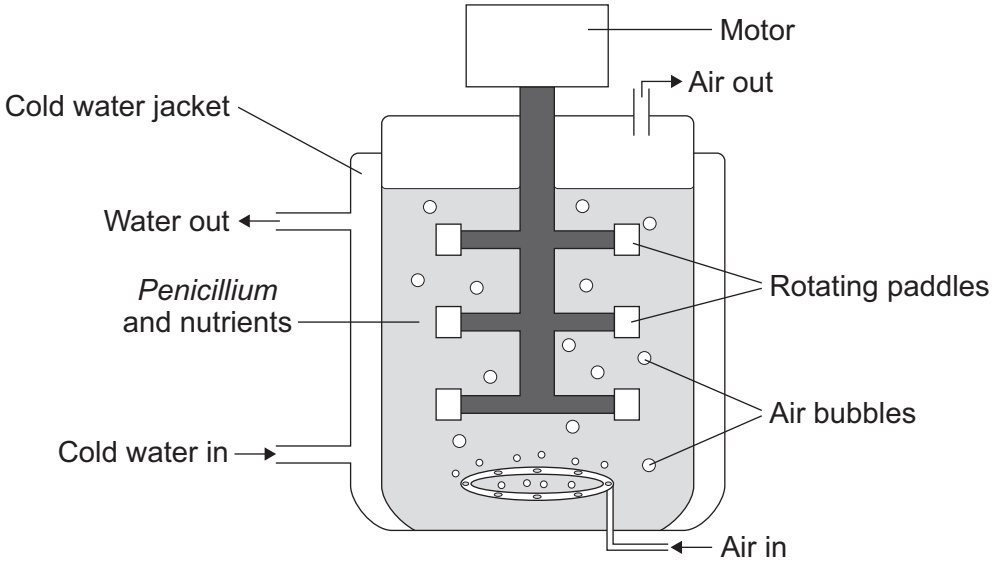
urea.

(1 mark)

6

Turn over for the next question

2 The diagram shows an industrial fermenter. This fermenter is used for growing the fungus *Penicillium*. *Penicillium* makes the antibiotic penicillin.



2 (a) Draw a ring around the correct answer to complete each sentence.

2 (a) (i) The cold water jacket removes heat which is produced by

breathing.

gas exchange.

respiration.

(1 mark)

2 (a) (ii) Temperatures above 45 °C would

cause too much oxygen to dissolve.

kill the *Penicillium.*

make the reaction too fast.

(1 mark)

2 (a) (iii) The function of the rotating paddles is to

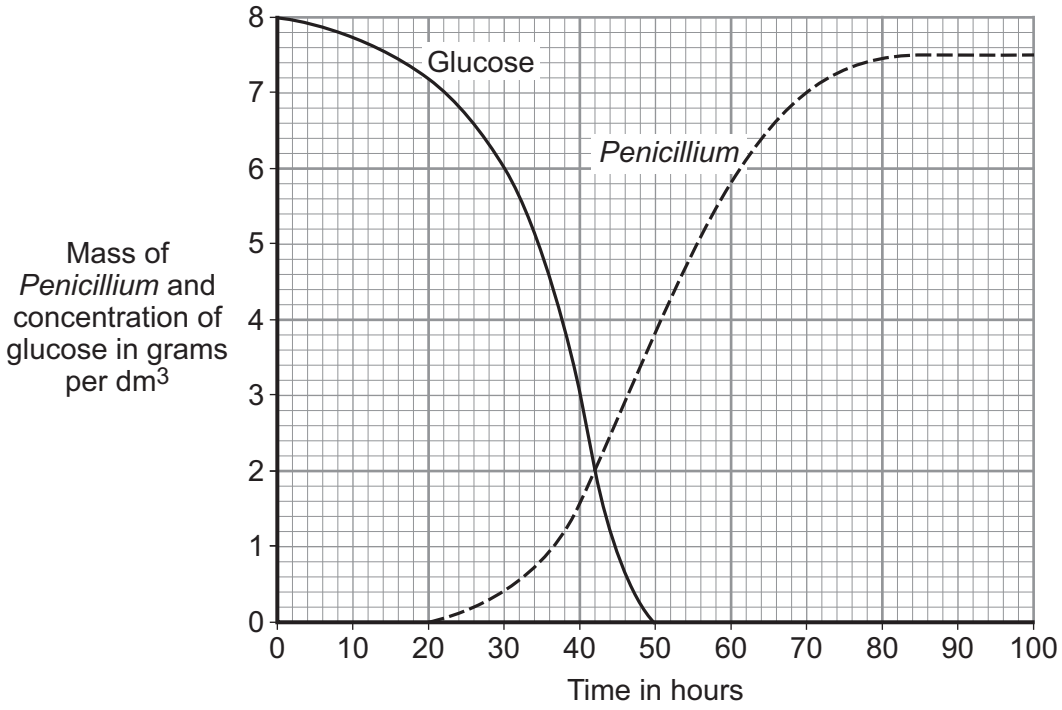
move the water in the cold water jacket.

mix the *Penicillium* with the nutrients.

remove oxygen from the fermenter.

(1 mark)

2 (b) The graph shows how the amounts of glucose and of *Penicillium* in the fermenter changed over 100 hours.



2 (b) (i) By how much did the concentration of glucose decrease during the first 40 hours?

..... grams per dm^3

(1 mark)

2 (b) (ii) Draw a ring around the correct answer to complete the sentence.

The mass of the *Penicillium* increased most rapidly

- before 40 hours.
- between 40 and 70 hours.
- after 70 hours.

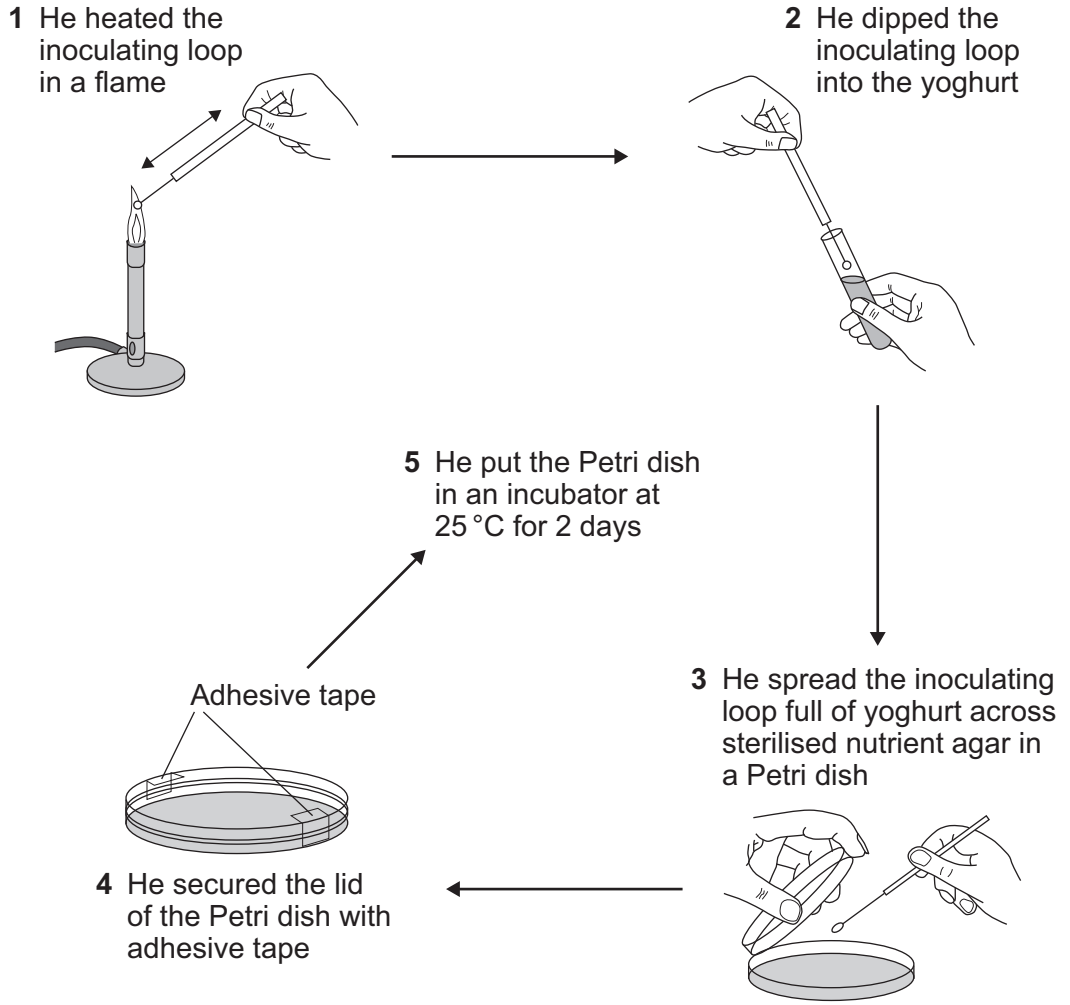
(1 mark)

5

Turn over for the next question

3 Fresh yoghurt contains living bacteria.

A scientist wanted a pure sample of **one** species of bacterium from some yoghurt. The diagram shows how the scientist did this.



3 (a) **List A** gives three of the actions shown in the diagram.
List B gives four possible reasons for these actions.

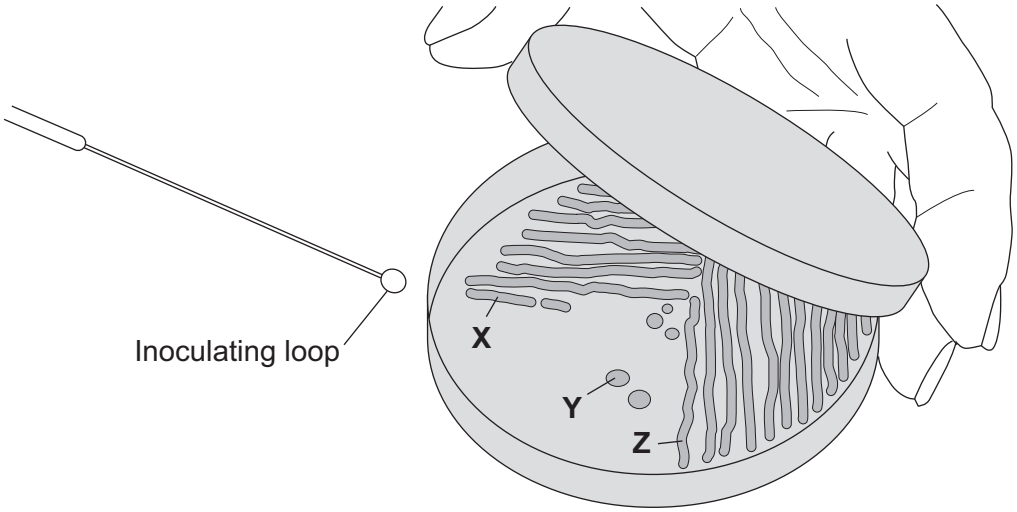
Draw a line from each action in **List A** to the correct reason in **List B**.

List A **Action**	**List B** **Reason**
	To stop bacteria from the air getting in
He heated the inoculating loop in a flame. (step **1**)	
	To stop oxygen getting in
He secured the lid of the Petri dish with adhesive tape. (step **4**)	
	To kill bacteria
He put the Petri dish in an incubator at 25 °C instead of 35 °C. (step **5**)	
	To reduce the growth of pathogens

(3 marks)

Question 3 continues on the next page

3 (b) The drawing shows what the Petri dish looked like after 2 days at 25 °C.



The scientist is going to take some bacteria out of the dish with the inoculating loop.

3 (b) (i) The scientist wants a pure sample of **one** species of bacterium.

Should he take bacteria from region **X**, region **Y**, or region **Z**? ☐

(1 mark)

3 (b) (ii) Explain why you chose this region.

.....

.....

(1 mark)

3 (c) The scientist transferred the bacteria into some milk.

3 (c) (i) Which nutrient in the milk would be an energy source for the bacteria?

Draw a ring around **one** answer.

carbohydrate **mineral ion** **vitamin**

(1 mark)

3 (c) (ii) Draw a ring around the correct answer to complete each sentence.

The bacteria in the milk ferment

- malt.
- lactose.
- protein.

The fermentation causes the milk to become

- more acidic.
- more alkaline.
- neutral.

(2 marks)

8

Turn over for the next question

4 Doctors use dialysis to treat patients with kidney failure.

The table shows the sizes of molecules of some of the substances found in blood plasma.

Substance	Size of molecule in arbitrary units
Water	18
Sodium ion	23
Urea	60
Glucose	180
Albumin (a blood protein)	68 000

4 (a) Use information from the table to answer the questions.

4 (a) (i) Albumin is a blood protein. Albumin is **not** removed from the blood during dialysis.

Explain why.

.....

.....

.....

.....

(2 marks)

4 (a) (ii) During a dialysis session, one patient's body mass decreased by 2 kilograms.

This decrease was mainly due to removal from the blood of **one** of the substances in the table.

Which substance was this? .....

(1 mark)

4 (a) (iii) The substance you named in part **(a)(ii)** was able to pass through the dialysis membrane.

Draw a ring around the correct answer to complete the sentence.

The substance passed through because the

membrane was

impermeable.
partially permeable.
surrounded by capillaries.

(1 mark)

4 (b) For most patients, a kidney transplant is better than continued treatment using dialysis.

Kidney transplants have some disadvantages.

Give **two** disadvantages of kidney transplants.

1 .....

.....

2 .....

.....

(2 marks)

6

Turn over for the next question

5 Plants lose water vapour from their leaves. Most of this water vapour is lost through the stomata.

5 (a) Draw a ring around the correct answer to complete the sentence.

Plants lose water vapour by

distillation.

filtration.

transpiration.

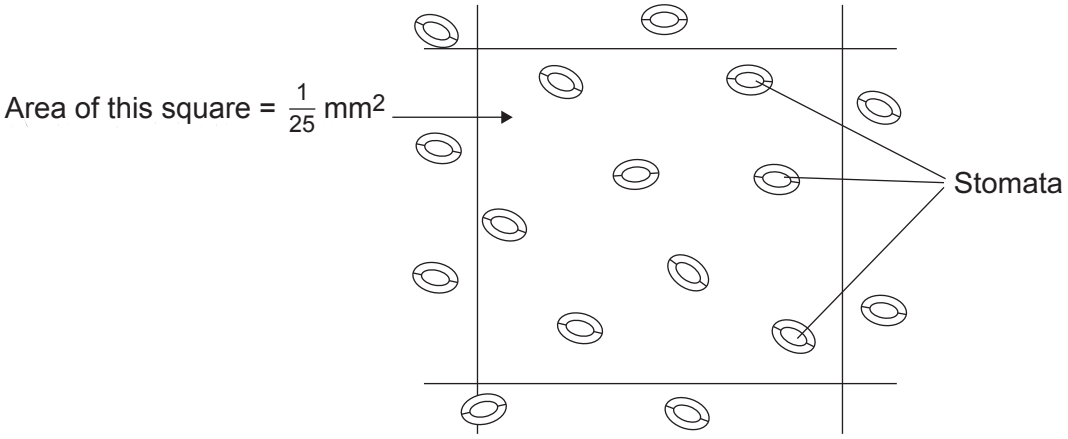
(1 mark)

5 (b) A class of students investigated the number of stomata per mm^2 on the upper surface and on the lower surface of the leaves of three species of plant, **P**, **Q** and **R**.

The students placed samples of the surface cells onto a grid on a microscope.

Student **X** counted the stomata on the lower surface of a leaf from one of the plant species.

The diagram shows part of the grid that student **X** saw under the microscope.



5 (b) (i) Complete the calculation to estimate the number of stomata per mm^2 on the lower surface of this leaf.

Number of stomata in $\frac{1}{25}$ mm^2 = ...

Number of stomata in 1 mm^2 = ...

(2 marks)

The table shows the mean results for the class.

Plant species	Mean number of stomata per mm^2 of leaf	
	Upper surface of leaf	**Lower surface of leaf**
P	40	304
Q	0	11
R	85	195

5 (b) (ii) Student **X** had counted the stomata on the lower surface of a leaf from one of the plant species.

Use your answer to part **(b)(i),** and information in the table, to help you to answer this question.

From which plant species, **P**, **Q** or **R**, was student **X**'s leaf most likely to have been taken? ☐

(1 mark)

5 (b) (iii) Species **Q** is normally found growing in hot, dry conditions.

Explain **one** way in which species **Q** is adapted for living in hot, dry conditions.

Use information from the table.

.....

.....

.....

.....

(2 marks)

6

Turn over for the next question

6 Some students investigated the best temperature for gas production by yeast.

The students set up the apparatus as shown in **Diagram 1**.

Diagram 1

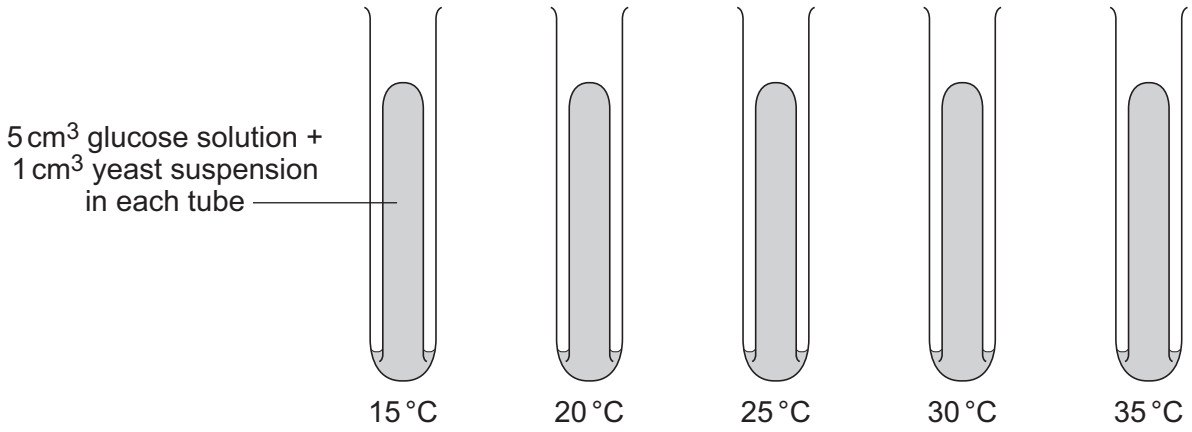
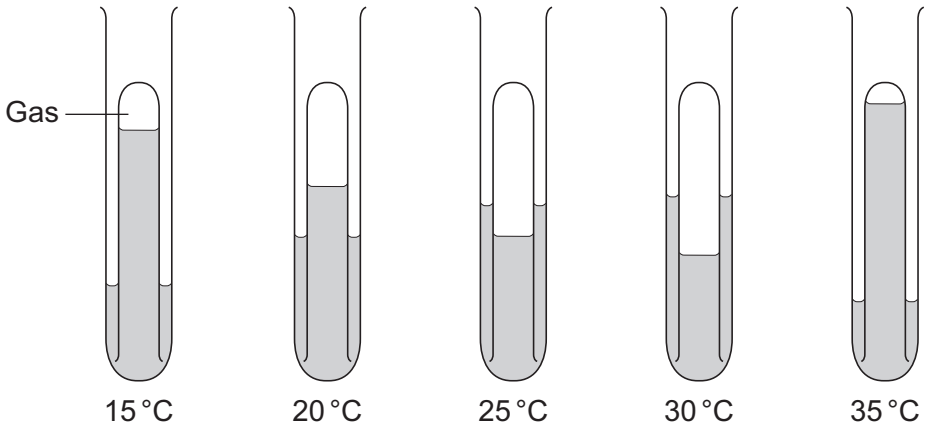


Diagram 2 shows the results after one hour.

Diagram 2



6 (a) In each apparatus the yeast produced a gas.

6 (a) (i) Name this gas.

.....

(1 mark)

6 (a) (ii) Name the process which produces this gas.

.....

(1 mark)

6 (b) One student said that the best temperature for the yeast to produce the gas was 30 °C.

What is the evidence for this in **Diagram 2**?

.....

.....

(1 mark)

6 (c) A second student said that the investigation might not have produced reliable results.

6 (c) (i) What should the students do next to check the reliability of their results?

.....

.....

(1 mark)

6 (c) (ii) How would the students then know if their results were reliable?

.....

.....

(1 mark)

6 (d) A third student said that the investigation might not have produced an accurate value for the best temperature for gas production.

What should the students do next to check that 30 °C was an accurate value for the best temperature?

.....

.....

.....

.....

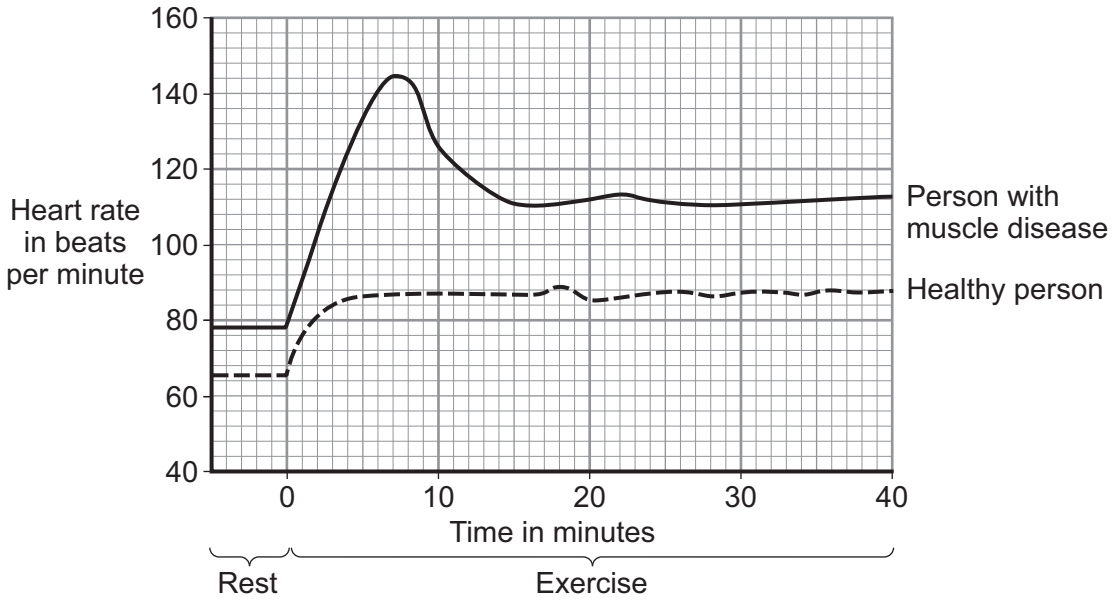
(2 marks)

7

Turn over for the next question

7 Two people did the same amount of gentle exercise on an exercise cycle.
One person had a muscle disease and the other had healthy muscles.

The graph shows the effect of the exercise on the heart rates of these two people.



7 (a) Describe **three** ways in which the results for the person with the muscle disease are different from the results for the healthy person.

To gain full marks in this question you need to include data from the graph in your answer.

1 .....

.....

2 .....

.....

3 .....

.....

(3 marks)

7 (b) The blood transports glucose to the muscles at a faster rate during exercise than when a person is at rest.

7 (b) (i) Name **one** other substance that the blood transports to the muscles at a faster rate during exercise.

.....

(1 mark)

7 (b) (ii) People with the muscle disease are not able to store glycogen in their muscles.

The results shown in the graph for the person with the muscle disease are different from the results for the healthy person.

Suggest an explanation for the difference in the results.

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(3 marks)

7

END OF QUESTIONS

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