

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



General Certificate of Secondary Education
Higher Tier
June 2012

Biology

BLY3H

H

Unit Biology B3

Written Paper

Monday 21 May 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.

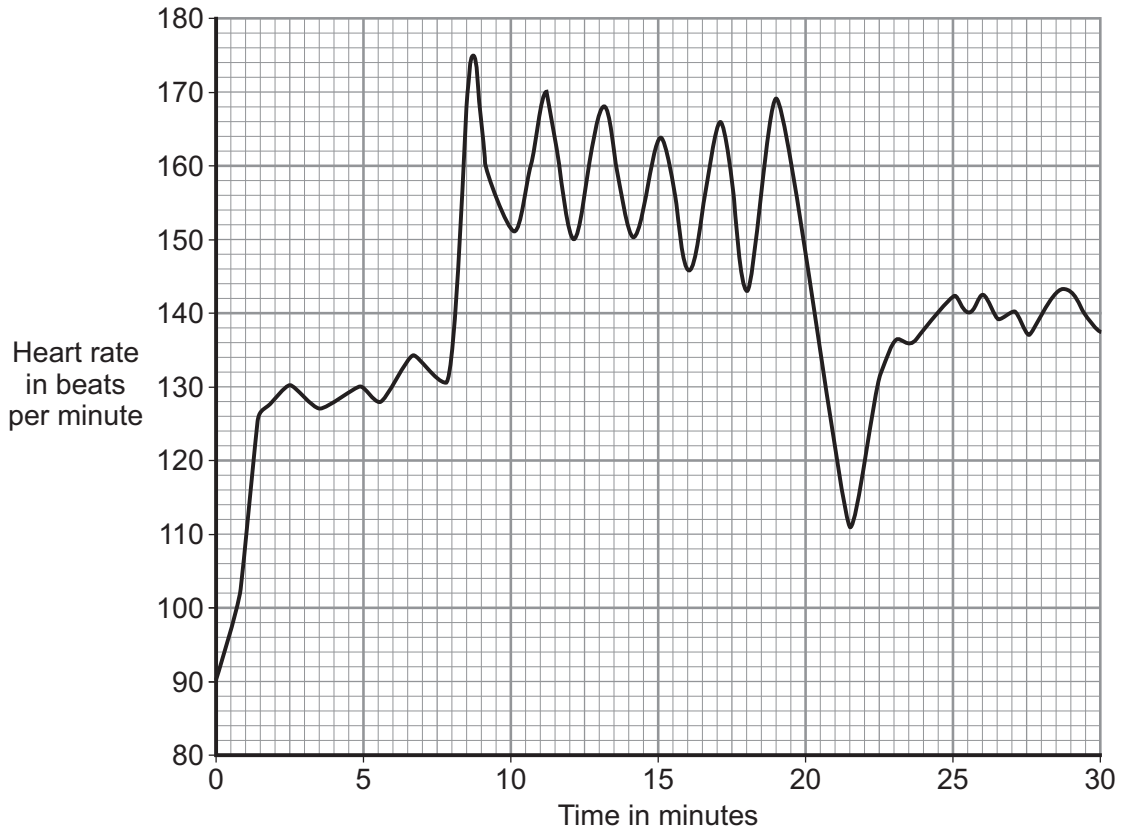


J U N 1 2 B L Y 3 H 0 1

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

1 One type of training exercise involves alternating periods of walking and running.

The graph shows how an athlete's heart rate changed during one 30-minute training session.



1 (a) (i) The athlete ran 6 times during the 30-minute training session.

Describe the evidence for this in the graph.

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(1 mark)

1 (a) (ii) Immediately after the final run, the athlete rested for a short time before he started to walk again.

For how many minutes did this rest last?

..... minutes
 (1 mark)



1 (b) The heart rate increases during exercise.

This increase in heart rate increases blood flow to the muscles.

Explain, as fully as you can, why this increase in heart rate is necessary.

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(4 marks)

6

Turn over for the next question

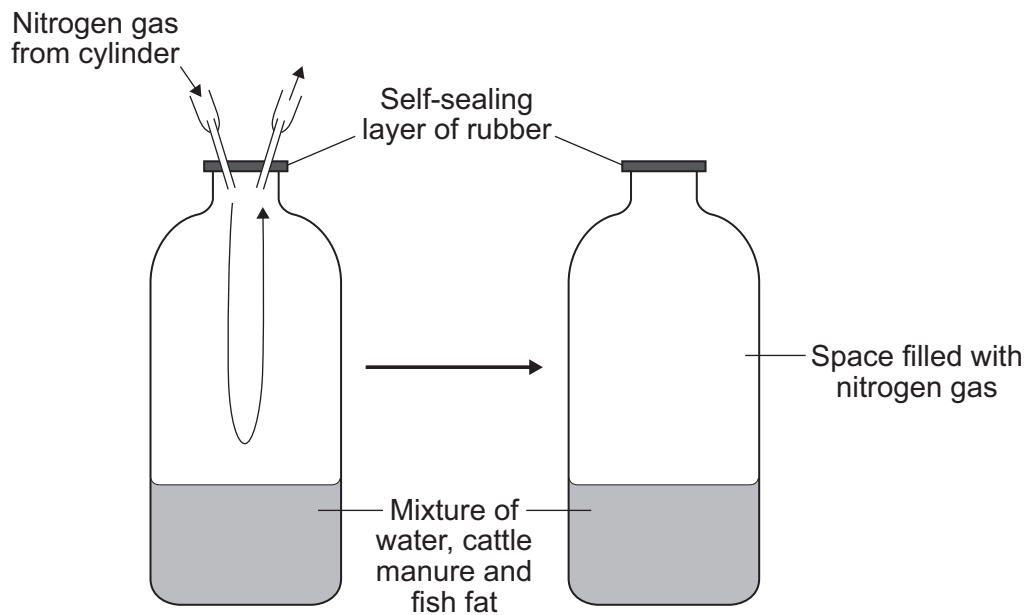
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- 2 Norway has a large fishing industry. Norwegian scientists investigated the effect of adding waste fish fat to cattle manure to improve the production of biogas.

The scientists set up many jars containing different concentrations of fish fat added to the cattle manure. The air in each jar was removed and replaced with pure nitrogen gas.

The diagram shows how one of these jars was set up.



The scientists then kept all the jars in an incubator at 35°C for 6 weeks.

- 2 (a) The scientists sealed each jar with a layer of rubber and replaced the air in the jars with nitrogen gas.

Explain why.

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(2 marks)



2 (b) The scientists removed samples of gas from each jar at intervals over the 6 weeks.
The table shows some of the scientists' results.

Contents of jar	Yield of biogas in cm ³ per gram	Yield of methane in cm ³ per gram	Proportion of methane in the biogas
Cattle manure	426	256	0.60
Cattle manure + 2.5% fish fat	686	426	
Cattle manure + 5% fish fat	861	543	0.63
Cattle manure + 10% fish fat	999	630	0.63

2 (b) (i) The final column of the table shows the proportion of methane in the biogas.

Apart from the methane and the added nitrogen, name the other gas that makes up most of the rest of the biogas.

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(1 mark)

2 (b) (ii) Calculate the proportion of methane in the biogas when 2.5% fish fat was added to the manure.

Show clearly how you work out your answer.

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Proportion of methane =
(2 marks)

2 (b) (iii) Describe the effects on biogas production of adding fish fat to cattle manure.

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(2 marks)

Question 2 continues on the next page

Turn over ►



2 (b) (iv) Olaf is a Norwegian farmer. Olaf's farm is 110 kilometres from the sea. He has a biogas generator on his farm. Olaf adds manure from his 50 cattle to his biogas generator.

Olaf decided **not** to add fish fat to his biogas generator.

Suggest **one** reason why.

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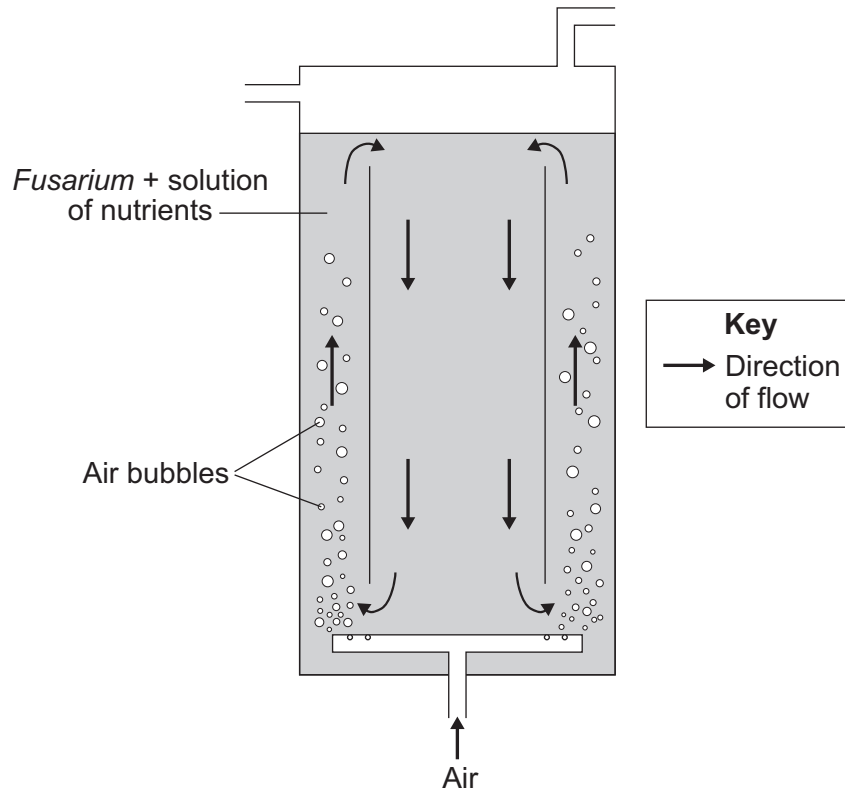
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(1 mark)

8



- 3 The diagram shows a laboratory bench-top fermenter.
The fermenter was used for growing the fungus *Fusarium*.



- 3 (a) (i) The air bubbles supply the *Fusarium* with oxygen.
A process occurs in the *Fusarium* which uses oxygen.
Give the precise name of this process.

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(2 marks)

- 3 (a) (ii) The air bubbles also help to move the *Fusarium* around the fermenter.
It is useful to move the *Fusarium* around the fermenter.
Suggest **one** reason why.

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(1 mark)

Question 3 continues on the next page

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- 3 (a) (iii) Another method of stirring the mixture in a fermenter is to use rotating paddles. *Fusarium* is made of long, branching fibres.

Rotating paddles are **not** used in a fermenter when growing *Fusarium*.

Suggest why.

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(1 mark)

- 3 (b) *Fusarium* is used for making mycoprotein.

Read the information about some substances found in mycoprotein.

- Protein can be used for making cells and enzymes.
- Fats contain a lot of energy, but large amounts in the diet can cause circulatory problems.
- Dietary fibre helps to reduce the risk of colon cancer.

The table compares the composition of mycoprotein and chicken.

	Amount per 100 grams	
	Mycoprotein	Chicken
Energy in kilojoules	357.0	726.6
Protein in grams	11.5	30.9
Fat in grams	2.9	4.5
Cholesterol in milligrams	0.0	85.0
Dietary fibre in grams	5.9	0.0

Use data from the table and the information to answer these questions.

- 3 (b) (i) It would be better for a body builder to eat chicken instead of mycoprotein.

Give **one** reason why.

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(1 mark)



3 (b) (ii) A food manufacturer claims that it is healthier to eat mycoprotein than to eat chicken.

Explain **two** ways in which the information, and data from the table, support this claim.

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(2 marks)

7

Turn over for the next question

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- 4 The table shows the concentrations of three mineral ions in the roots of a plant and in the water in the surrounding soil.

Mineral ion	Concentration in millimoles per kilogram	
	Plant root	Soil
Calcium	125	2.0
Magnesium	80	3.1
Potassium	250	1.2

- 4 (a) (i) The plant roots could **not** have absorbed these mineral ions by diffusion.

Explain why.

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(2 marks)

- 4 (a) (ii) Name the process by which the plant roots absorb mineral ions.

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(1 mark)

- 4 (b) How do the following features of plant roots help the plant to absorb mineral ions from the soil?

- 4 (b) (i) A plant root has thousands of root hairs.

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(1 mark)



4 (b) (ii) A root hair cell contains many mitochondria.

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(2 marks)

4 (b) (iii) Many of the cells in the root store starch.

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(1 mark)

7

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ANSWER IN THE SPACES PROVIDED**



5 Blood plasma is a solution of glucose, and many other substances, in water.
The urine of a healthy person contains water but does not contain glucose.

5 (a) Name **two** more substances found in the urine of a healthy person.

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(2 marks)

5 (b) (i) Describe what happens to the glucose in the blood of a healthy person when the blood enters the kidney.

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(3 marks)

5 (b) (ii) A diabetic person's blood often contains a high concentration of glucose.

The urine of a diabetic person may contain glucose.

Suggest an explanation why.

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(2 marks)

7

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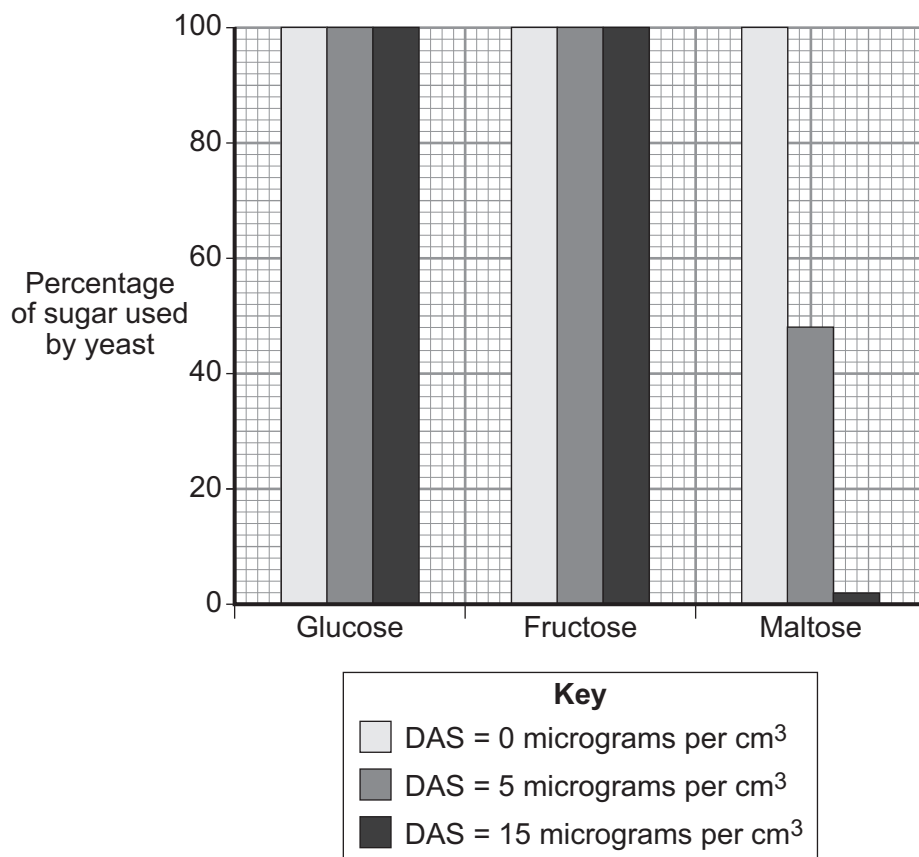


- 6 Some species of fungi make a toxin called DAS. These fungi sometimes contaminate the tanks used for making beer from malt extract.

Scientists investigated the effect of DAS on yeast. They grew the yeast in a solution of malt extract. The malt extract is a mixture of sugars: it is mainly maltose with small amounts of glucose and fructose. A maltose molecule is two glucose molecules joined together.

The table and the graph show the scientists' results.

DAS concentration in micrograms per cm ³	Percentage of alcohol produced
0	4.01
5	2.53
15	0.10



6 (a) Use information from both the table and the graph to describe the effect of DAS on the fermentation of sugars by yeast.

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(4 marks)

6 (b) (i) Yeast cells cannot absorb maltose.

Suggest **one** reason why.

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(1 mark)

6 (b) (ii) One effect of DAS is to stop the release of an enzyme from the yeast cells. When the concentration of DAS was 0 micrograms per cm³, the yeast cells were able to use all the maltose.

Suggest why the yeast cells were able to use all the maltose only when there was no DAS present.

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(3 marks)

Question 6 continues on the next page

Turn over ►



6 (c) Tanks should be sterilised and cleaned thoroughly before they are used for brewing beer. Sterilisation will kill the fungi that make DAS.

Give **two** reasons why a beer manufacturer would want to kill the fungi that make DAS.

Use information given earlier in this question.

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(2 marks)

10

END OF QUESTIONS

