

Surname \_\_\_\_\_

Other Names \_\_\_\_\_

Centre Number \_\_\_\_\_

For Examiner's Use

Candidate Number \_\_\_\_\_

Candidate Signature \_\_\_\_\_

## **ASSESSMENT AND QUALIFICATIONS ALLIANCE**

**General Certificate of Secondary Education**

**Higher Tier**

**June 2010**

**Biology**

**Unit Biology B3**

**Written Paper**

**BLY3H**

**Friday 21 May 2010 9.00 am**

**You will need no other materials.  
You may use a calculator.**

**TIME ALLOWED**

- **45 minutes plus your additional time allowance.**

**At the top of the page, write your surname and other names, your centre number, your candidate number and add your signature.**

**[Turn over]**

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## **INSTRUCTIONS**

- **Use black ink or black ball-point pen.**
- **Answer ALL questions.**
- **You must answer the questions in the spaces provided.**
- **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.**

**DO NOT TURN OVER UNTIL TOLD TO DO SO**

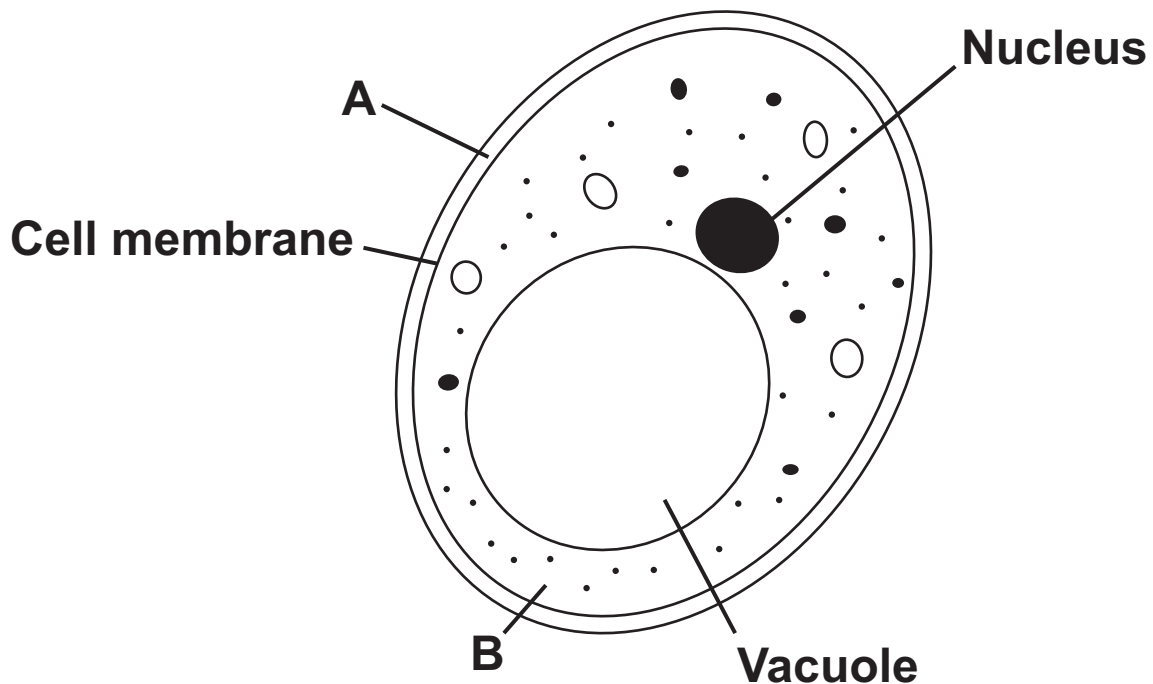
Answer ALL questions in the spaces provided.

- 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.

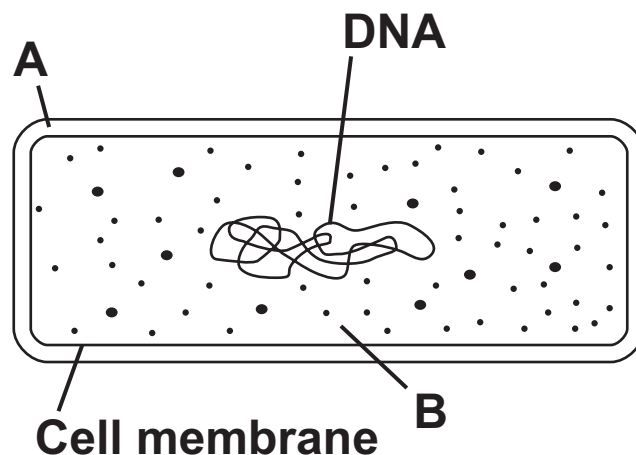
- 1 (a) The diagrams show the structures of the yeast cell and the bacterial cell.

(Not to scale)

### YEAST CELL



### BACTERIAL CELL



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

**Name structures A and B. [2 marks]**

**A** \_\_\_\_\_

**B** \_\_\_\_\_

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

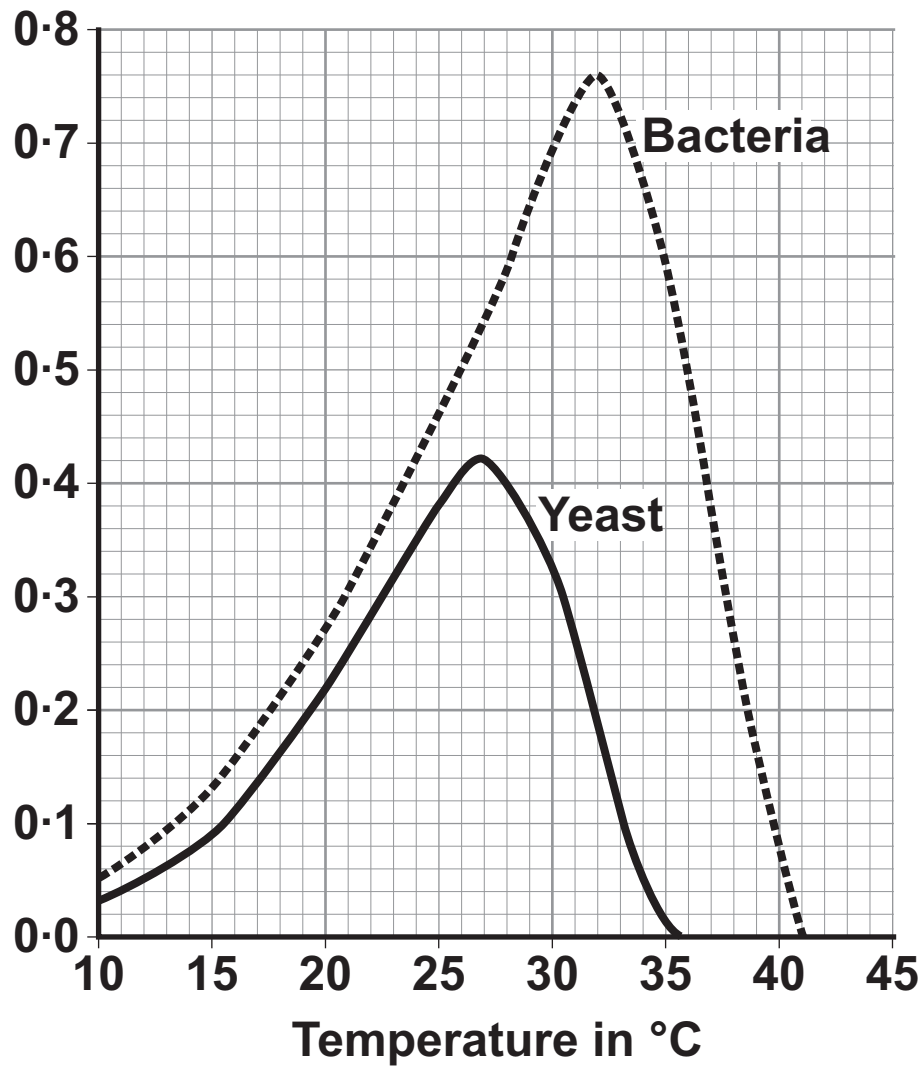
**Give ONE other way in which the structure of the bacterial cell is different from the structure of the yeast cell. [1 mark]**

\_\_\_\_\_  
\_\_\_\_\_

**[Question 1 continues on the next page]**

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

Growth rate in  
arbitrary  
units



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

**Explain why. [2 marks]**

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

**Explain why. [2 marks]**

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**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? [1 mark]**

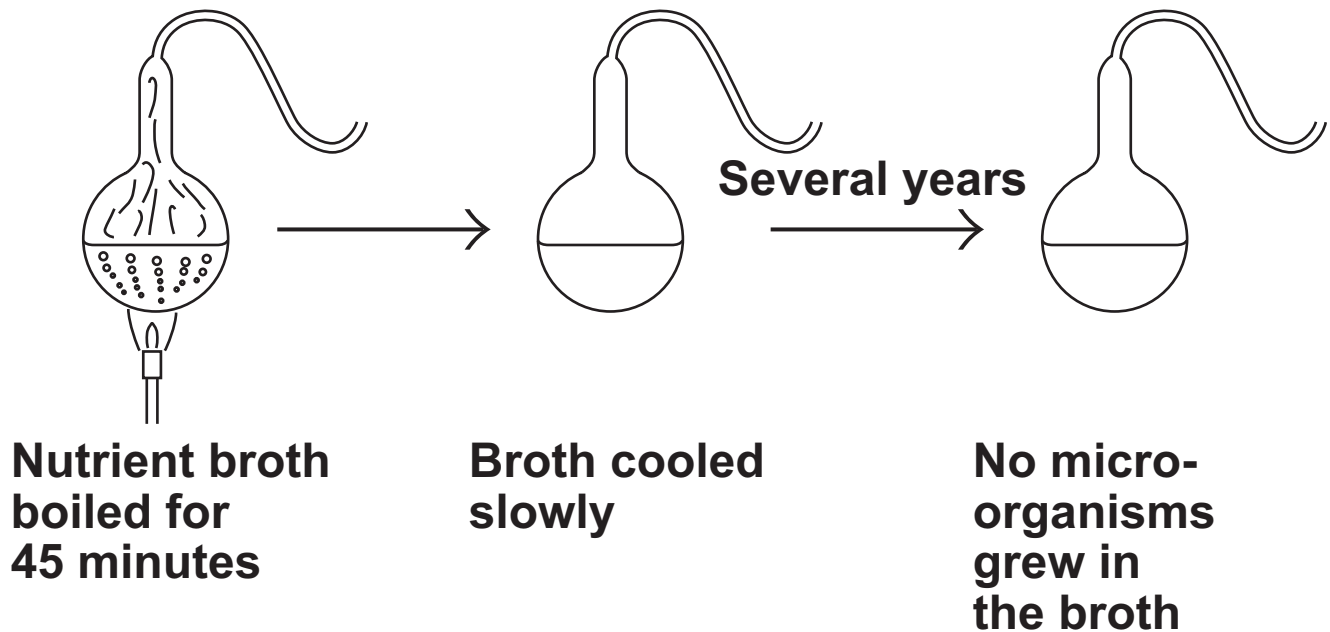
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**[Turn over]**

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

**DIAGRAM 1**



- 2 (a) (i) **Why did Pasteur boil the nutrient broth?**  
[1 mark]

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

**Explain why. [1 mark]**

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

**Why is it useful to repeat a scientific investigation several times? [1 mark]**

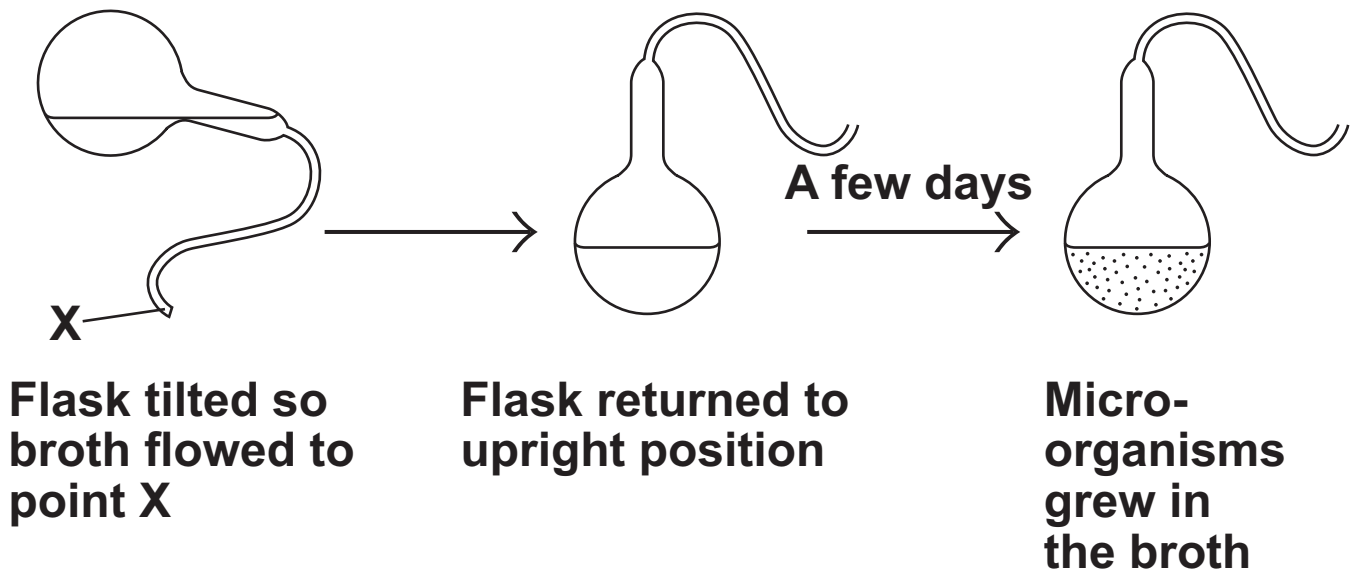
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**[Question 2 continues on the next page]**

- 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. [2 marks]

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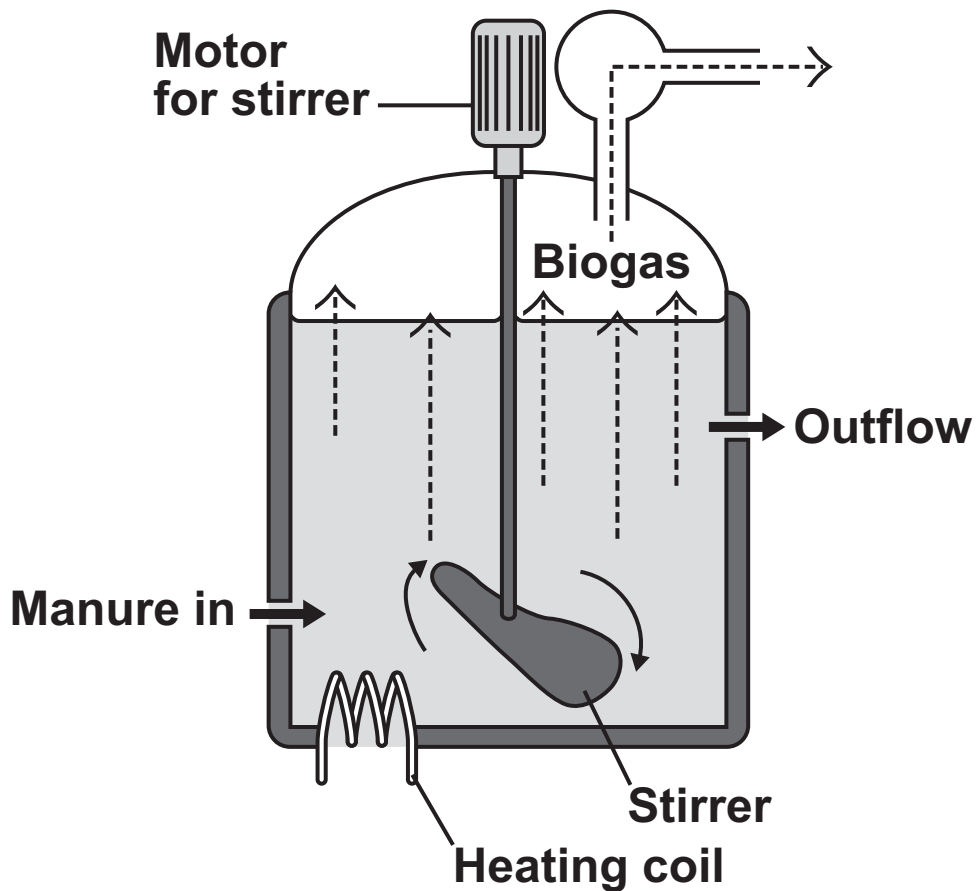
2 (d) Complete the sentence. [1 mark]

This investigation provides evidence for the theory of \_\_\_\_\_ .

6

[Turn over for the next question]

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



- 3 (a) (i) What does 'anaerobic' mean? [1 mark]

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

Suggest ONE reason why. [1 mark]

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

**Suggest ONE reason why. [1 mark]**

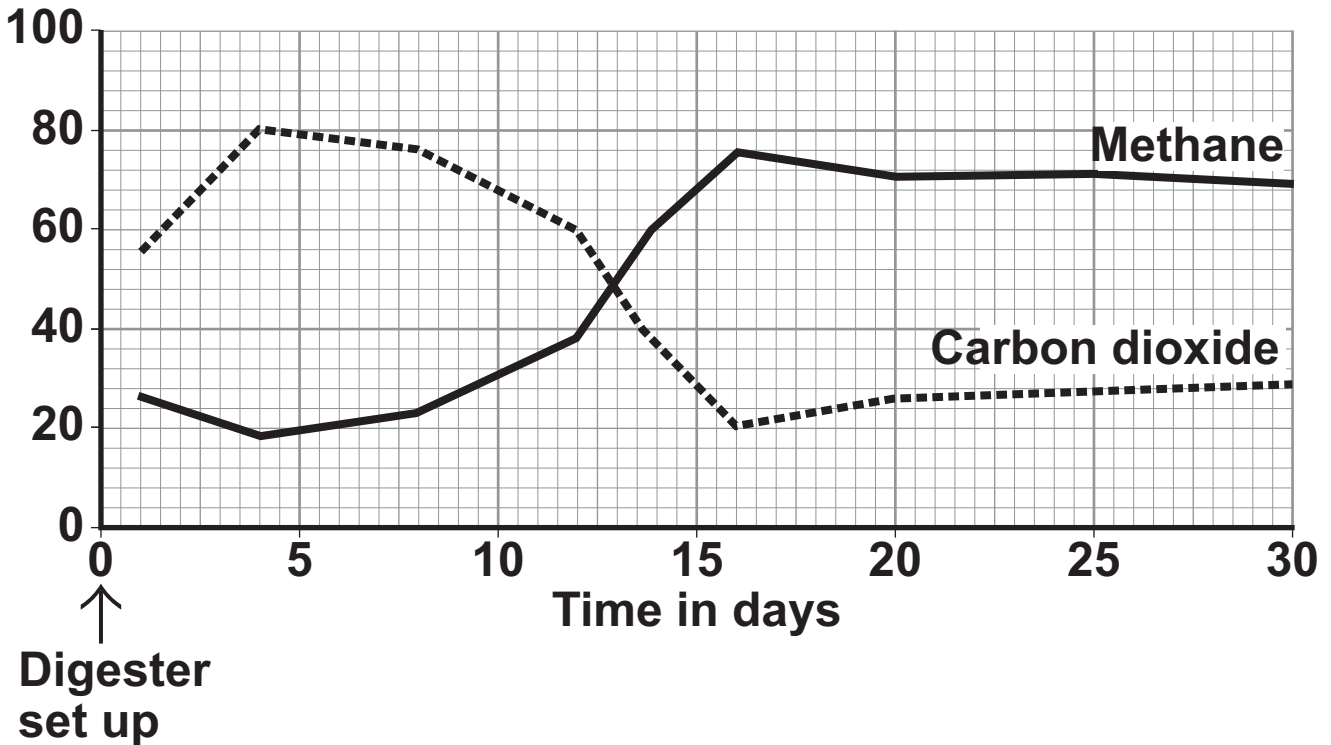
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**[Question 3 continues on the next page]**

- 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.

Percentage  
of each gas  
in the biogas



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. [3 marks]**

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**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. [2 marks]**

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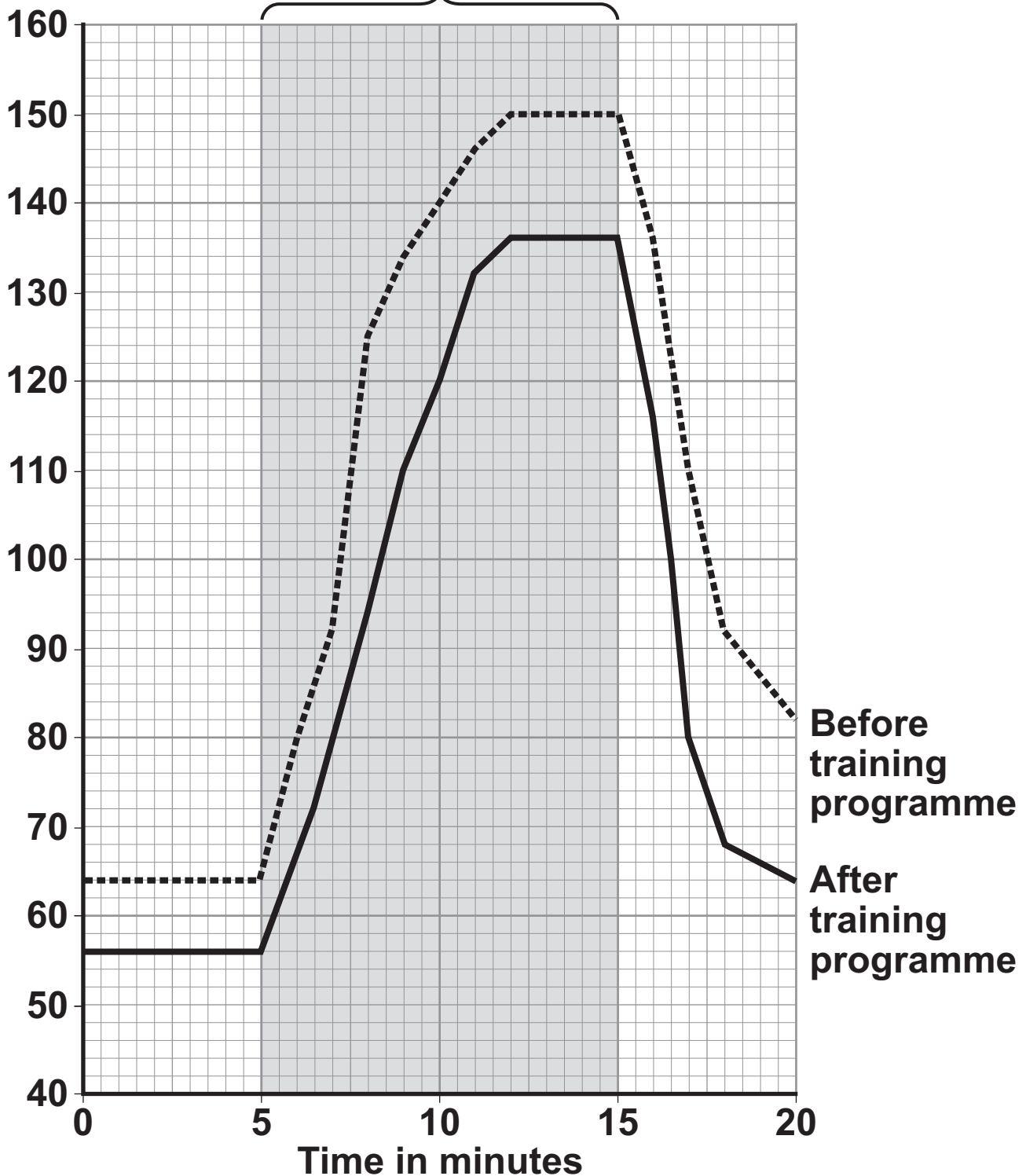
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- 4 An athlete carried out a 6-month training programme. GRAPH 1 shows the effect of the same amount of exercise on his heart rate before and after the training programme.

GRAPH 1

Heart rate in  
beats per minute

Exercise





- 4 (a) (i) Use GRAPH 1 to find the heart rate of the TRAINED athlete 5 minutes after the start of the exercise. [1 mark]**

**Heart rate = \_\_\_\_\_ beats per minute**

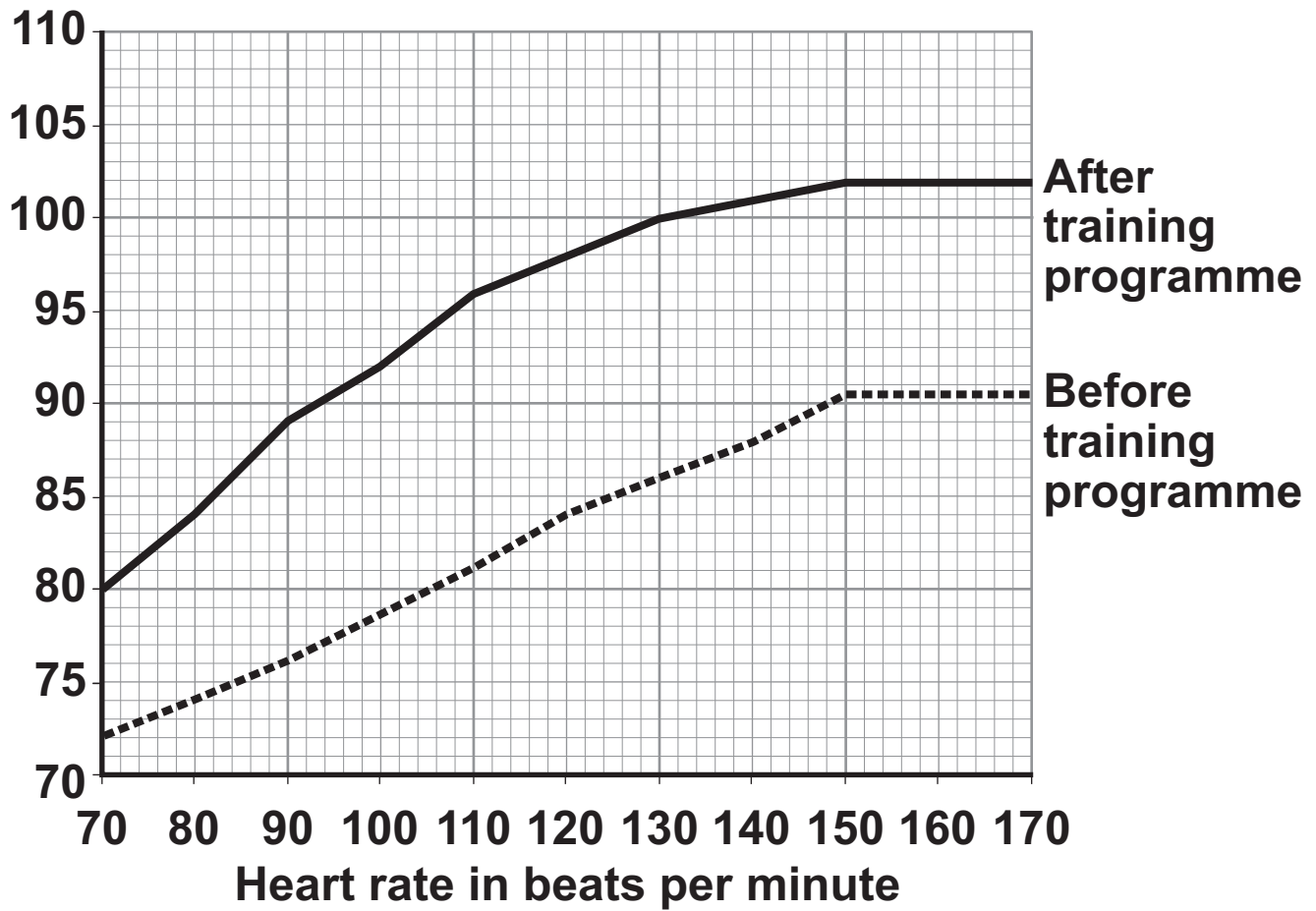
**The stroke volume of the heart is the volume of blood pumped out of the left side of the heart in one heart beat.**

**[Question 4 continues on the next page]**

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

**GRAPH 2**

**Stroke volume  
in cm<sup>3</sup>**



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. [2 marks]

Show clearly how you work out your answer.

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Cardiac output = \_\_\_\_\_ cm<sup>3</sup> blood per minute

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. [2 marks]

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[Question 4 continues on the next page]

**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. [4 marks]**

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**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. [4 marks]**

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**[Turn over for the next question]**

**6 Diffusion and active transport take place in healthy kidneys.**

**6 (a) Explain what is meant by:**

**6 (a) (i) diffusion [2 marks] \_\_\_\_\_**

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**6 (a) (ii) active transport [2 marks] \_\_\_\_\_**

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**6 (b) Describe, as fully as you can, how urine is produced by the kidneys. [5 marks]**

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**END OF QUESTIONS**

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

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