

Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										

For Examiner's Use	
Examiner's Initials	
Question	Mark
1	
2	
3	
4	
5	
6	
7	
TOTAL	



General Certificate of Secondary Education  
Higher Tier  
January 2012

# Biology

**BLY3H**

**Unit Biology B3**

**H**

**Written Paper**

**Tuesday 24 January 2012 9.00 am to 9.45 am**

**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.



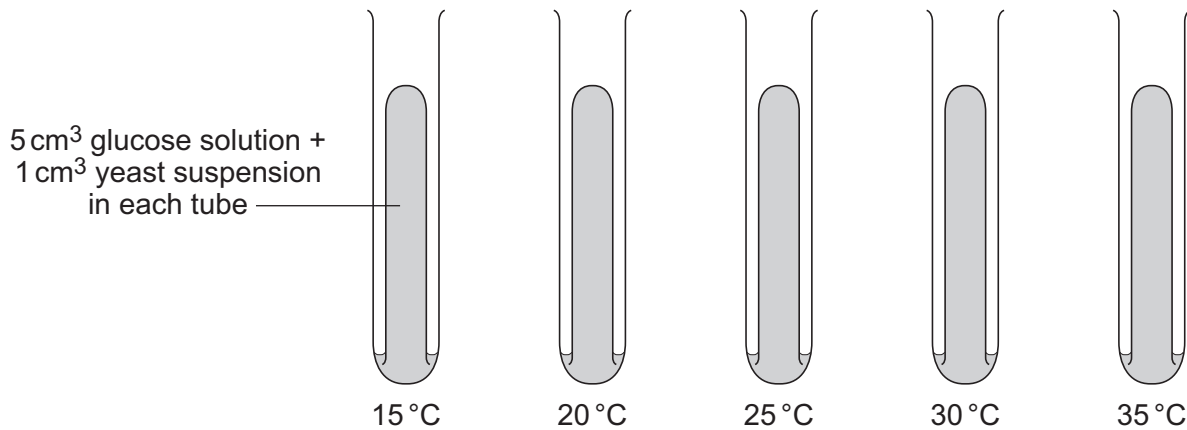
J A N 1 2 B L Y 3 H 0 1

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

**1** Some students investigated the best temperature for gas production by yeast.

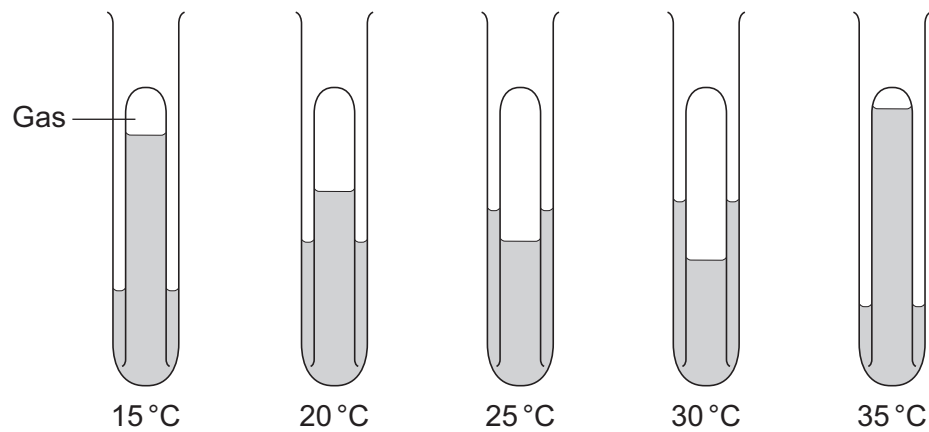
The students set up the apparatus as shown in **Diagram 1**.

**Diagram 1**



**Diagram 2** shows the results after one hour.

**Diagram 2**



**1 (a)** In each apparatus the yeast produced a gas.

**1 (a) (i)** Name this gas.

.....  
(1 mark)



1 (a) (ii) Name the process which produces this gas.

.....  
(1 mark)

1 (b) One student said that the best temperature for the yeast to produce the gas was 30°C.  
What is the evidence for this in **Diagram 2**?

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.....  
(1 mark)

1 (c) A second student said that the investigation might not have produced reliable results.

1 (c) (i) What should the students do next to check the reliability of their results?

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.....  
(1 mark)

1 (c) (ii) How would the students then know if their results were reliable?

.....  
.....  
(1 mark)

1 (d) A third student said that the investigation might not have produced an accurate value for the best temperature for gas production.

What should the students do next to check that 30°C was an accurate value for the best temperature?

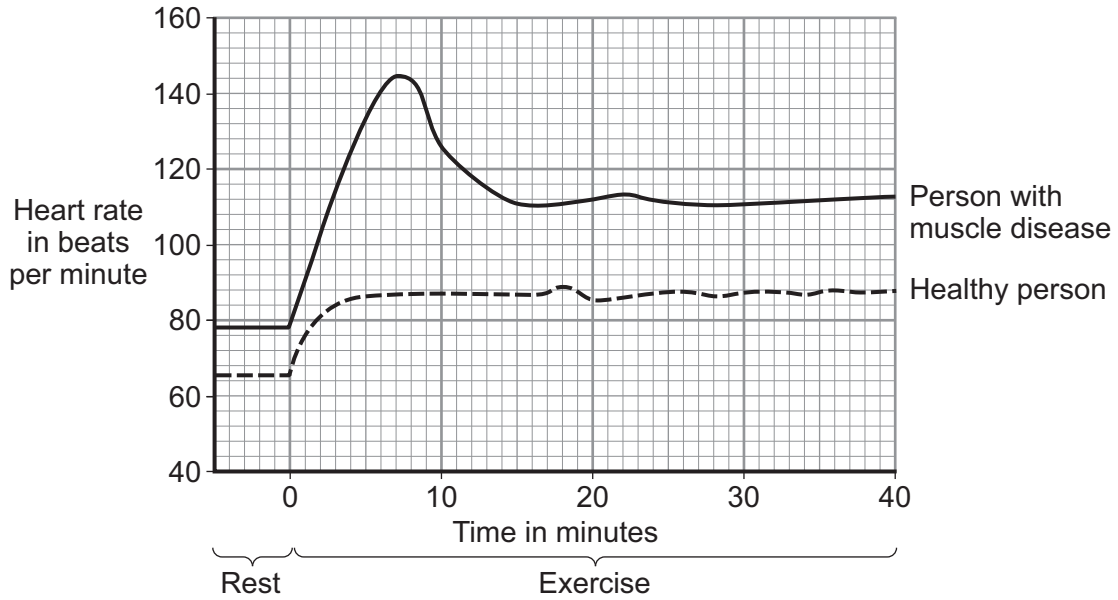
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(2 marks)

7
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Turn over ►



2 Two people did the same amount of gentle exercise on an exercise cycle. One person had a muscle disease and the other had healthy muscles. The graph shows the effect of the exercise on the heart rates of these two people.



2 (a) Describe **three** ways in which the results for the person with the muscle disease are different from the results for the healthy person.

To gain full marks in this question you need to include data from the graph in your answer.

- 1 .....
- .....
- 2 .....
- .....
- 3 .....
- .....

(3 marks)



2 (b) The blood transports glucose to the muscles at a faster rate during exercise than when a person is at rest.

2 (b) (i) Name **one** other substance that the blood transports to the muscles at a faster rate during exercise.

.....  
(1 mark)

2 (b) (ii) People with the muscle disease are not able to store glycogen in their muscles.

The results shown in the graph for the person with the muscle disease are different from the results for the healthy person.

Suggest an explanation for the difference in the results.

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(3 marks)

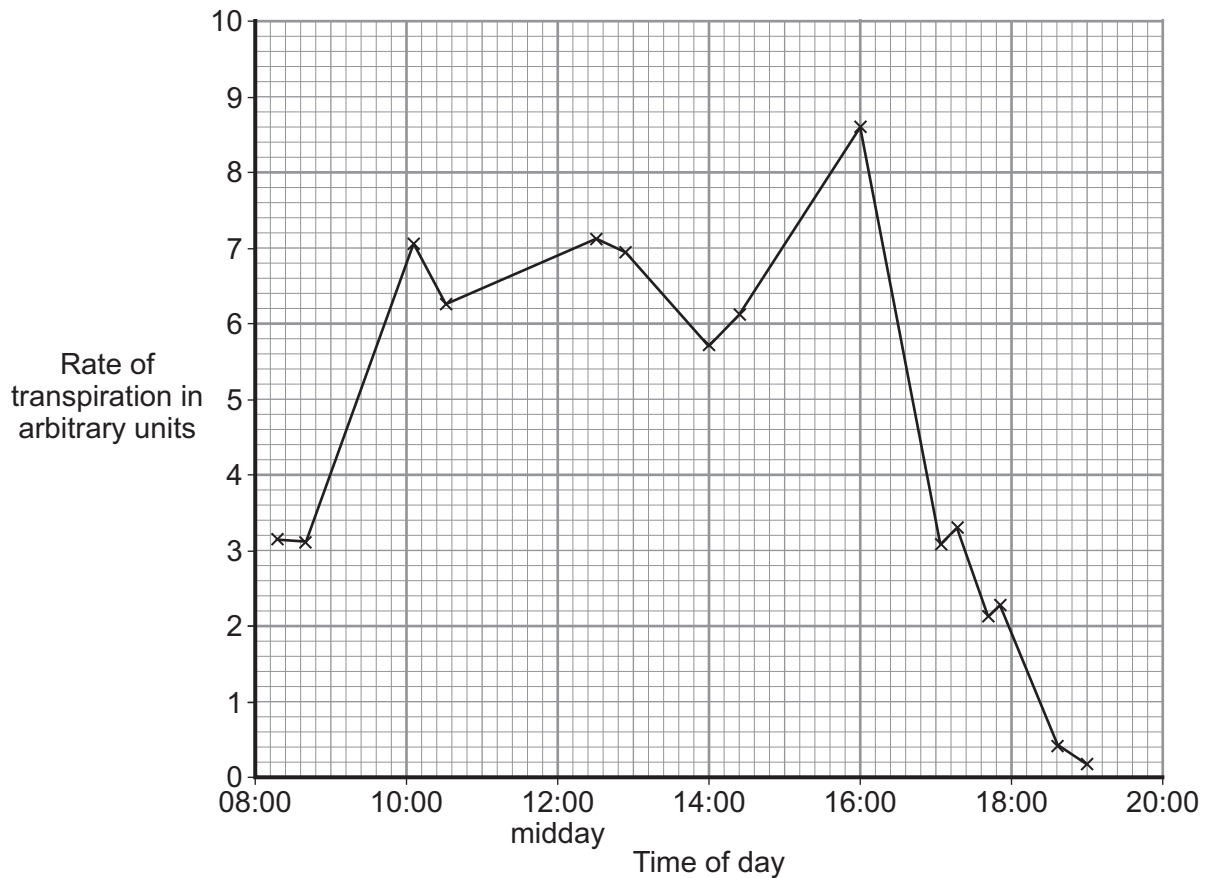
7

Turn over for the next question

Turn over ►



- 3 The graph shows the rate of transpiration from a plant at different times of the day.



*Transpiration* occurs mainly in the leaves of a plant.

- 3 (a) (i) What is *transpiration*?

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(2 marks)

- 3 (a) (ii) Through which part of a leaf does most transpiration occur?

.....

(1 mark)



**3 (b)** In this investigation, the rate of transpiration decreases between 16:00 hours and 19:00 hours.

**3 (b) (i)** Calculate the average rate of decrease per hour in the rate of transpiration over this time.

Show clearly how you work out your answer.

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Rate = ..... arbitrary units per hour  
(2 marks)

**3 (b) (ii)** Suggest **one** explanation for the decrease in the rate of transpiration between 16:00 hours and 19:00 hours.

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(2 marks)

7

**Turn over for the next question**

**Turn over ►**



4 Some scientists set up a biogas generator.

The table shows how the rate of biogas production and the composition of the biogas changed over the first 30 days.

Time in days	Rate of biogas production in cm <sup>3</sup> per hour	Composition of the biogas	
		Percentage of methane	Percentage of carbon dioxide
1	110	27	56
5	90	20	78
10	50	30	68
15	170	68	30
20	115	72	26
25	110	71	27
30	105	70	28

4 (a) (i) Name the process that produces the methane in biogas.

.....  
(1 mark)





4 (a) (ii) For the first 10 days, the gas released from the generator contained a high concentration of carbon dioxide. This was because there was air in the generator when it was first set up.

Explain why the presence of air results in a high concentration of carbon dioxide in the biogas.

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(3 marks)

4 (b) The scientists concluded that it would not be profitable to collect biogas from the generator until after about 20 days.

Use the data to explain why.

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(1 mark)

4 (c) The rate of biogas production slowed down towards the end of the investigation.

Suggest **one** reason why.

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(1 mark)

6

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ANSWER IN THE SPACES PROVIDED**



**5** Yoghurt is made by the action of certain bacteria on milk.

**5 (a)** Describe fully how the action of bacteria on milk produces yoghurt.

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(3 marks)

**5 (b)** The action of the bacteria on the milk prevents other species of bacteria growing in the milk.

Suggest **one** reason why other bacteria cannot grow in this milk.

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.....

(1 mark)

4

**Turn over for the next question**

**Turn over ►**



**6** Use your knowledge of how the kidney works to answer the following questions.

**6 (a)** Blood plasma contains mineral ions, glucose, urea and proteins.

Explain why urine contains mineral ions and urea, but **no** glucose or protein.

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*(4 marks)*



**6 (b)** A man ate and drank the same amounts of the same substances and he did the same amount of exercise on two different days. On one of the two days the weather was hot and on the other day the weather was cold.

The man's urine contained a higher concentration of mineral ions and urea on the hot day than on the cold day.

Explain why.

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(4 marks)

8

**Turn over for the next question**

**Turn over ►**



- 7 One species of bacterium makes an enzyme that changes the sugar sucrose into complex carbohydrates. These complex carbohydrates are used in various foods, drugs and cosmetics.

Scientists wanted to develop a method for industrial production of the enzyme. They grew the bacteria in a fermenter. The scientists investigated the effects of four different culture media on production of the enzyme by the bacteria.

**Table 1** gives details of the contents of the four culture media.

**Table 1**

Substance	Percentage concentration			
	Medium 1	Medium 2	Medium 3	Medium 4
Sucrose	2.0	2.0	2.0	2.5
Yeast extract	0.5	0.5	0.5	0.5
Peptone	0.5	0.5	0.5	0.5
Potassium phosphate	0.5	2.0	1.5	1.5
Sodium chloride	–	0.001	0.001	0.001
Manganese sulfate	–	0.002	–	–
Manganese chloride	–	–	0.001	0.001
Iron (II) sulfate	–	0.001	–	–
Calcium chloride	–	–	0.005	0.01
Magnesium sulfate	–	0.02	–	0.001

**Table 2** shows the yield of enzyme in each medium.

**Table 2**

	Medium 1	Medium 2	Medium 3	Medium 4
<b>Relative yield of enzyme</b>	1.00	1.17	3.48	5.41



7 (a) Give **two** variables that the scientists controlled in this investigation.

1 .....

2 .....

(1 mark)

7 (b) In this investigation, the scientists heated all the apparatus and growth media to 121 °C for 15 minutes before use.

Explain fully why this treatment was necessary.

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(2 marks)

7 (c) Evaluate the evidence that calcium ions are useful in production of the enzyme.

Use the information from **Tables 1** and **2**.

Remember to give a conclusion to your evaluation.

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(3 marks)

6

**END OF QUESTIONS**



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