

Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										



General Certificate of Secondary Education
Higher Tier
June 2010

Biology

Unit Biology B3

Written Paper

Friday 21 May 2010 9.00 am to 9.45 am

BLY3H

H

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

You will need no other materials.
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.



J U N 1 0 B L Y 3 H 0 1

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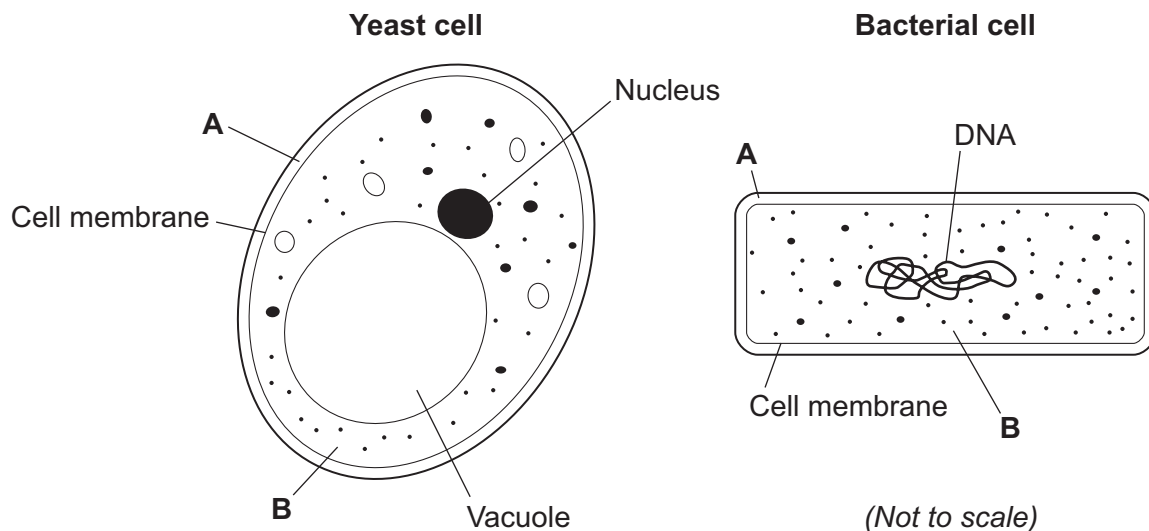
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ANSWER IN THE SPACES PROVIDED**



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

- 1** Sourdough bread is light in texture and tastes slightly sour. It is made using two types of microorganism, a yeast and a bacterium. The bacterium can make acids such as lactic acid. This acid makes the bread taste sour.

- 1 (a)** The diagrams show the structures of the yeast cell and the bacterial cell.



- 1 (a) (i)** Both the yeast cell and the bacterial cell have structures **A** and **B**.

Name structures **A** and **B**.

A

B

(2 marks)

- 1 (a) (ii)** The yeast cell and the bacterial cell have different shapes.

Give **one** other way in which the structure of the bacterial cell is different from the structure of the yeast cell.

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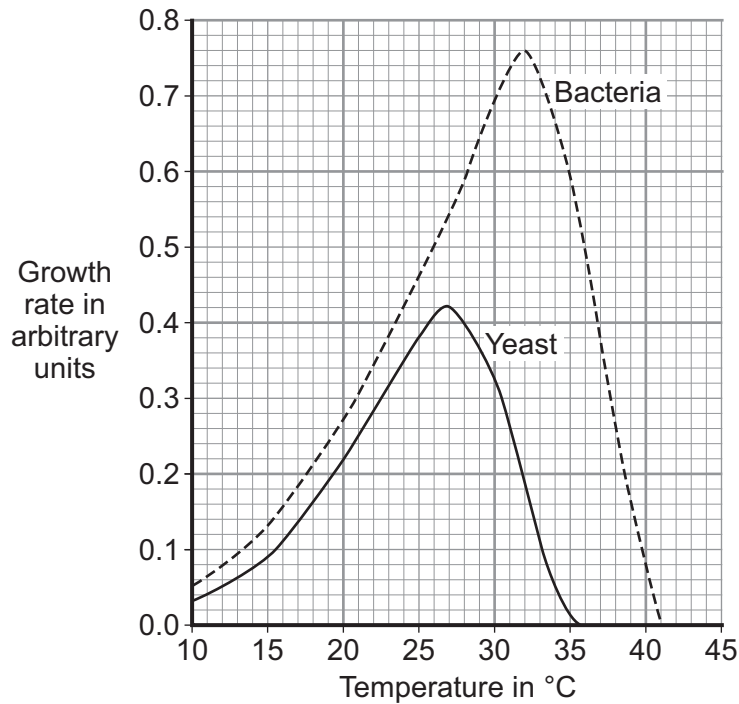
(1 mark)

Question 1 continues on the next page

Turn over ►



- 1 (b)** The graph shows how the growth rates of the yeast and the bacteria change with temperature.



- 1 (b) (i)** Sourdough bread rises fastest at 27°C.

Explain why.

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(2 marks)

- 1 (b) (ii)** The bread has a sourer taste if it rises at 32°C.

Explain why.

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(2 marks)



1 (b) (iii) The growth rate of the yeast is unaffected by pH in the range 3.5 to 7.0 pH units.

Why is this useful in the production of sourdough bread?

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(1 mark)

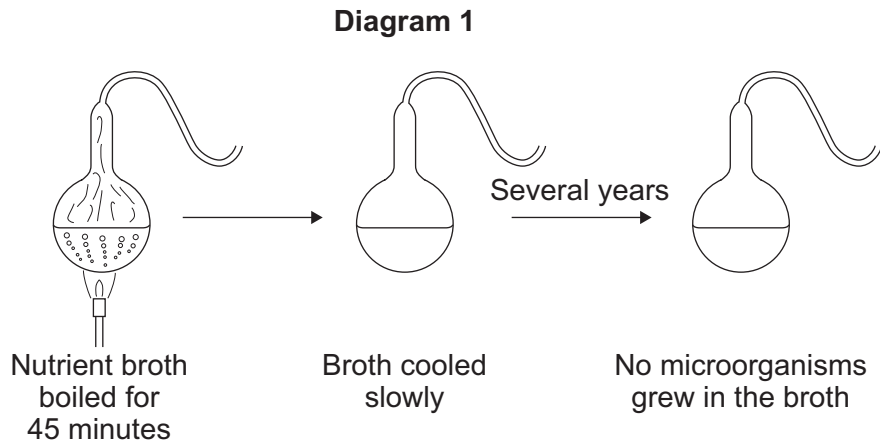
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Turn over for the next question

Turn over ►



- 2** **Diagram 1** shows some details of an investigation carried out by Louis Pasteur.



- 2 (a) (i)** Why did Pasteur boil the nutrient broth?

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(1 mark)

- 2 (a) (ii)** Because of the shape of the flask, no microorganisms grew even after several years.

Explain why.

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(1 mark)

- 2 (b)** Pasteur repeated the investigation several times.

Why is it useful to repeat a scientific investigation several times?

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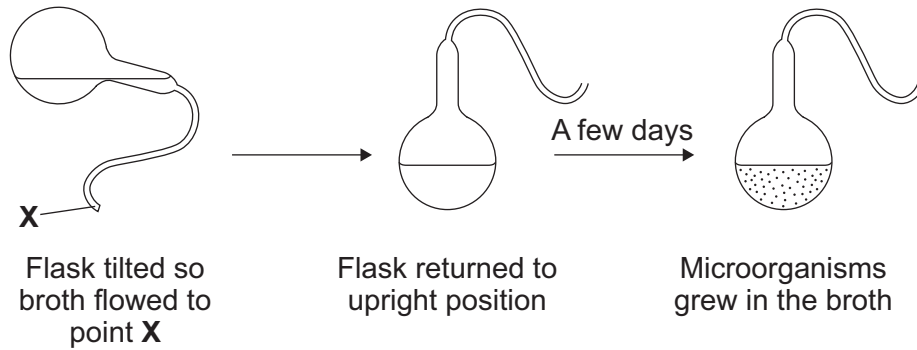
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(1 mark)



- 2 (c)** After several years, some of Pasteur's flasks were tilted so that the broth flowed to point **X**, as shown in **Diagram 2**. The flasks were then returned to the upright position and left for a few days.

Diagram 2



Microorganisms grew in the broth.

Explain why.

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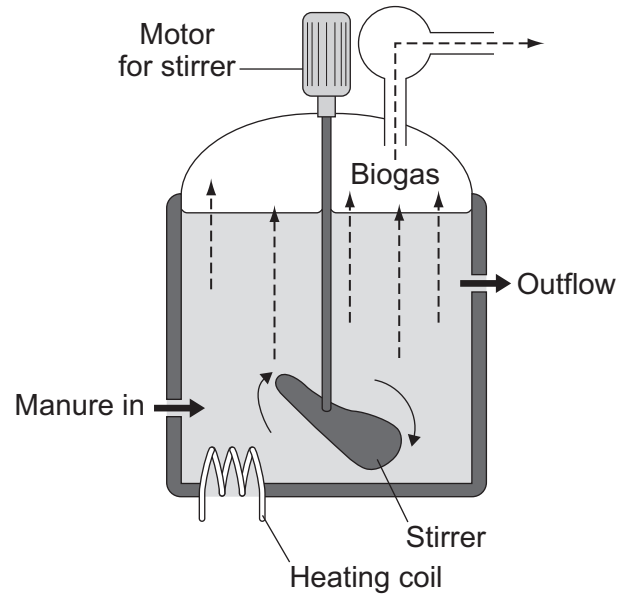
(2 marks)

- 2 (d)** Complete the sentence.

This investigation provides evidence for the theory of
(1 mark)



- 3 The diagram shows one type of *anaerobic* digester. This is used to produce biogas.



- 3 (a) (i) What does *anaerobic* mean?

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 (1 mark)

- 3 (a) (ii) The concentration of solids fed into this digester must be kept very low.

Suggest **one** reason why.

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 (1 mark)

- 3 (a) (iii) This digester is more expensive to run than some other simpler designs of biogas generator.

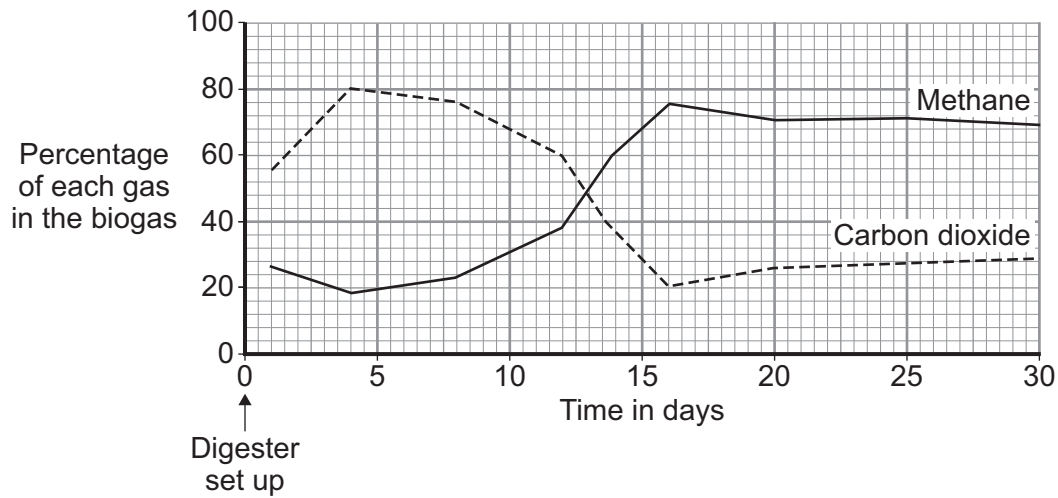
Suggest **one** reason why.

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 (1 mark)



- 3 (b)** The graph shows how the composition of the biogas produced by the digester changed over the first 30 days after the digester was set up.



Use information from the graph to answer the following questions.

- 3 (b) (i)** Describe how the percentage of carbon dioxide changed over the 30 days.

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(3 marks)

- 3 (b) (ii)** On which day was the best quality biogas produced?

(1 mark)

- 3 (c)** Four days after the digester was first set up, the biogas contained a high percentage of carbon dioxide.

Suggest an explanation for this.

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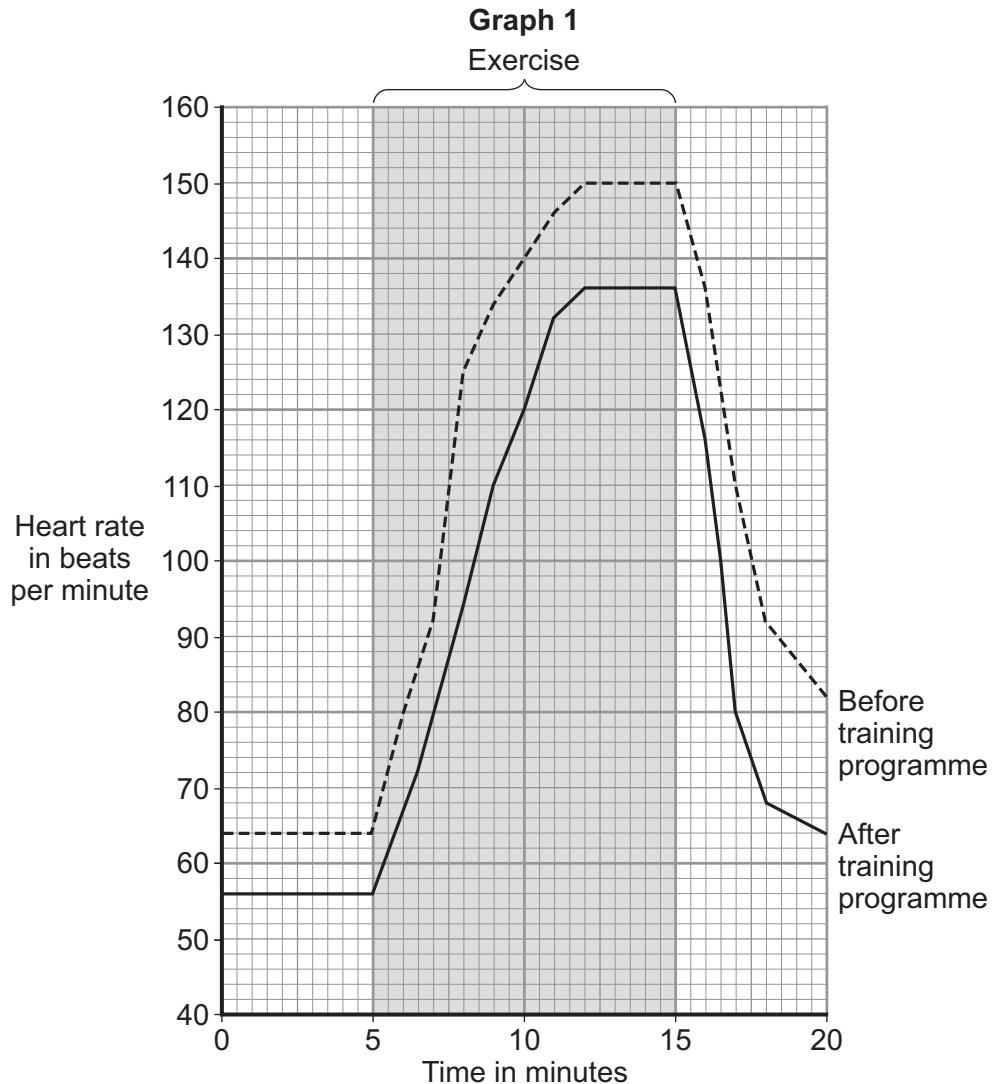
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(2 marks)



- 4 An athlete carried out a 6-month training programme.

Graph 1 shows the effect of the same amount of exercise on his heart rate before and after the training programme.



- 4 (a) (i) Use **Graph 1** to find the heart rate of the **trained** athlete 5 minutes after the start of the exercise.

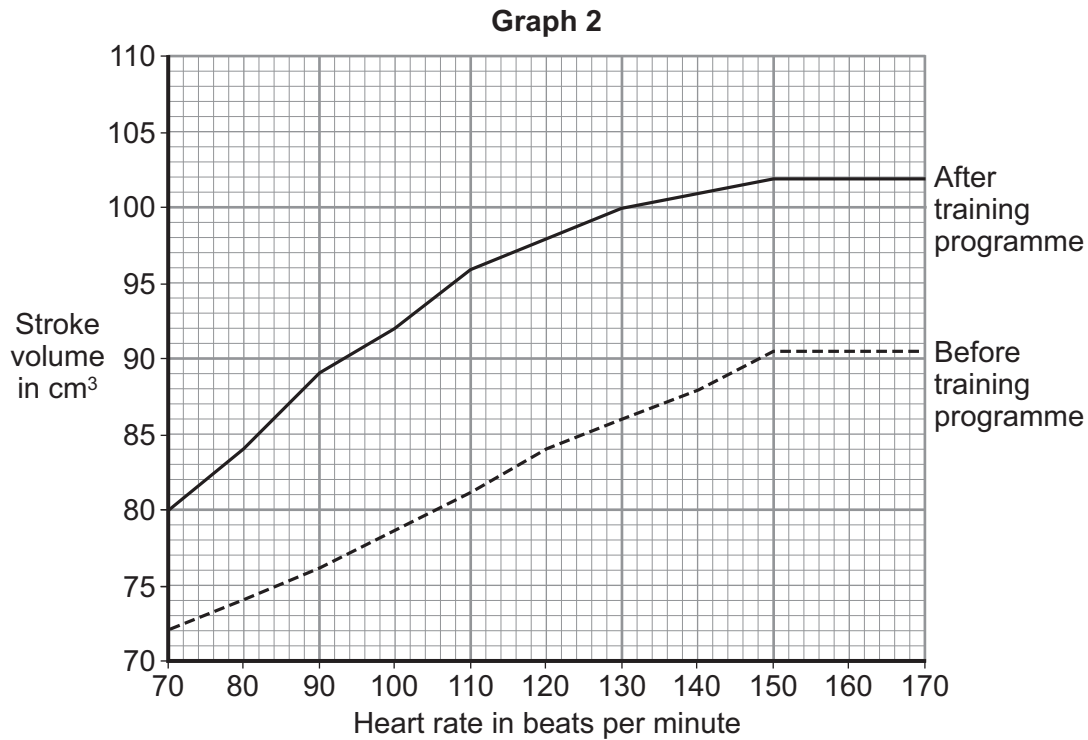
Heart rate = beats per minute

(1 mark)

The stroke volume of the heart is the volume of blood pumped out of the left side of the heart in one heart beat.

Graph 2 shows the relationship between the stroke volume and the heart rate before and after the athlete did the training programme.





4 (a) (ii) The *cardiac output* is defined as

$$\text{cardiac output} = \text{heart rate} \times \text{stroke volume}$$

Calculate the cardiac output of the **trained** athlete 5 minutes after the start of the exercise. Use your answer to part (a)(i), and information from **Graph 2**.

Show clearly how you work out your answer.

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Cardiac output = cm³ blood per minute
(2 marks)

4 (b) **Graph 1** shows that, for the same amount of exercise, the heart of the trained athlete was beating more slowly than it did before the training programme.

Use information from **Graph 2** to explain why.

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(2 marks)

Question 4 continues on the next page

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- 4 (c)** An increased cardiac output will provide more oxygen and more glucose to the working muscles.

Explain how this helps the athlete during exercise.

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(4 marks)

9



- 5** Describe, as fully as you can, how ethanol-based fuels are produced from plant materials.

You should name **at least one** enzyme used in this process.

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(4 marks)

4

Turn over for the next question

Turn over ►



6 (a) (i) diffusion.....

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(2 marks)

6 (a) (ii) active transport

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(2 marks)

[illegible]

9



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