

Surname											Other Names										
Centre Number											Candidate Number										
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For Examiner's Use
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General Certificate of Secondary Education  
January 2008

**BIOLOGY**  
**Unit Biology B3**

**Higher Tier**

**BLY3H**  
**H**



Tuesday 15 January 2008 1.30 pm to 2.15 pm

<p><b>You will need no other materials.</b> You may use a calculator.</p>
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Time allowed: 45 minutes

**Instructions**

- Use blue or black ink or ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- 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 maximum mark for this paper is 45.
- The marks for questions are shown in brackets.
- 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.

For Examiner's Use			
Question	Mark	Question	Mark
1		4	
2		5	
3		6	
		7	
Total (Column 1) →			
Total (Column 2) →			
TOTAL			
Examiner's Initials			

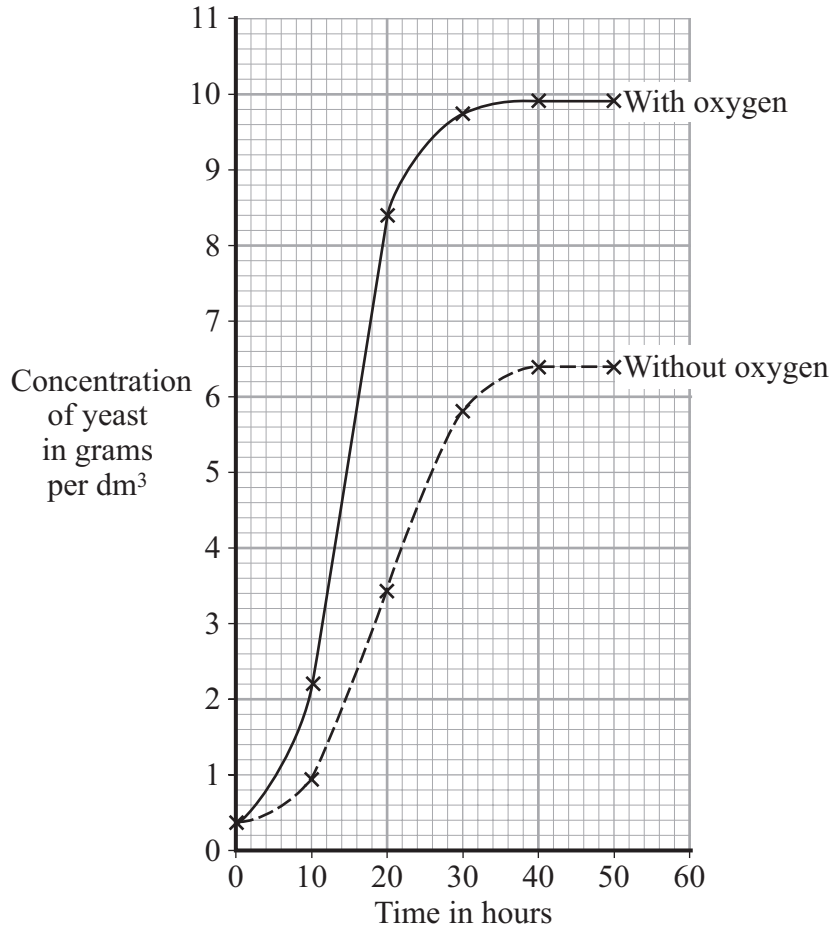


J A N O 8 B L Y 3 H O 1

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

- 1 A student grew two batches of yeast in separate flasks. The conditions in each flask were the same except that one flask had a supply of oxygen and the other was without oxygen.

The results are shown in the graph.



- (a) Calculate the average hourly increase in mass of the yeast between 10 hours and 20 hours in the presence of oxygen. Show your working.

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Answer ..... grams per dm<sup>3</sup> per hour  
(2 marks)



- (b) Explain why the yeast grew better in the presence of oxygen.

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(2 marks)

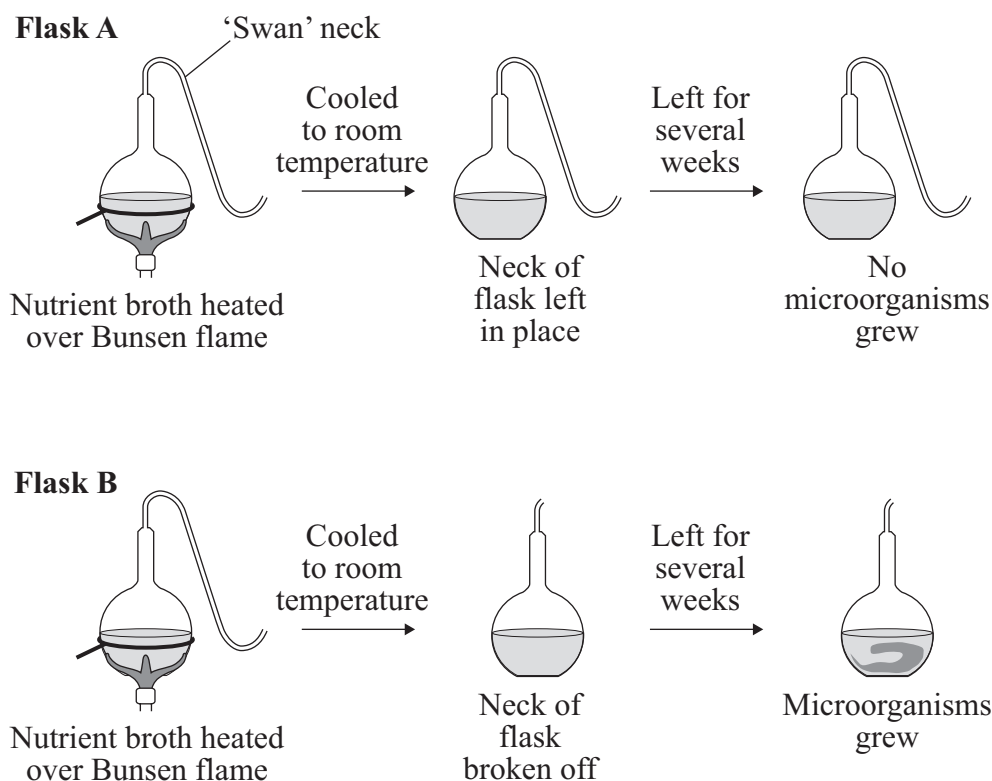
4

**Turn over for the next question**

**Turn over ►**



2 In 1862, Louis Pasteur carried out the following experiments.



- (a) (i) Why was each flask heated over a Bunsen flame?

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(1 mark)

- (ii) Why was each flask then cooled to room temperature?

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(1 mark)

- (iii) Suggest the function of the 'swan' neck in **Flask A**.

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(1 mark)



- (b) Do the results of the experiments support the theory of biogenesis?

Explain your answer.

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(2 marks)

5
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**Turn over for the next question**

**Turn over ►**



- 3 Read the passage below about biogas production in Sri Lanka, which is a country with a much warmer climate than the UK.

Mr Ratnayake is a farmer. Using nothing more than cow dung, he has enough power to cook and provide heat and light for his home without using a single piece of wood. He collects the manure from his cows in their cattle shed. He then mixes the manure with water and leaves it to ferment in a large concrete pit. The gas produced is collected in a simple storage tank and is piped into his house for use.

The dried manure left after this biogas is generated is richer than ordinary manure. It makes a good organic fertiliser for Mr Ratnayake's crops. He can then sell his crops at a higher price as they are organic produce.

- (a) (i) What is the fuel gas present in biogas?

.....  
(1 mark)

- (ii) Name the process which produces biogas.

.....  
(1 mark)

- (b) (i) Give **two** ways in which Mr Ratnayake benefits from making biogas as described in the passage.

1 .....

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2 .....

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(2 marks)



- (ii) This design of biogas generator works well in Sri Lanka. It would not work so well in the UK.

Explain why.

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(2 marks)

6

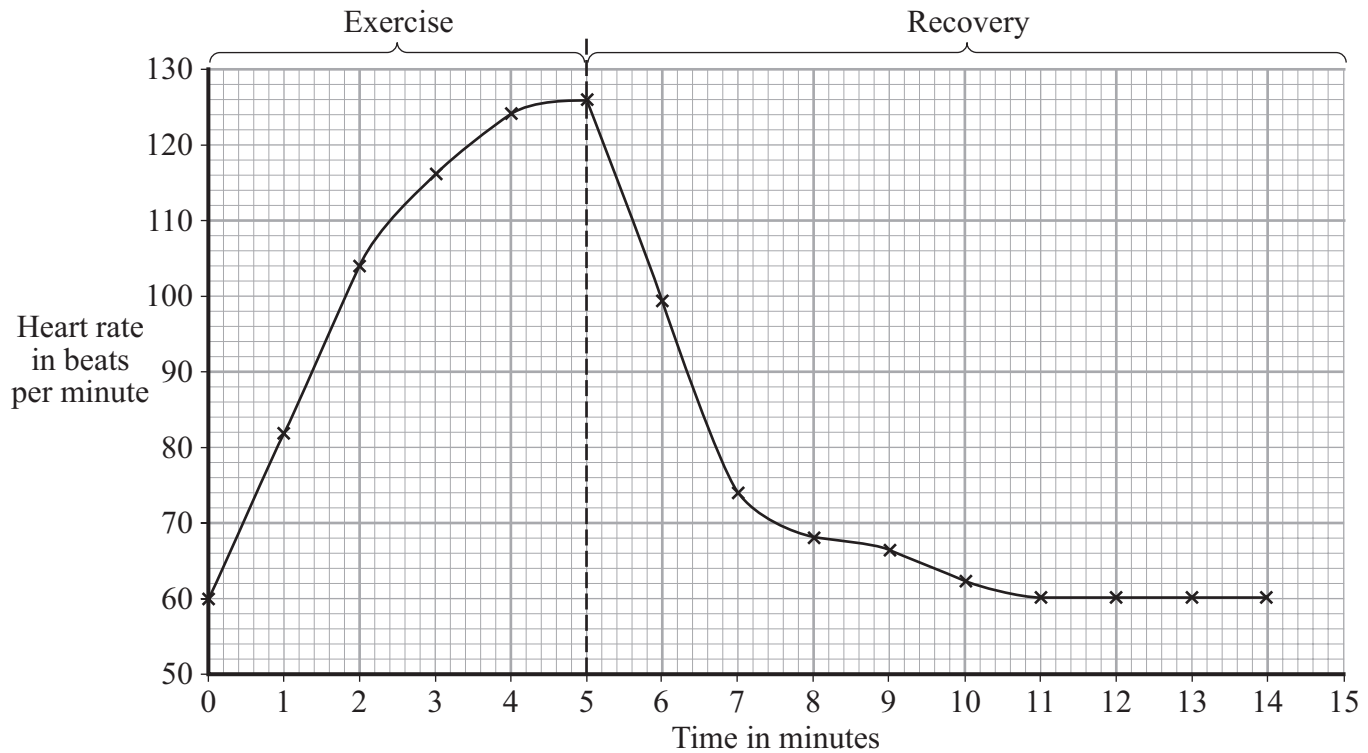
**Turn over for the next question**

**Turn over ►**



- 4 A student pedalled an exercise cycle at constant speed for 5 minutes. The student's heart rate was recorded at one-minute intervals during the exercise and also during recovery.

The results are shown in the graph.



- (a) Describe, in as much detail as you can, the changes in heart rate between 0 and 14 minutes.

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(3 marks)





- (b) How do arteries supplying the leg muscles alter the rate of blood flow through them during exercise?

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(1 mark)

- (c) Explain how an increase in heart rate helped the student during exercise.

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(4 marks)

8

**Turn over for the next question**

**Turn over ►**



- 5 (a) Why is glucose found in the blood but not in the urine?  
Use your knowledge of how the kidney works to explain your answer as fully as you can.

.....

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(3 marks)

- (b) The table shows the concentrations of dissolved substances in the urine of a healthy person and the urine of a person with one type of kidney disease.

Substance	Concentration in grams per dm <sup>3</sup>	
	Urine of healthy person	Urine of person with kidney disease
Protein	0	6
Glucose	0	0
Amino acids	0	0
Urea	21	21
Mineral ions	19	19

- (i) Suggest an explanation for the difference in composition of the urine between the healthy person and the person with the kidney disease.

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(2 marks)



- (ii) The person with the kidney disease could be treated either by using a dialysis machine or by having a kidney transplant operation.

What are the advantages and disadvantages of having a kidney transplant operation rather than dialysis?

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(4 marks)

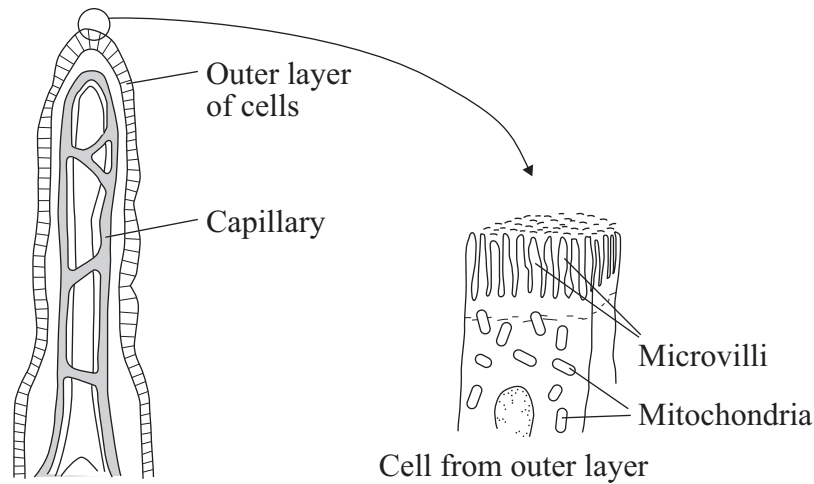
9

**Turn over for the next question**

**Turn over ►**



- 6 The small intestine is lined with millions of villi. The diagram shows the structure of a villus.



In the small intestine, some of the products of digestion are absorbed into the blood by *active transport*.

- (a) Explain what is meant by *active transport*.

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(2 marks)

- (b) How do microvilli and mitochondria help in the active transport of the products of digestion from the small intestine into the blood?

Microvilli .....

.....

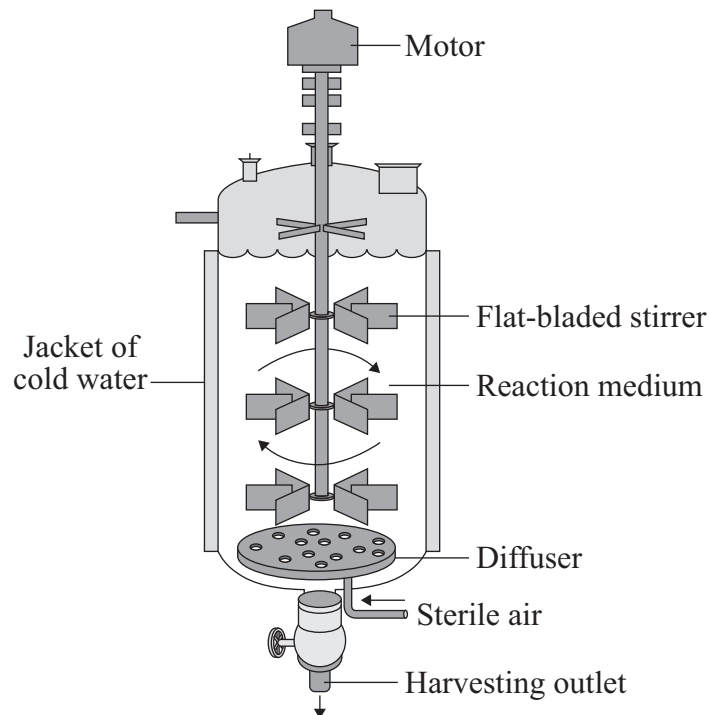
Mitochondria .....

.....

(2 marks)



- 7 The diagram shows a fermenter. This fermenter was used to grow the fungus *Cephalosporium* which makes the antibiotic Cephalosporin C. The reaction medium contains a mixture of the sugars glucose and sucrose and a variety of mineral ions.



- (a) (i) The stirrer continuously mixes the contents of the fermenter. Why is this important?

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 (1 mark)

- (ii) Explain why the fermenter is surrounded by a jacket of cold water.

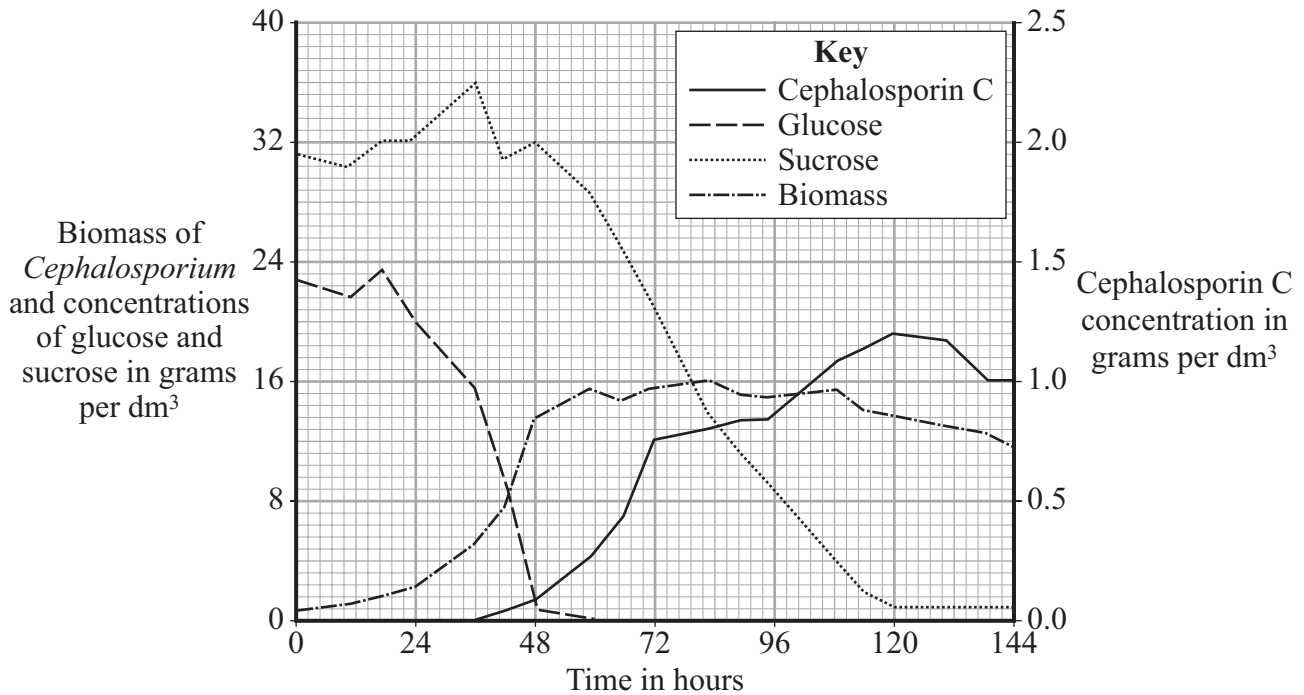
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 (2 marks)

Question 7 continues on the next page

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- (b) The graph shows changes in the concentrations of glucose, sucrose, Cephalosporin C and the biomass of *Cephalosporium* measured in the fermenter over 6 days.



- (i) During which 6-hour time period is the antibiotic being produced at its maximum rate?

.....  
(1 mark)

- (ii) What evidence is there that *Cephalosporium* is able to use glucose more easily than sucrose?

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(1 mark)



- (iii) Describe and explain the relationship between glucose concentration, the biomass of *Cephalosporium* and the concentration of Cephalosporin C.

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(4 marks)

9

**END OF QUESTIONS**



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