

Surname		Other Names	
Centre Number		Candidate Number	
Candidate Signature			

For Examiner's Use

General Certificate of Secondary Education
January 2008

BIOLOGY
Unit Biology B3

Higher Tier

Tuesday 15 January 2008 1.30 pm to 2.15 pm

<p>You will need no other materials. You may use a calculator.</p>

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.

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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			

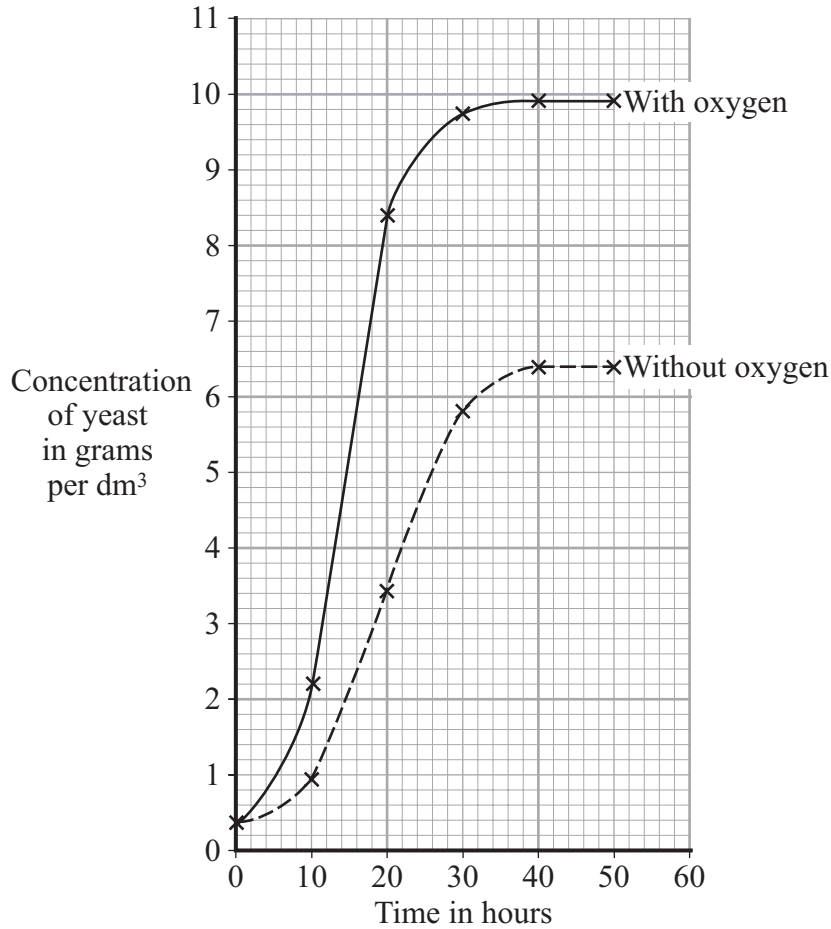


J A N O 8 B L Y 3 H O 1

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 dm³ per hour
 (2 marks)



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

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(2 marks)

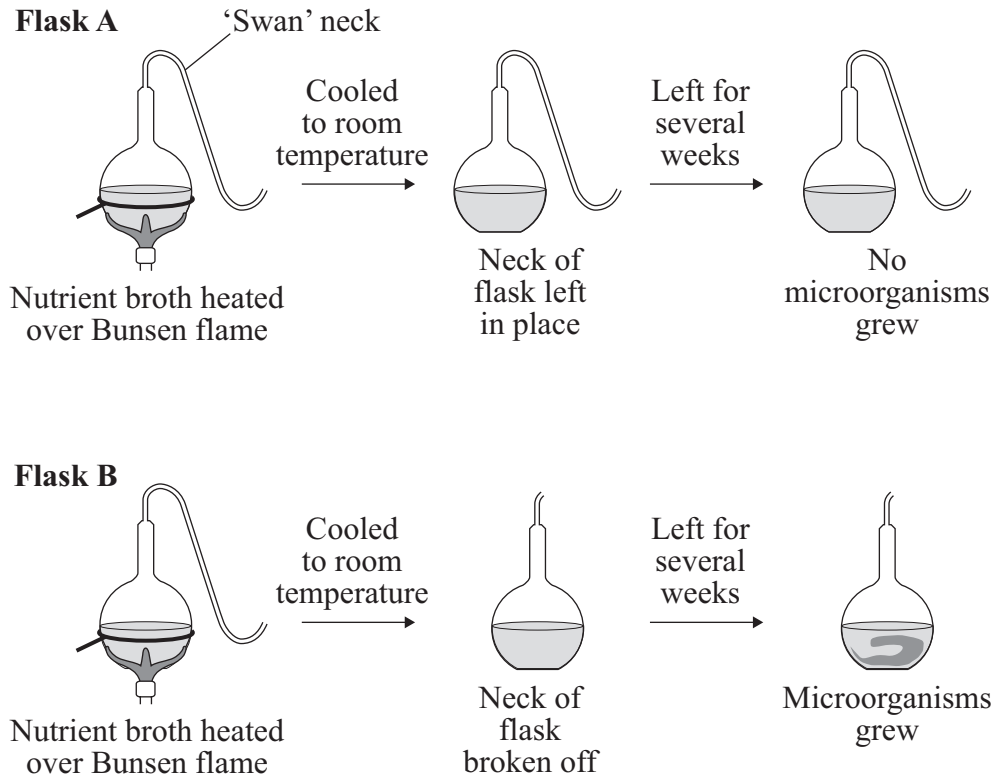
4

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?

.....

 (1 mark)

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

.....

 (1 mark)



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

Explain your answer.

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(2 marks)

5

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

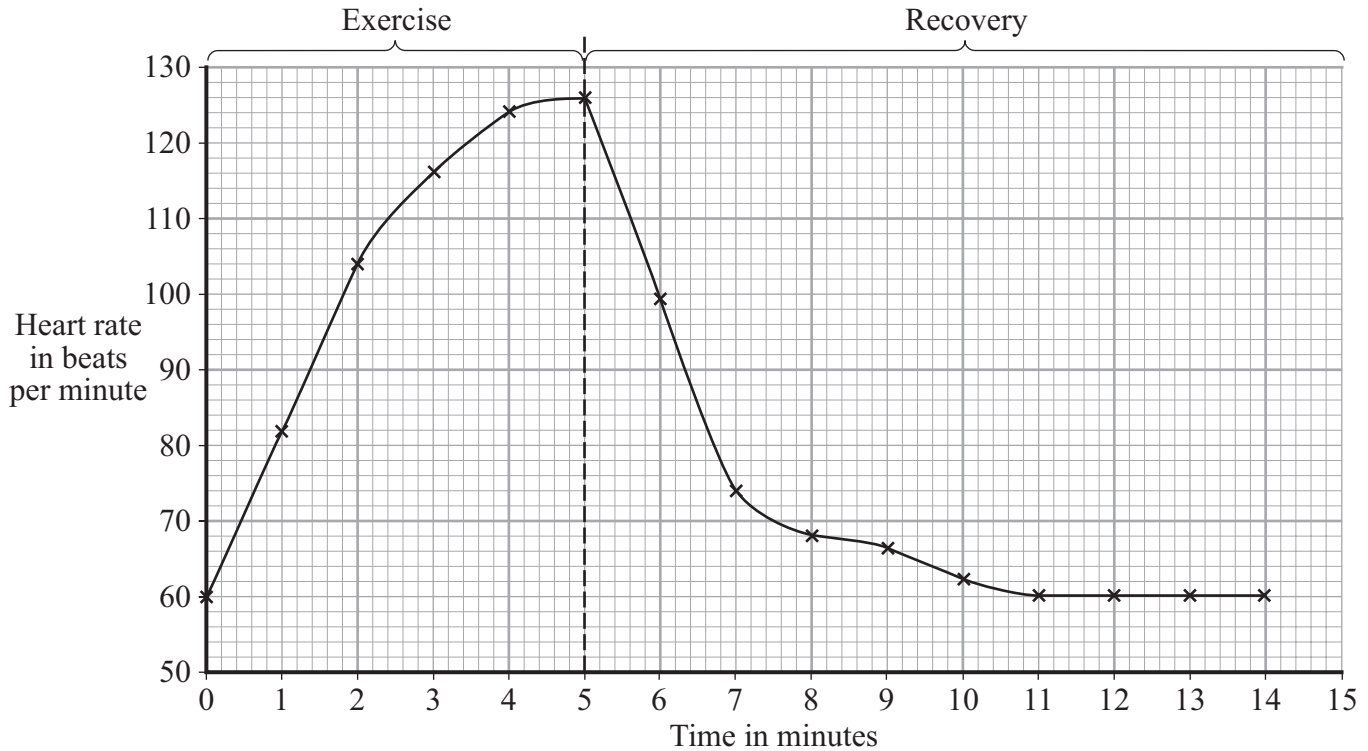
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- 4 A student pedalled an exercise cycle at constant speed for 5 minutes. The student's heart rate was recorded at one-minute intervals during the exercise and also during recovery.

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 ³	
	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)

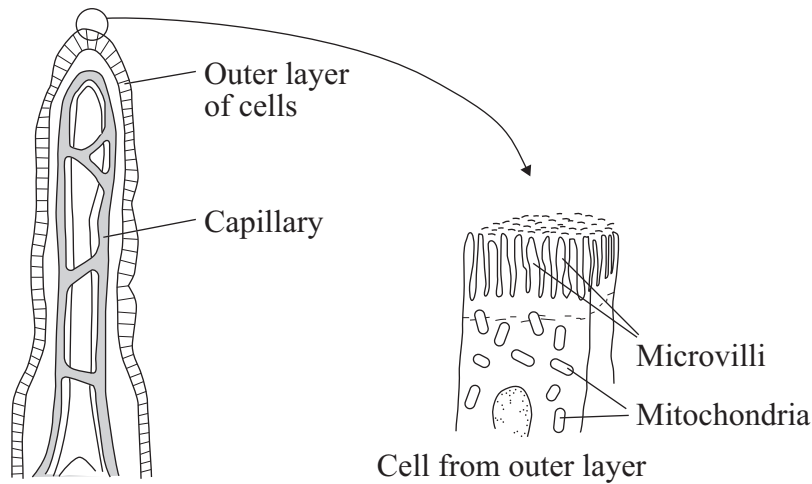
9

Turn over for the next question

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- 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

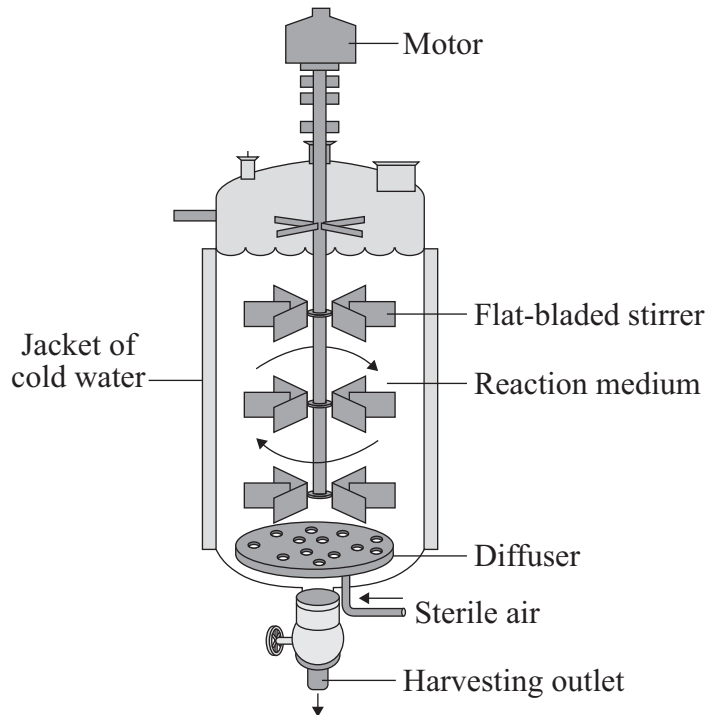
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(2 marks)

4



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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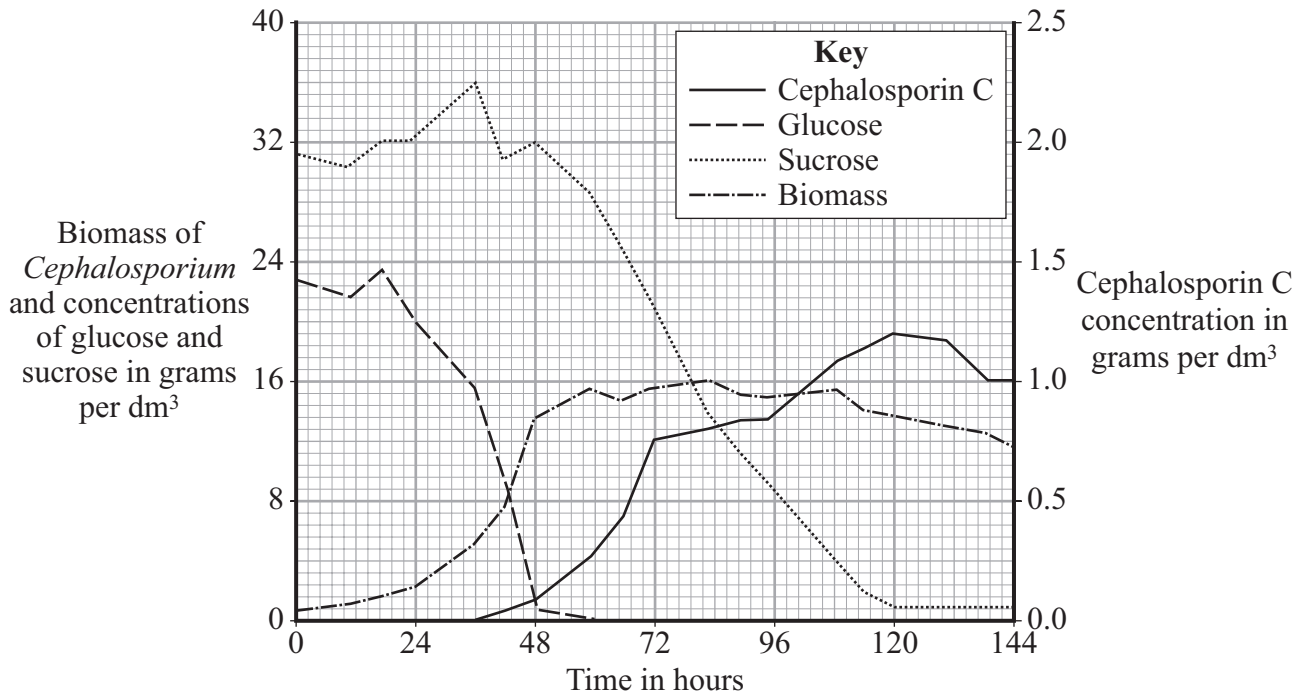
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Question 7 continues on the next page

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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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