Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										

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

General Certificate of Secondary Education
Higher Tier
January 2010

Additional Science BLY2H

Biology H

Unit Biology B2

Written Paper

Thursday 14 January 2010 9.00 am to 9.45 am

For this paper you must have:
- a ruler.

You may use a calculator.

Time allowed
- 45 minutes

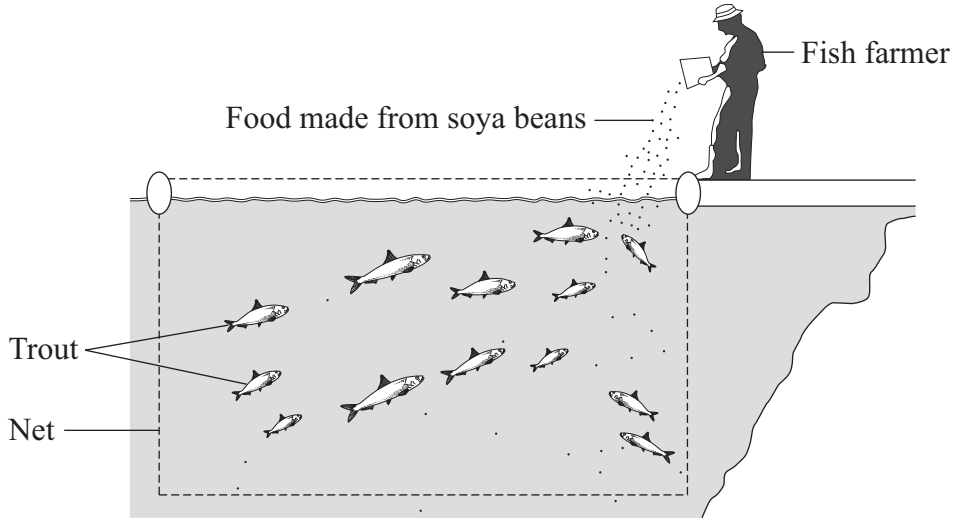
Instructions
- Use black ink or black ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Answers written in margins or on blank pages will not be marked.
- Do all rough work in this book. Cross through any work 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.

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

1 A fish farmer keeps trout in a large net in a lake.



The fish farmer feeds the trout on food made from soya beans.

When the trout are large enough the farmer sells them for food for people.

1 (a) Draw a pyramid of biomass for the three organisms in this food chain.

Label the pyramid.

(2 marks)

1 (b) It would be more energy efficient if people ate the soya beans rather than eating the trout.

Which **two** of the following are reasons for this?

Tick (✓) **two** boxes.

Some people do not like eating animals such as trout. ☐

The trout release energy when they respire. ☐

Soya bean plants release energy when they respire. ☐

Some energy will be lost in waste from the trout. ☐

Soya bean plants absorb energy during photosynthesis. ☐

(2 marks)

1 (c) Suggest **one** advantage to the fish farmer of keeping the trout in a large net instead of letting them swim freely in the lake.

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(1 mark)

1 (d) Some trout die before they are large enough to be sold.
The dead trout contain carbon.

Use your knowledge of the carbon cycle to describe how this carbon is returned to the atmosphere after the trout die.

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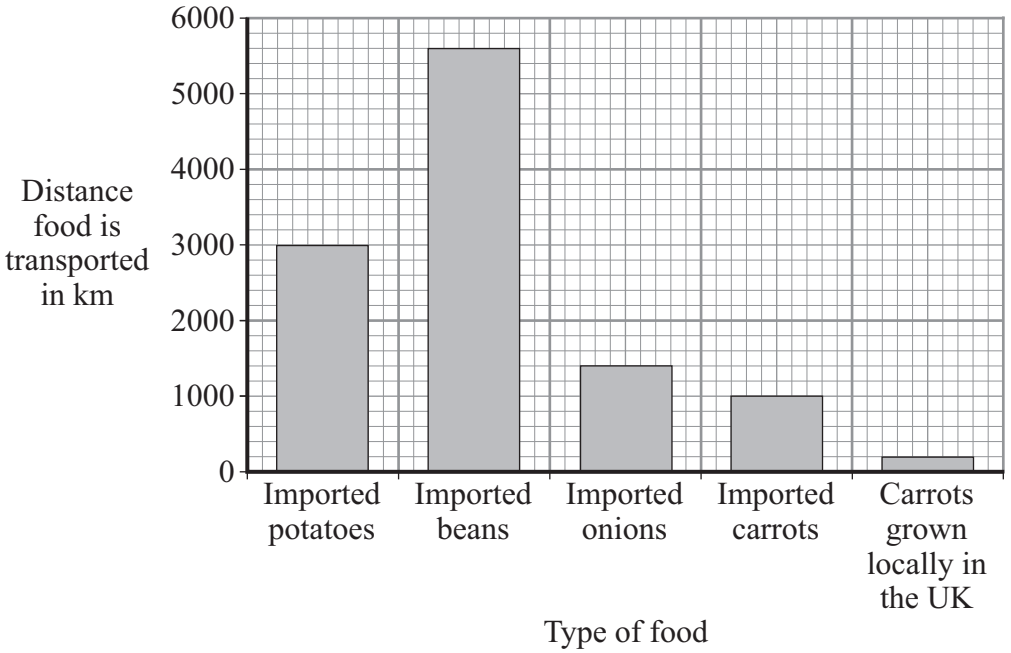
(2 marks)

7

2 Some people are concerned about the distance that food is transported between the grower and the supermarket.

The bar chart shows the distances for some foods.



2 (a) Both imported carrots and carrots grown locally in the UK can be bought in supermarkets all year round.

How many times further are imported carrots transported than carrots grown locally in the UK?

Show clearly how you work out your answer.

.....

.....

..... times
(1 mark)

2 (b) Many of the beans sold in supermarkets in the UK are grown in Kenya, a tropical country in Africa.

Beans grow faster in Kenya than they do in the UK.

Suggest and explain **one** reason why.

Reason .....

.....

Explanation .....

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(2 marks)

2 (c) Many people believe that we should buy locally produced food instead of food imported from abroad.

Explain how this would help the environment.

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(2 marks)

5

Turn over for the next question

3 (a) (i) Which organ in the body monitors the concentration of glucose (sugar) in the blood?

.....

(1 mark)

3 (a) (ii) In a healthy person, insulin prevents high levels of glucose in the blood.

How does it do this?

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(1 mark)

3 (b) There are two forms of diabetes.

In type 1 diabetes, the body produces little or no insulin.
In type 2 diabetes, the body cells do not respond to insulin.

There are two ways in which diabetes can be treated.

Draw lines to join the type of diabetes to the way or ways in which it can be treated.

Type of diabetes	**Treatment**
	Careful attention to diet only
Type 1	
	Careful attention to diet **and** injection of insulin
Type 2	
	Injection of insulin only

(2 marks)

3 (c) To make insulin, cells in the pancreas need amino acids.
A *small section of DNA* in the pancreas cells is involved in making insulin from the amino acids.

3 (c) (i) Insulin is a hormone.

What type of substance is insulin?

Draw a ring around **one** answer.

carbohydrate **lipid** **protein**

(1 mark)

3 (c) (ii) What term is used to describe the *small section of DNA* which controls the production of insulin?

.....

(1 mark)

3 (c) (iii) Amino acids cannot be stored in the body.

Describe, as fully as you can, what happens to the excess amino acids.

You may wish to use the following words in your explanation:

liver **kidneys** **bladder**

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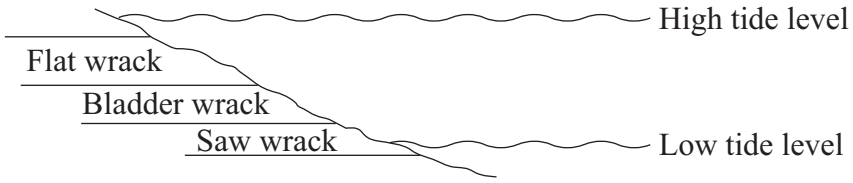
(3 marks)

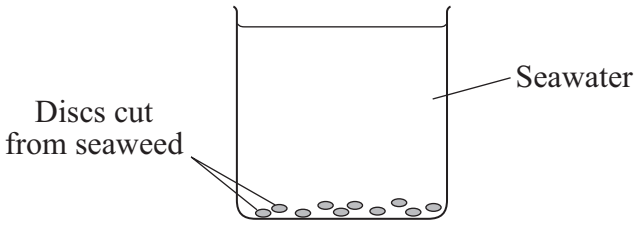
9

4 The diagram shows where three seaweeds live on a seashore.
As the tide moves in and out, these seaweeds are covered with seawater for different lengths of time.



Some students investigated the rate of photosynthesis in these seaweeds.

- They cut ten small discs from one seaweed.
- They dropped the discs into seawater in a beaker.
- They recorded the time taken for the fifth disc to float to the surface.
- They repeated this experiment with the other two seaweeds.



4 (a) (i) Suggest why the discs floated to the surface.

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(1 mark)

4 (a) (ii) Suggest the advantage of recording the time taken for the fifth disc to reach the surface, rather than for the tenth disc.

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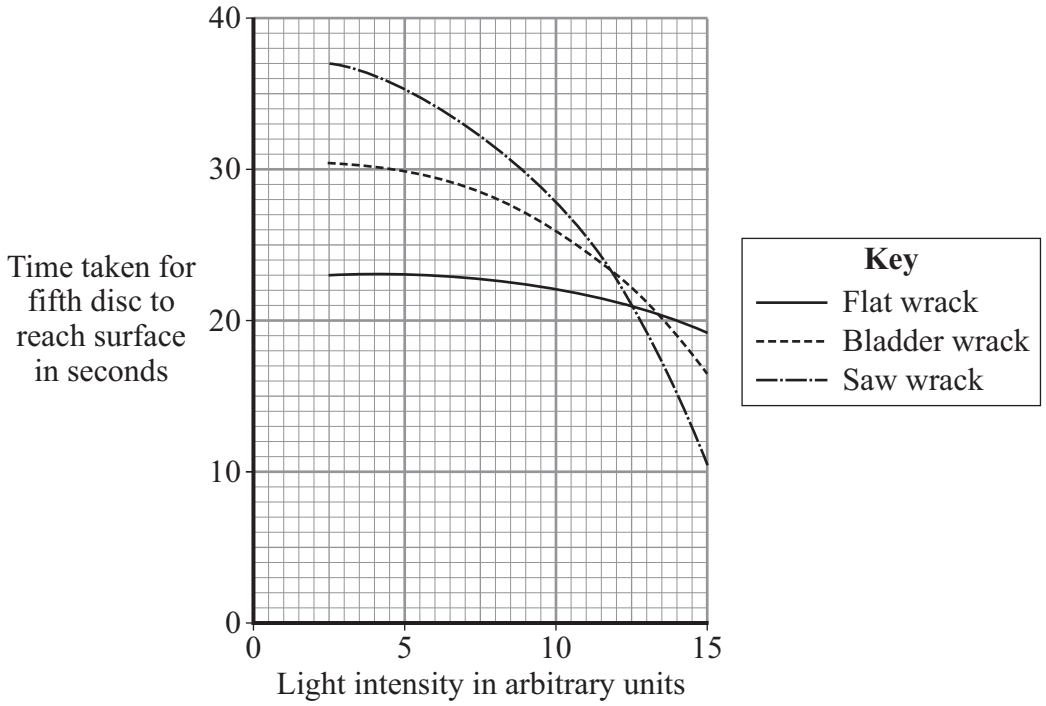
(1 mark)

4 (b) The students carried out their experiments at different light intensities. The graph shows the results they collected.



4 (b) (i) Compare the rate of photosynthesis for flat wrack with the rate for saw wrack at different light intensities.

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(2 marks)

4 (b) (ii) Seawater absorbs light.

The growth rate of saw wrack is less than the growth rate of bladder wrack.

Suggest why.

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(2 marks)

6

Turn over ▶

5 (a) Mr and Mrs Smith both have a history of cystic fibrosis in their families.
Neither of them has cystic fibrosis.
Mr and Mrs Smith are concerned that they may have a child with cystic fibrosis.

Use a genetic diagram to show how they could have a child with cystic fibrosis.

Use the symbol **A** for the dominant allele and the symbol **a** for the recessive allele.

(3 marks)

5 (b) Mr and Mrs Smith decided to visit a genetic counsellor who discusses embryo screening.

Read the information which they received from the counsellor.

- Under an anaesthetic five eggs will be removed from Mrs Smith's ovary.
- The eggs will be fertilised in a dish using Mr Smith's sperm cells.
- The embryos will be grown in the dish until each embryo has about thirty cells.
- One cell will be removed from each embryo and tested for cystic fibrosis.
- A suitable embryo will be placed into Mrs. Smith's uterus and she may become pregnant.
- Any unsuitable embryos will be killed.

5 (b) (i) Suggest why it is helpful to take five eggs from the ovary, rather than just one.

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(1 mark)

5 (b) (ii) Evaluate the use of embryo screening in this case.

Remember to give a conclusion as part of your evaluation.

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(4 marks)

8

6 Starch is broken down into sugar by amylase. Amylase is produced in the salivary glands.

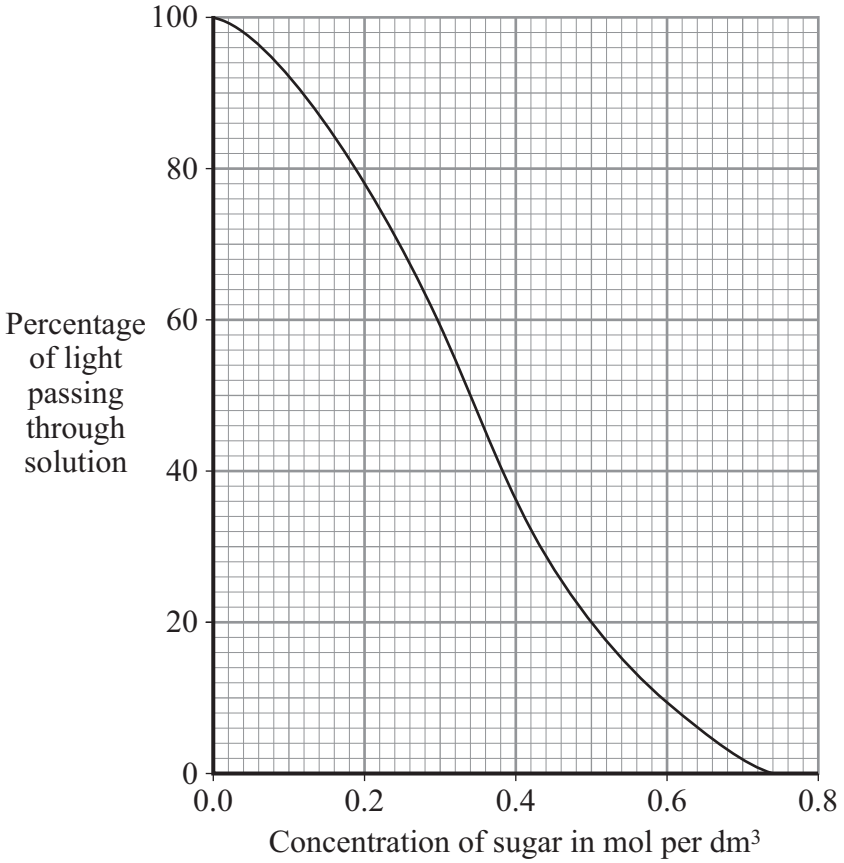
6 (a) Name **two** other organs in the digestive system which produce amylase.

.....and .....

(2 marks)

6 (b) A colorimeter measures colour intensity by measuring the percentage of light that passes through a solution.
Graph 1 shows the percentage of light passing through sugar solutions of different concentrations to which a test reagent has been added.

Graph 1



Students used a colorimeter to compare the starch-digesting ability of amylase enzymes obtained from two organs, **P** and **Q**.

- The students collected 5 cm^3 samples of amylase from **P** and **Q** and placed them into a water-bath at 40 ºC.
- Two test tubes containing 10 cm^3 samples of starch solution were also placed into the water-bath.
- All the tubes were left in the water-bath for 10 minutes.
- Each amylase sample was added to one of the tubes containing the starch solution.
- The test tubes were placed back into the water-bath.
- Every minute, a few drops were taken from each tube, the test reagent was added and the percentage of light passing through this solution was measured in the colorimeter.

The tubes containing amylase samples and starch solution were left in the water-bath for ten minutes before the amylase was added to the starch.

Explain why.

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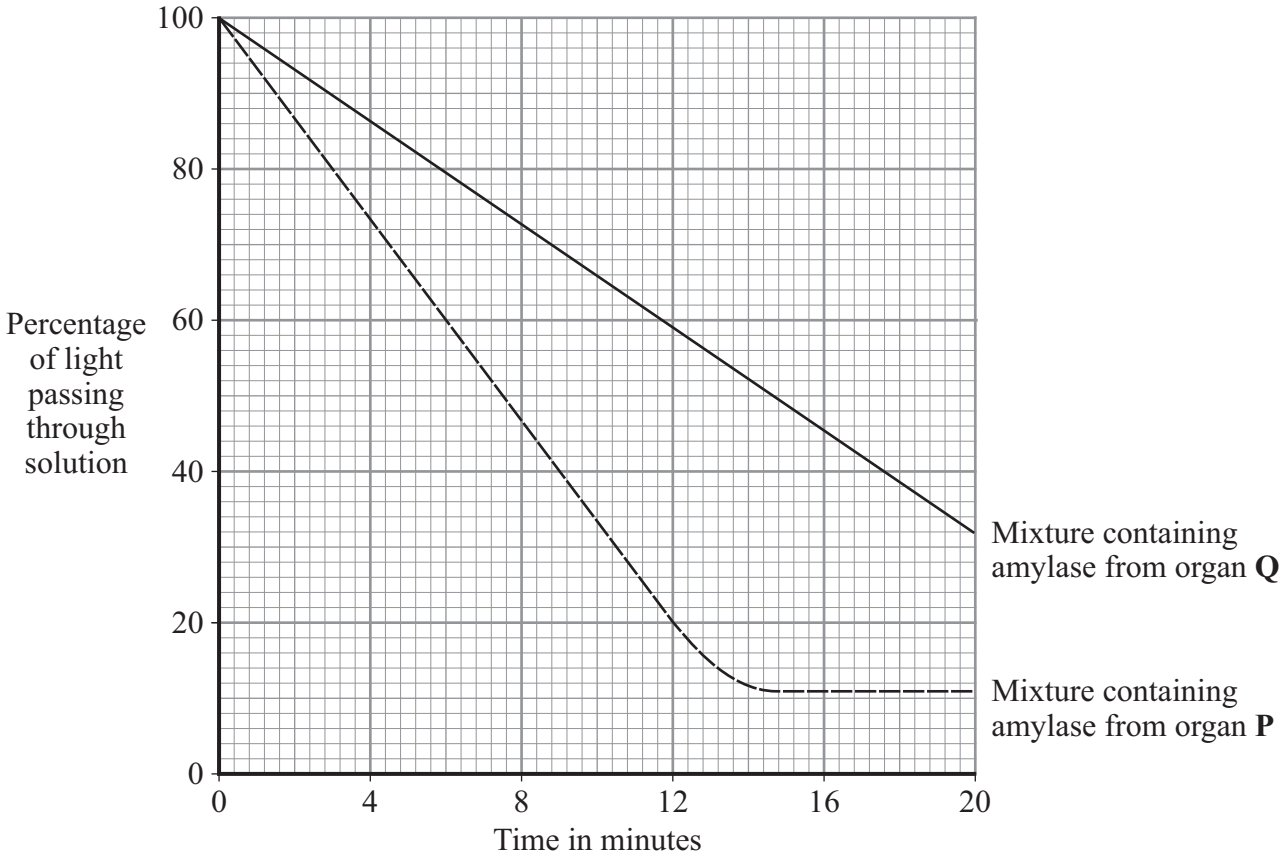
(2 marks)

6 (c) **Graph 2** shows how the readings from the colorimeter changed over the next 20 minutes.

Graph 2



6 (c) (i) Use **Graph 1** and **Graph 2** to determine the concentration of sugar in the mixture from organ **Q** after 20 minutes.

.....

Answer ..... mol per dm^3

(1 mark)

Question 6 continues on the next page

6 (c) (ii) Use your answer to 6(c)(i) to calculate the rate at which sugar was produced in the mixture containing amylase from organ **Q**.

Show clearly how you work out your answer.

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Answer.....mol per dm^3 per minute

(2 marks)

6 (c) (iii) Suggest why the amount of light passing through the mixture from organ **P** did not change after 16 minutes.

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(1 mark)

6 (c) (iv) One of the students suggested that they could have completed their experiment more quickly if the temperature of the water-bath had been set at 80 ºC.

This would **not** have been the case.

Explain why.

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(2 marks)

10

END OF QUESTIONS

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