Surname		Other Names	
Centre Number			Candidate Number				
Candidate Signature									

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General Certificate of Secondary Education
June 2006

BIOLOGY (MODULAR) SPECIFICATION A **3413/H**
Written Paper
Higher Tier

H

Wednesday 7 June 2006 1.30 pm to 3.00 pm

For this paper you must have:
- a ruler

You may use a calculator.

Time allowed: 1 hour 30 minutes

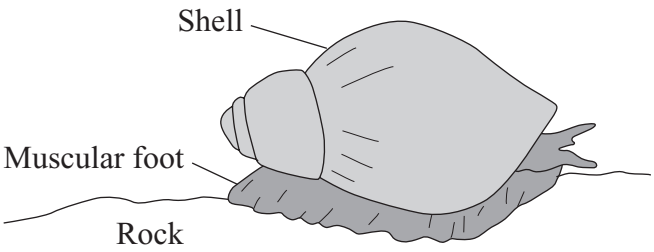
Instructions
- Use blue or black ink or ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- Answer the questions in the spaces provided.
- Do all rough work in this book. Cross through any work you do not want marked.

Information
- The maximum mark for this paper is 90.
- The marks for questions are shown in brackets.
- You are reminded of the need for good English and clear presentation in your answers.

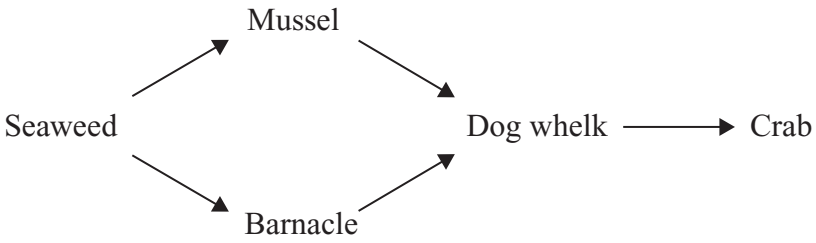
For Examiner's Use			
Number	Mark	Number	Mark
1		9	
2		10	
3		11	
4		12	
5		13	
6		14	
7		15	
8			
Total (Column 1) →			
Total (Column 2) →			
TOTAL			
Examiner's Initials			

ENVIRONMENT

1 The diagram shows a picture of a dog whelk. Dog whelks live on rocky beaches. When the tide goes out, they can be seen holding onto the rocks using a muscular foot.



The diagram below shows part of a food web from a rocky beach.



Some students wanted to compare the number of dog whelks on two different beaches.

They counted the number of dog whelks on each beach.

The table shows how many dog whelks were found on each beach.

	Windy beach	**Sheltered beach**
Number of dog whelks	110	79

(a) Give **two** factors that should be controlled in this investigation.

1 .....

2 .....

(2 marks)

(b) The students concluded that more dog whelks are found on windy beaches.

(i) Use the information given in the food web to suggest **two** reasons why there are more dog whelks on windy beaches.

1.....

2.....

(2 marks)

(ii) Suggest a reason why the students' conclusion may not be valid.

.....

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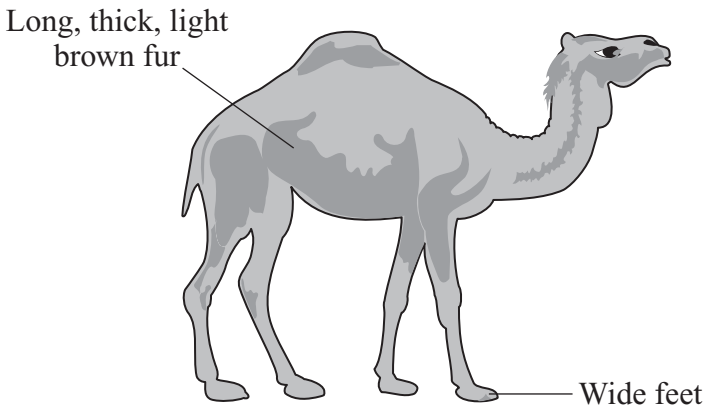
(1 mark)

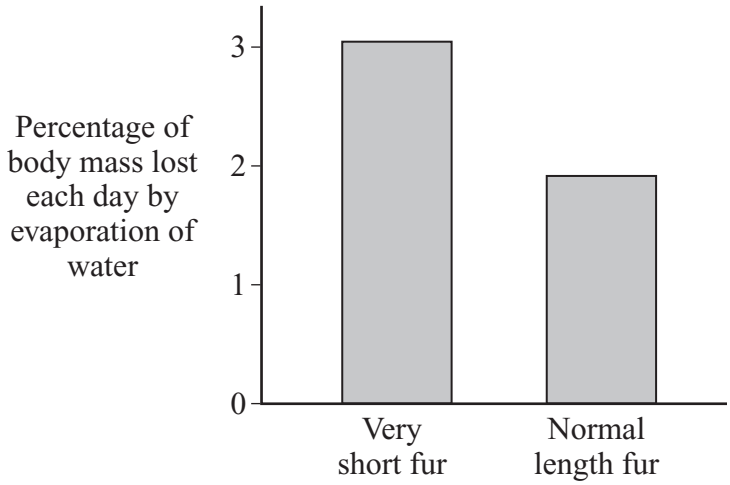
5

Turn over for the next question

2 The camel lives in a desert where it is very hot during the day and cold at night.



The graph shows the effect of cutting the fur very short.



(a) Use the information from the graph to explain how the fur helps the camel to survive in the desert.

.....

.....

(1 mark)

(b) Suggest **two** other ways in which the thick fur helps the camel.

1 .....

2 .....

(2 marks)

(c) Explain how the features shown in the table help the camel to survive in the desert.

Feature	Explanation
Light brown fur	
Wide feet	

(2 marks)

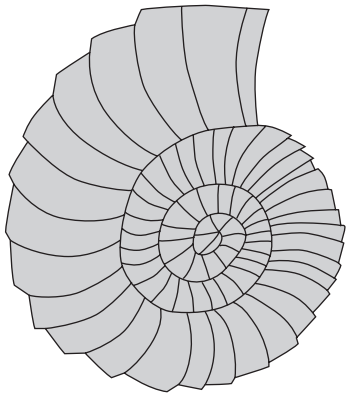
5

Turn over for the next question

LEAVE MARGIN BLANK

INHERITANCE AND SELECTION

3 The diagram shows a fossil of an ammonite. Ammonites were animals with hard shells that lived in the sea about 100 million years ago.



(a) Suggest how this fossil may have been formed.

To gain full marks in this question you should write your ideas in good English. Put them in a sensible order and use the correct scientific words.

.....

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.....

(4 marks)

(b) Ammonites became extinct around 65 million years ago.

Suggest **three** reasons why organisms die out.

1 .....

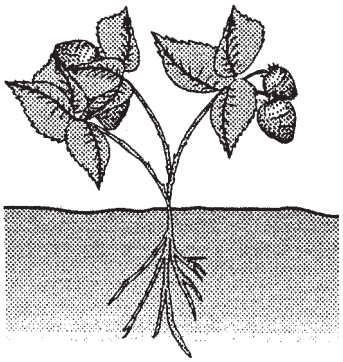
2 .....

3 .....

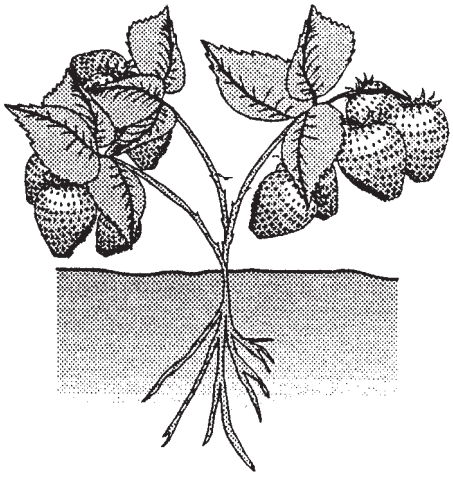
(3 marks)

7

4 Cultivated strawberries have been produced by selectively breeding wild strawberries.



Wild strawberry



Cultivated strawberry

(a) Explain in detail how this would have been done.

.....

.....

.....

.....

(3 marks)

(b) Strawberries can reproduce both sexually and asexually.

Explain why a strawberry grower might choose *asexual* reproduction to breed his crop.

.....

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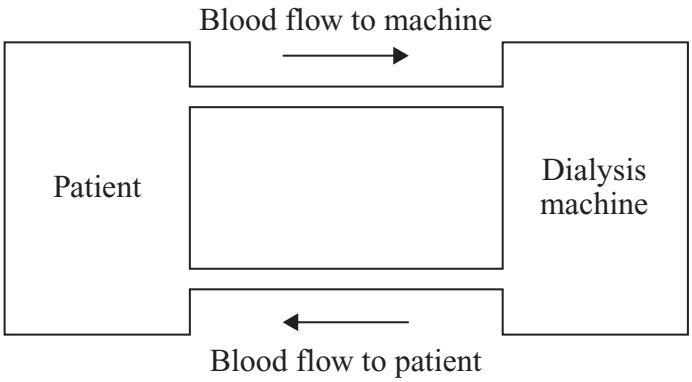
(1 mark)

4

BIOLOGY IN ACTION

5 People whose kidneys do not work well may be treated by dialysis.



(a) Which waste substance is removed from the blood by dialysis?

.....

(1 mark)

(b) Explain how the dialysis machine removes waste substances from the blood.

.....

.....

.....

.....

(3 marks)

(c) A kidney transplant is a more permanent treatment for kidney failure.

Give **two** reasons why a patient with kidney failure may be treated with dialysis instead of a transplant.

1 .....

2 .....

(2 marks)

6

Turn over for the next question

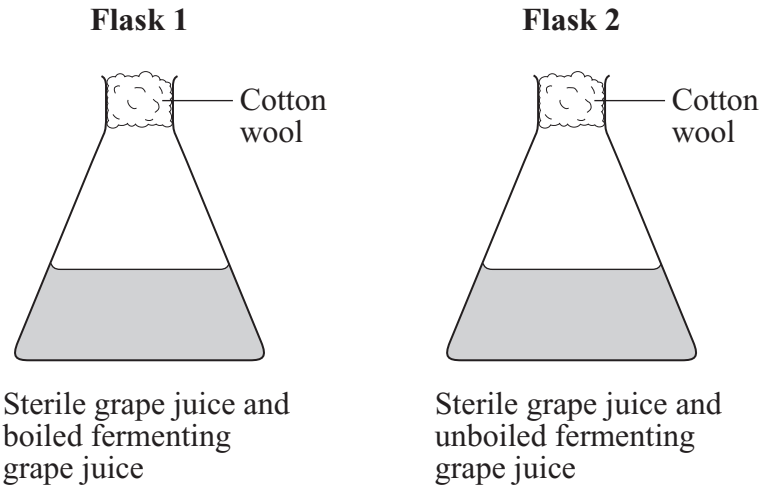
6 In the nineteenth century, scientists had different views about the cause of fermentation. Louis Pasteur suggested that living yeast cells caused fermentation in grape juice. Another scientist called Liebig disagreed, because fermenting milk does not contain yeast cells.

(a) A student tested Pasteur's idea. He treated two samples of fermenting grape juice.

In Sample 1, the fermenting grape juice was boiled before being added to sterile grape juice in **Flask 1**.

In Sample 2, the fermenting grape juice was **not** boiled before being added to sterile grape juice in **Flask 2**.

He then left both mixtures for two weeks.



(i) What would you expect to **see** in the flasks if fermentation were taking place?

.....

(1 mark)

(ii) During the two weeks, there was no evidence that fermentation had taken place in **Flask 1**.

Explain how this agrees with Pasteur's suggestion.

.....

.....

(2 marks)

(iii) Explain what happens during fermentation in **Flask 2**.

.....

.....

(2 marks)

(b) Liebig had shown that milk will ferment without any yeast.

(i) Suggest why.

.....

(1 mark)

(ii) Name one type of food that can be made by fermenting milk.

.....

(1 mark)

7

Turn over for the next question

LEAVE MARGIN BLANK

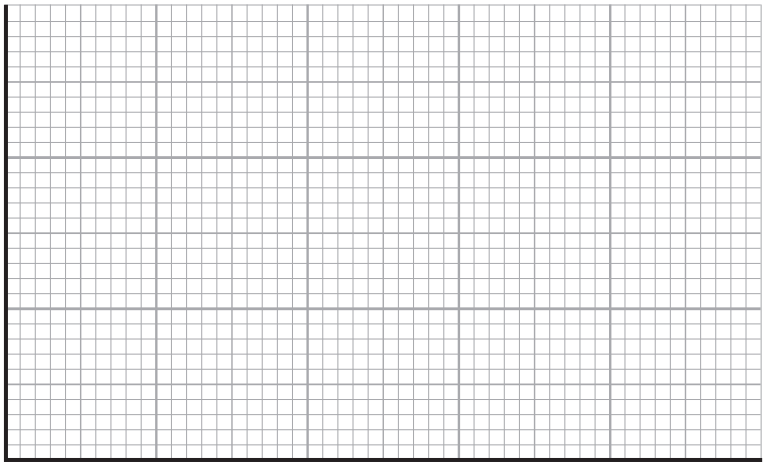
QUESTIONS FROM PREVIOUSLY TESTED MODULES

7 The table shows the effect of pH on the activity of an enzyme which breaks down starch.

pH	4	5	6	7	8	9
Time taken to break down starch (in minutes)	30	18	8	2	3	7

(a) Draw a graph of the data in the table.

Time taken to break down starch (in minutes)



⟶ pH

(3 marks)

(b) At what pH does this enzyme work the fastest? .....

(1 mark)

(c) Explain why starch needs to be digested.

.....

.....

.....

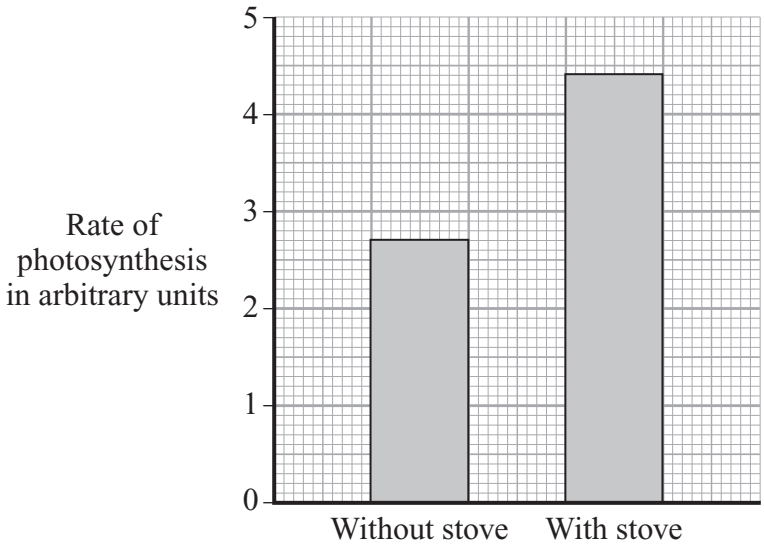
.....

(3 marks)

7

8 A farmer wanted to find out whether heating his greenhouses would improve his crop.
He put an oil-burning stove in one greenhouse.
He then measured the rate of photosynthesis in two greenhouses on the same day in April.

His results are shown in the graph.



(a) By how much did the rate of photosynthesis increase in the greenhouse with the stove?

.....

(1 mark)

(b) Give **two** possible explanations for this increase in the rate of photosynthesis.

1 .....

.....

2 .....

.....

(2 marks)

(c) The farmer repeated his investigation the following year. This time he took his measurements a month earlier, in March. He found that heating the greenhouse did not change the rate of photosynthesis.

Explain why.

.....

.....

(1 mark)

4

LEAVE MARGIN BLANK

ENVIRONMENT

9 (a) Describe how the carbon in compounds in dead leaves can be recycled back into carbon compounds in living plants.

.....

.....

.....

.....

.....

.....

(4 marks)

(b) Human activities are increasing the amount of carbon dioxide in the air.

Carbon dioxide is a 'greenhouse gas' which is causing global warming.

(i) Suggest **two** different ways in which humans could slow down this increase in carbon dioxide.

1.....

2.....

(2 marks)

(ii) Name **one** other 'greenhouse gas'.

.....

(1 mark)

(c) Explain how increased amounts of carbon dioxide in the air cause global warming.

.....

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.....

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(3 marks)

10

LEAVE MARGIN BLANK

INHERITANCE AND SELECTION

10 Most people make a dark pigment called melanin. Some people cannot make melanin. The gene that controls melanin production has two alleles, **B** and **b**. When a person has the dominant allele (**B**), melanin is made.

(a) Two parents who both make melanin have a child. This child has a pale skin because he cannot make melanin.

Draw a labelled genetic diagram to explain how this could happen.

The first step has been done for you.

	Mother	×	Father
Alleles present in body cells			

(3 marks)

(b) People who cannot make melanin are more likely to develop skin cancer if they do not use a sun screen. Suggest why.

.....

.....

(2 marks)

5

11 Cystic fibrosis is caused by a recessive allele. The dominant allele of this gene codes for a protein. People who have two recessive alleles cannot make this protein.

(a) In which part of the cell does this protein normally work?

.....

(1 mark)

(b) Explain why people with two recessive alleles cannot make this protein.

.....

.....

.....

(3 marks)

(c) Scientists have tried to treat people with cystic fibrosis by introducing the dominant allele of the cystic fibrosis gene into their cells.

Explain how the scientists could use genetic engineering to make a large number of copies of this allele.

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(3 marks)

7

BIOLOGY IN ACTION

12 (a) Complete the table to show the antigens and antibodies in each blood type.

Blood group	Antigens	Antibodies
B		
AB		

(2 marks)

(b) In which part of the blood would you find the antibodies?

.....

(1 mark)

(c) In an emergency, blood group O can be given to a patient of any blood group. Explain why.

.....

.....

(2 marks)

5

Turn over for the next question

13 Read the following extract.

> Sugar cane is used to manufacture the bio fuel ethanol in Brazil.
>
> Sugar cane is a tall grass that contains large quantities of sugar. It grows well in Brazil, particularly when treated with fertiliser and pesticide.
>
> The sugar cane is cut and crushed. Yeast is then used to convert the sugar to ethanol. Fermentation stops when the concentration of ethanol reaches about 10 % by volume. The product is then distilled to increase the concentration of the ethanol so that it can be used as fuel.

(a) Explain why fermentation stops when the concentration of ethanol reaches 10 % by volume.

.....

.....

(2 marks)

(b) Evaluate the environmental impact of using ethanol instead of petrol in vehicles.

Use the information given and your own knowledge in your answer.

To gain full marks in this question you should write your ideas in good English. Put them in a sensible order and use the correct scientific words.

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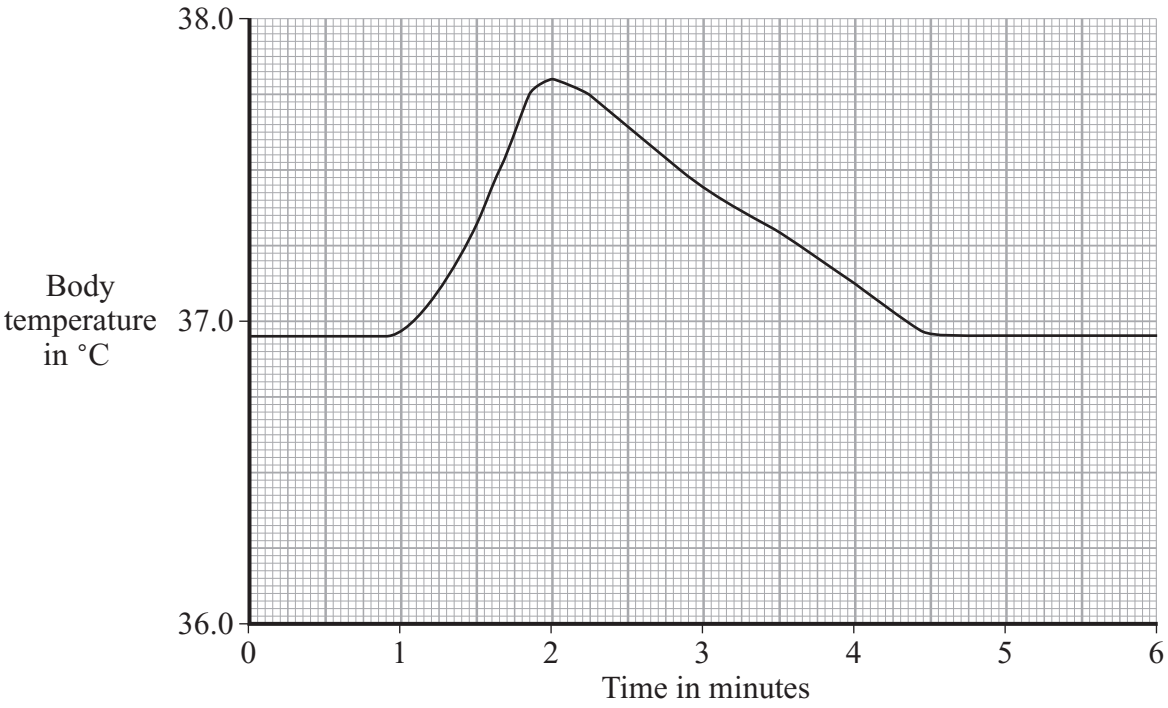
(5 marks)

7

QUESTIONS FROM PREVIOUSLY TESTED MODULES

14 The graph shows the change in body temperature after a hot drink.



(a) In which organ of the body is the core body temperature detected?

.....

(1 mark)

(b) The temperature rises to 37.8 ºC.
How long does it take to return to normal?

..... minutes

(1 mark)

(c) Describe how the temperature is returned to normal.

.....

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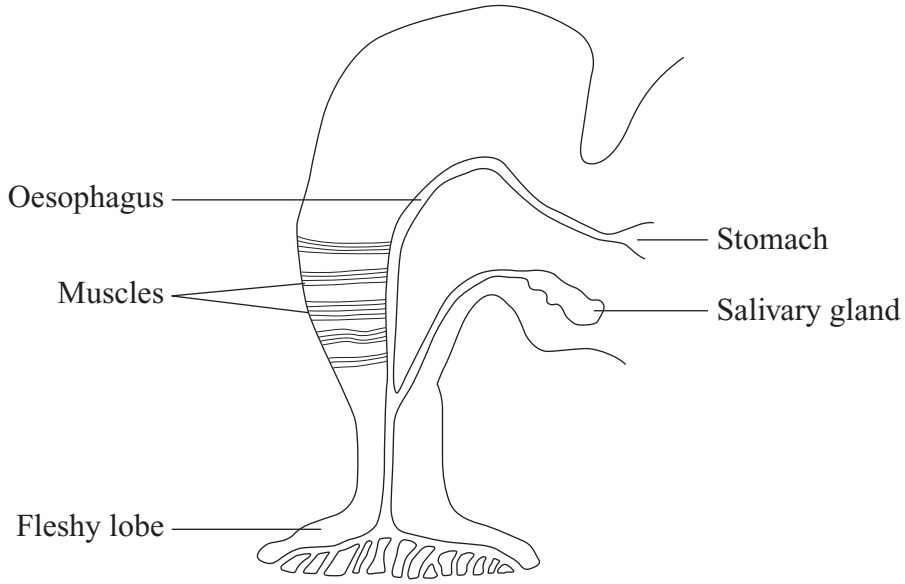
(5 marks)

7

15 The diagram shows the head of a housefly.



(a) Explain how the muscles attached to the oesophagus help the housefly to feed on soluble material.

.....

.....

(2 marks)

(b) How is the fleshy lobe adapted to make feeding more efficient?

.....

.....

(2 marks)

4

END OF QUESTIONS