Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										

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

General Certificate of Secondary Education
Higher Tier
June 2011

Biology

BLY3H

H

Unit Biology B3

Written Paper

Thursday 19 May 2011 1.30 pm to 2.15 pm

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.

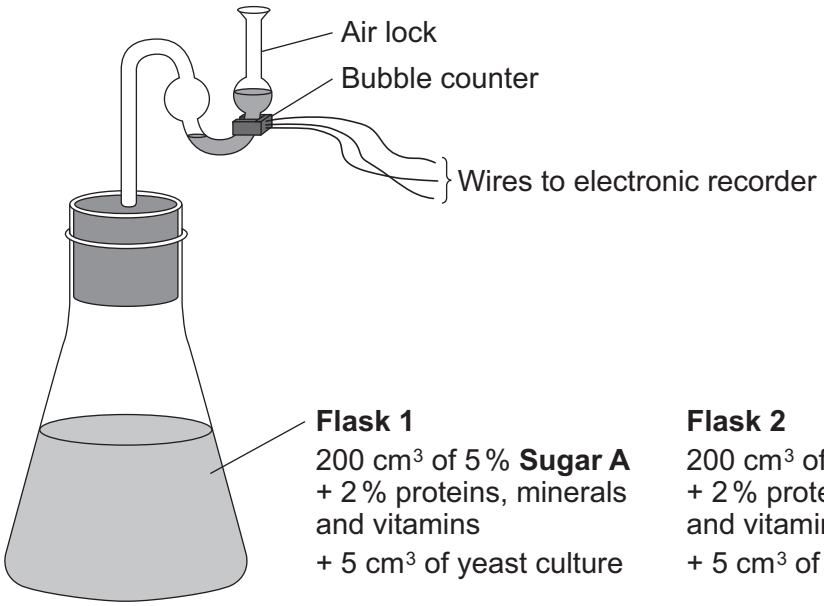
Information
- The marks for questions are shown in brackets.
- The maximum mark for this paper is 45.
- You are expected to use a calculator where appropriate.
- You are reminded of the need for good English and clear presentation in your answers.

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

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

1 Some students wanted to investigate whether yeast could ferment two different types of sugar, **A** and **B**.

They set up two flasks, as shown in the diagram.



Flask 1
200 cm^3 of 5 % **Sugar A**
+ 2 % proteins, minerals and vitamins
+ 5 cm^3 of yeast culture

Flask 2
200 cm^3 of 5 % **Sugar B**
+ 2 % proteins, minerals and vitamins
+ 5 cm^3 of yeast culture

1 (a) (i) When setting up the flasks, it is important not to allow any other microorganisms to enter.

Describe **two** precautions that the students could have taken to prevent the growth of other microorganisms.

1 .....

.....

2 .....

.....

(2 marks)

1 (a) (ii) Each flask contained the same concentration of sugar.

Why was this important?

.....

.....

(1 mark)

1 (b) The yeast in each flask produced a gas. The gas escaped as bubbles through the liquid in the air lock. The experiment ran for 120 hours.

1 (b) (i) Name the gas produced by the yeast.....

(1 mark)

1 (b) (ii) Every time a bubble of gas passed from the flask through the air lock, the bubble counter sent an electrical signal to the recorder.

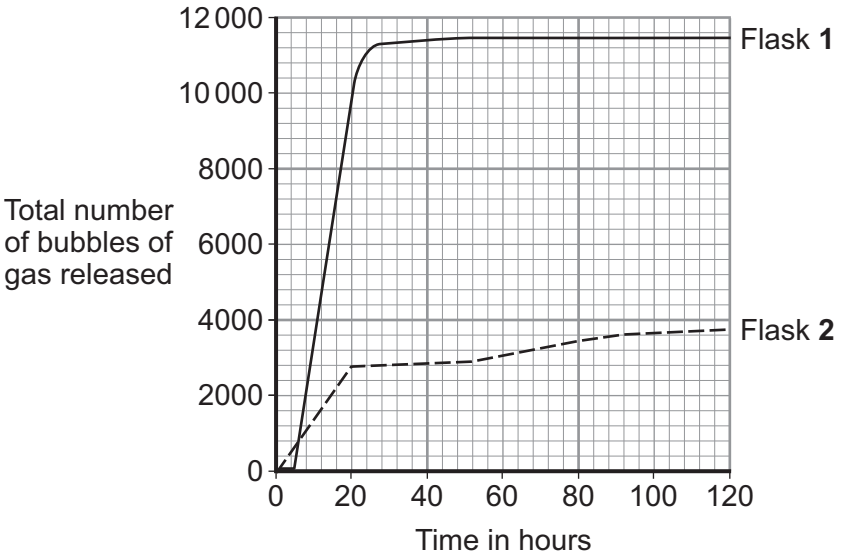
Give **one** advantage of using a bubble counter and electronic recorder instead of a person to count the bubbles.

.....

.....

(1 mark)

1 (c) The graph shows the students' results.



1 (c) (i) Which sugar, **A** or **B**, does the yeast ferment better?

Draw a ring around your answer. **A** / **B**

Give **one** reason for your answer.

.....

.....

(1 mark)

1 (c) (ii) What happened to gas production in **Flask 1** after 50 hours?

.....

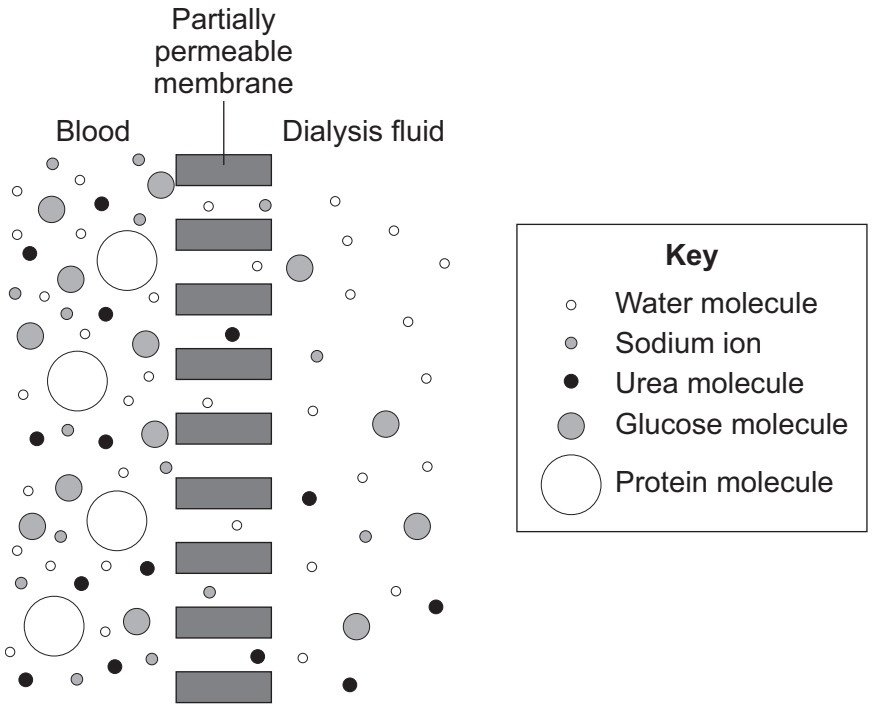
(1 mark)

7

Turn over ▶

2 Dialysis can be used to treat a person with kidney disease.

The diagram shows blood and dialysis fluid separated by a partially permeable membrane.



Blood plasma and dialysis fluid contain several substances dissolved in water.

The table shows the concentrations of some of these substances in dialysis fluid and in the blood plasma of a person with kidney disease immediately before dialysis.

Substance	Concentration of substance in grams per dm^3	
	Blood plasma of person with kidney disease	**Dialysis fluid**
Sodium ions	3.26	3.15
Urea	0.45	0.00
Glucose	0.90	0.99
Protein	60.00	0.00

2 (a) Protein molecules are **not** able to move from the blood to the dialysis fluid.
Use information from the diagram to explain why.

.....

.....

(1 mark)

2 (b) Urea molecules move from the blood into the dialysis fluid.

2 (b) (i) Give the name of this type of movement. .....

(1 mark)

2 (b) (ii) Why do the urea molecules move in this direction?

Use information from the table to help you to answer this question.

.....

.....

(1 mark)

2 (c) The concentration of sodium ions in the blood plasma will change during dialysis.

Suggest a value for the concentration of sodium ions in the plasma at the end of dialysis.

Use information from the table.

Concentration of sodium ions = ... grams per dm^3

(1 mark)

2 (d) For most patients a kidney transplant is better than continued treatment by dialysis.

2 (d) (i) Give **two** advantages of having a kidney transplant rather than treatment by dialysis.

1 .....

.....

2 .....

.....

(2 marks)

2 (d) (ii) Give **two** possible disadvantages of having a kidney transplant.

1 .....

.....

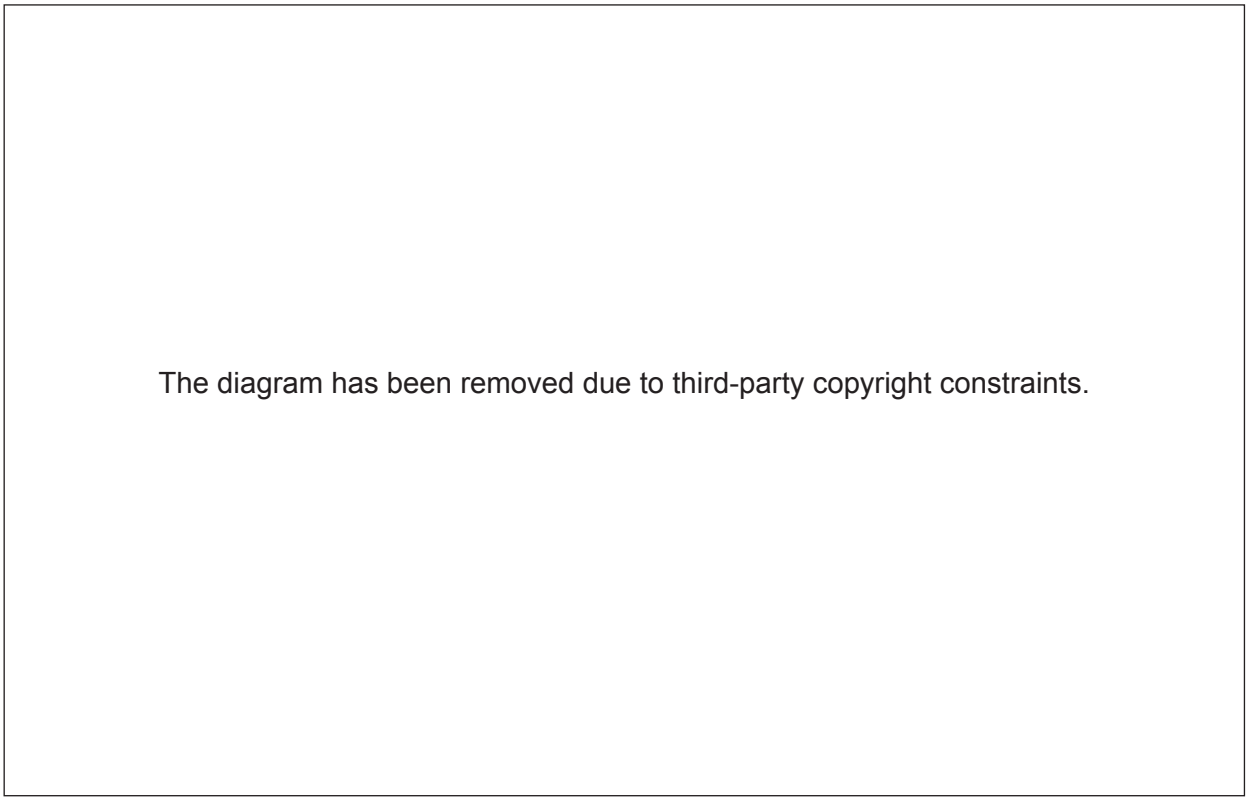
2 .....

.....

(2 marks)

8

3 The diagram shows part of a biogas generator. Organic matter flows through the generator, as shown in the diagram.



3 (a) The table shows the composition of the biogas produced by this generator.

Gas	Percentage
Carbon dioxide	27.0
Water vapour	2.0
Hydrogen sulfide	0.5
Ammonia	0.5
Gas **X**	

3 (a) (i) Name gas **X**. .....

(1 mark)

3 (a) (ii) Calculate the percentage of gas **X** in the biogas.

Show clearly how you work out your answer.

.....

.....

Percentage of gas **X** = ... %

(2 marks)

3 (b) (i) Some biogas is pumped back in at the base of the generator. This biogas moves around inside the generator, as shown by the arrows in the diagram.

The movement of the biogas makes the breakdown of the organic matter more efficient.

Suggest how.

.....

.....

(1 mark)

3 (b) (ii) Biogas is pumped into the generator rather than air.

Suggest **one** reason why.

.....

.....

(1 mark)

3 (c) The biogas generator is usually kept underground in a large tank of water. The water can be heated to keep the temperature at 35 °C.

Explain why the biogas generator is kept at 35 °C.

.....

.....

.....

.....

(2 marks)

7

4 Oxygen is transported round the body by the blood.

Blood leaving the human lung can carry about 250 milligrams of oxygen per litre. However, only 7 milligrams of oxygen will dissolve in one litre of water at body temperature.

4 (a) Suggest an explanation for the difference.

.....

.....

.....

.....

(2 marks)

4 (b) Blood leaving the skeletal muscles during exercise may contain only 30 milligrams of oxygen per litre.

Explain what causes the difference in oxygen concentration between the blood leaving the lungs and the blood leaving the skeletal muscles.

.....

.....

.....

.....

.....

.....

.....

.....

(4 marks)

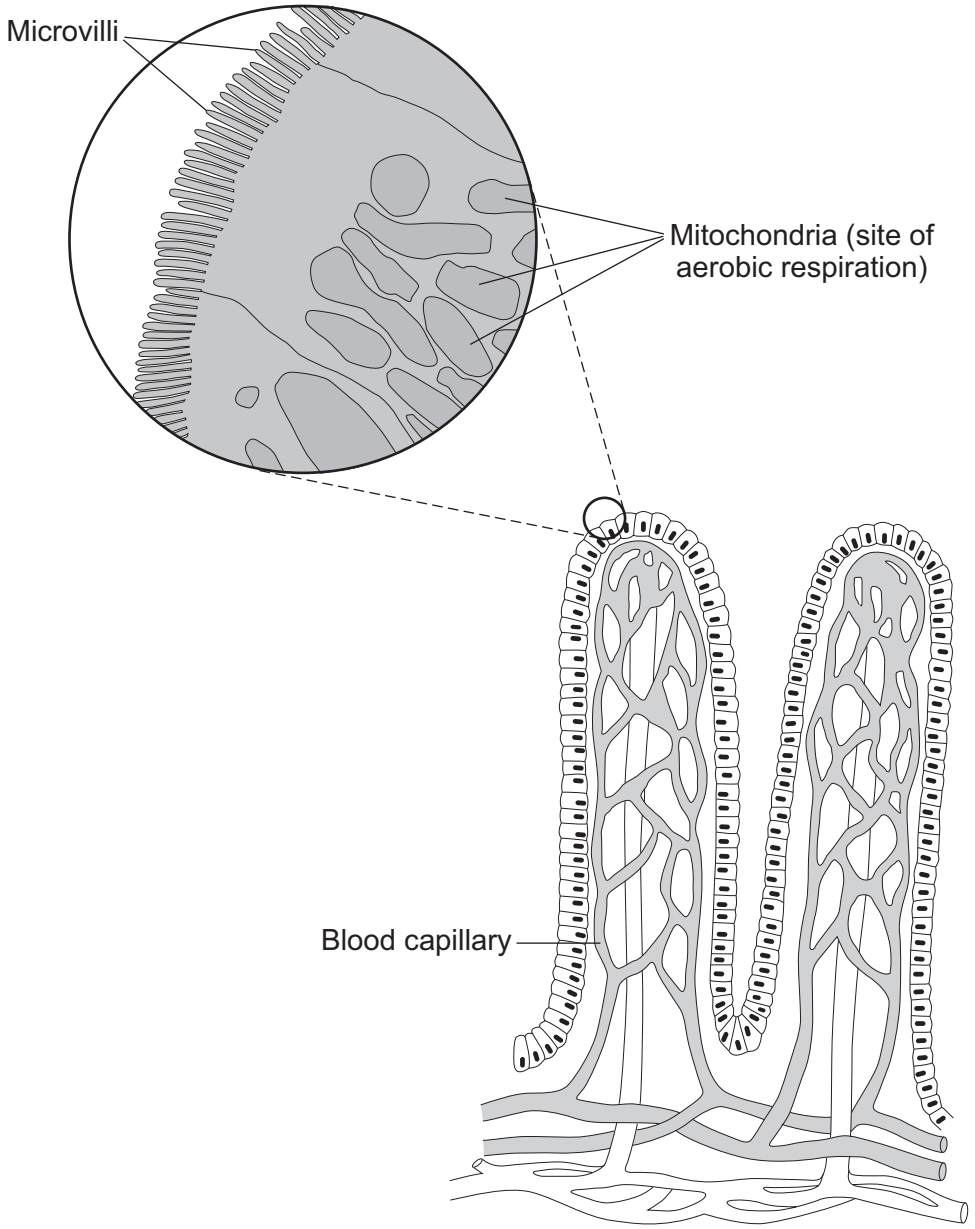
6

Turn over for the next question

DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED

5 The villi of the small intestine absorb the products of digestion.

The diagram shows two villi. It also shows parts of some of the surface cells of a villus, as seen with an electron microscope.



Describe and explain how the villi are adapted to maximise the rate of absorption of the products of digestion.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

(5 marks)

5

Turn over for the next question

6 (a) In industry, microorganisms are grown in fermenters to make useful products.

Name **one** useful product that can be made using microorganisms grown in a fermenter.

.....

(1 mark)

6 (b) Scientists grew one species of bacterium in a fermenter.
The scientists added glucose and other nutrients to the culture medium in the fermenter.

To study the growth of the bacteria, the scientists removed a 1 cm^3 sample of the culture medium from the fermenter once every 5 hours. They added a measured volume of water to dilute the sample by a known amount.

The scientists used two different methods to find the number of bacteria in each sample.

Method A

The scientists:

- added 0.1 cm^3 of the diluted culture to a Petri dish
- poured molten agar into the Petri dish and swirled the dish to mix the contents
- placed the Petri dish in an incubator at 35 °C for 24 hours
- counted the number of colonies of bacteria that had grown in the Petri dish.

Method B

The scientists:

- put some of the diluted sample into a special counting chamber on a microscope
- counted the number of bacteria found in a small volume of the diluted culture.

6 (b) (i) In each method, the scientists diluted the samples that they removed from the fermenter.

Why did they need to do this?

.....

.....

(1 mark)

6 (b) (ii) In **Method A**, the scientists counted colonies of bacteria that had grown in a Petri dish. Explain how counting colonies helped the scientists to find the number of bacteria in a sample.

.....

.....

.....

.....

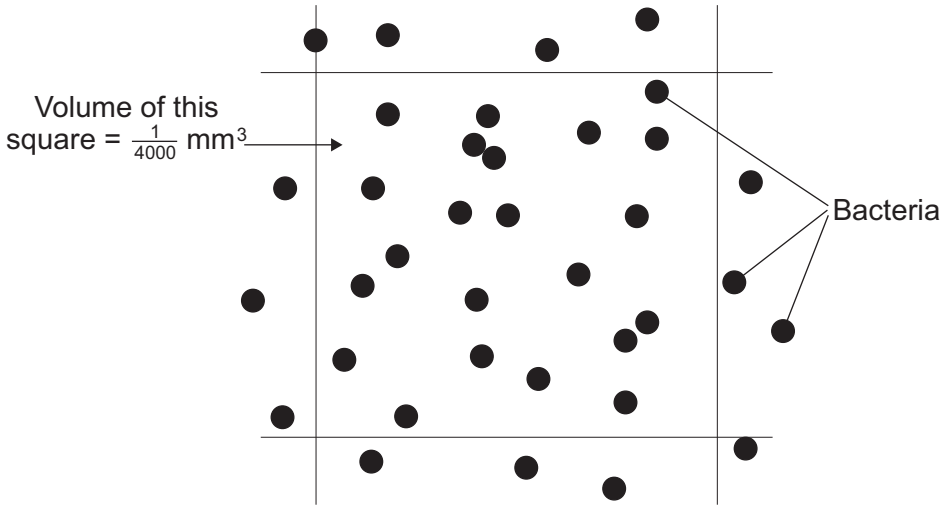
(2 marks)

6 (c) The scientists wanted to find the number of bacteria in a sample of culture medium by using **Method B**.

The sample of culture medium was diluted to $\frac{1}{100}$ of its original concentration.

The diluted sample was then placed in the counting chamber.

The diagram shows part of the counting chamber as seen under a microscope.



Complete the following calculations to find how many bacteria there were in 1 mm^3 of the undiluted sample of culture medium.

Use information from the diagram.

Number of bacteria in $\frac{1}{4000}$ mm^3 of **diluted** culture medium = ...

Number of bacteria in 1 mm^3 of **diluted** culture medium = ...

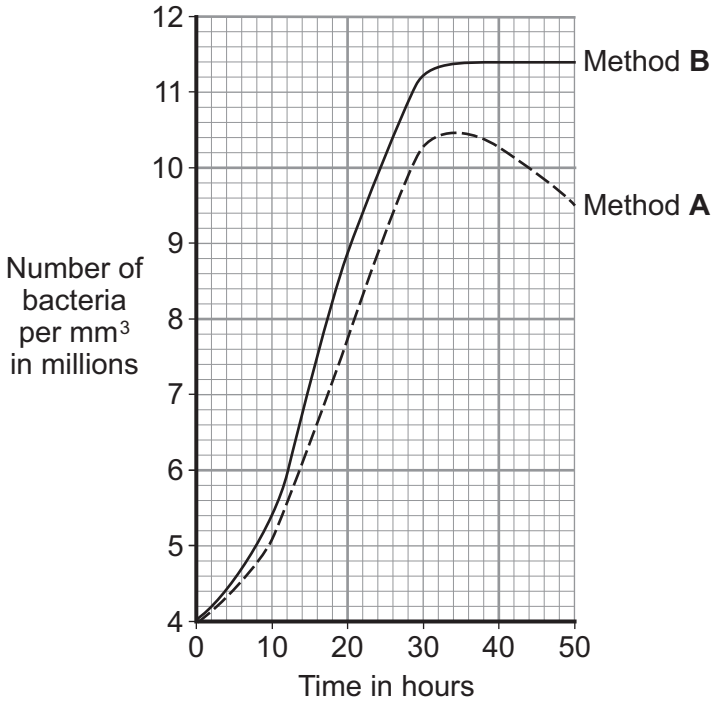
Number of bacteria in 1 mm^3 of **undiluted** culture medium = ...

(2 marks)

Question 6 continues on the next page

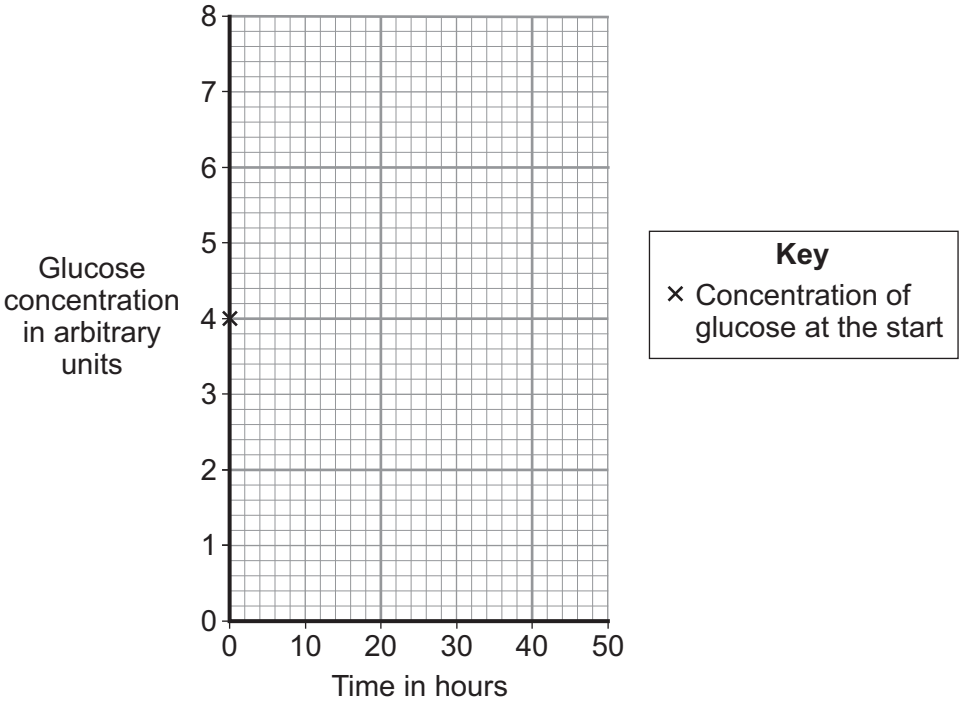
6 (d) The scientists grew the bacteria for 50 hours.
Graph 1 shows the scientists' results.

Graph 1



Graph 2 is not complete.
The concentration of glucose in the fermenter at the start of the investigation was 4 units.

Graph 2



6 (d) (i) **On Graph 2**, draw a line to show how the glucose concentration would change over the 50 hours of the investigation.

(2 marks)

6 (d) (ii) Explain the shape of the growth curve that was obtained using **Method A**.

Use information from your answer to part (d)(i).

.....

.....

.....

.....

.....

.....

(3 marks)

6 (d) (iii) Why did **Method B** give higher values for the number of bacteria than **Method A**?

.....

.....

(1 mark)

12

END OF QUESTIONS

There are no questions printed on this page

DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED

ACKNOWLEDGEMENT OF COPYRIGHT-HOLDERS AND PUBLISHERS

Permission to reproduce all copyright material has been applied for. In some cases, efforts to contact copyright-holders have been unsuccessful and AQA will be happy to rectify any omissions of acknowledgements in future papers if notified.

Question 3 Copyright © 2010 Organic Power Ltd.