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	
8	
TOTAL	

General Certificate of Secondary Education
Higher Tier
January 2011

Additional Science
Unit Biology B2

BLY2H

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Biology
Unit Biology B2

Written Paper

Thursday 13 January 2011 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.

Do not write outside the box

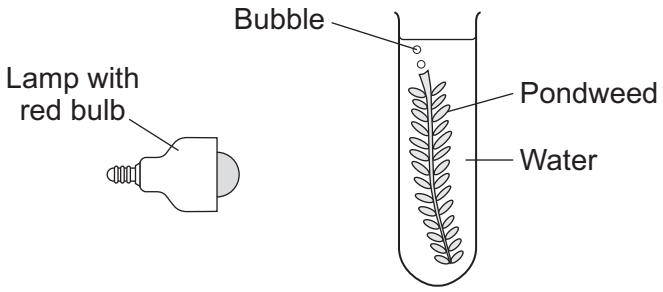
Answer **all** questions in the spaces provided.

1 A group of pupils investigated the way in which the colour of light affects photosynthesis.

The pupils:

- put a piece of pondweed into a test tube of water
- shone light from a lamp with a red light bulb onto the pondweed
- counted the bubbles of gas produced by the pondweed every minute for three minutes.

The diagram shows the experiment.



The pupils repeated their experiment using a yellow light bulb, a green light bulb and a blue light bulb.

1 (a) (i) What was the independent variable in the investigation?

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(1 mark)

1 (a) (ii) To make the investigation fair the pupils needed to control some variables.

Suggest **one** variable that the pupils should have controlled during their investigation.

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(1 mark)

1 (a) (iii) It is better to count the bubbles every minute for three minutes than to count all the bubbles in three minutes.

Why?

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(1 mark)

Do not write outside the box

1 (b) The table shows the pupils' results.

Colour of bulb	Number of bubbles produced in one minute			
	1st minute	2nd minute	3rd minute	Mean
Red	24	19	21	21
Yellow	18	14	15	16
Green	6	4	3	4
Blue	32	34	32	33

Algae are tiny organisms that photosynthesise.
In natural light algae grow very quickly on the sides of a fish tank.
The algae make it difficult to see the fish.

1 (b) (i) What would be the best colour of light bulb to illuminate the fish tank to reduce the growth of algae?

Use the results in the table to help you to decide.

Draw a ring around **one** answer.

red **yellow** **green** **blue**

(1 mark)

1 (b) (ii) Explain why the colour you have chosen is the best.

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(2 marks)

6

Turn over for the next question

Do not write outside the box

2 A group of students investigated a food chain in a garden.

The table shows the estimates of the population and biomass of some of the organisms the students found.

Organism	Number in the garden	Mean mass of each one in g	Biomass of population in g
Hedgehog	1	200	200
Slug	600	2	1200
Lettuce	20	300	

2 (a) (i) Calculate the biomass of the lettuce population.

Show clearly how you work out your answer.

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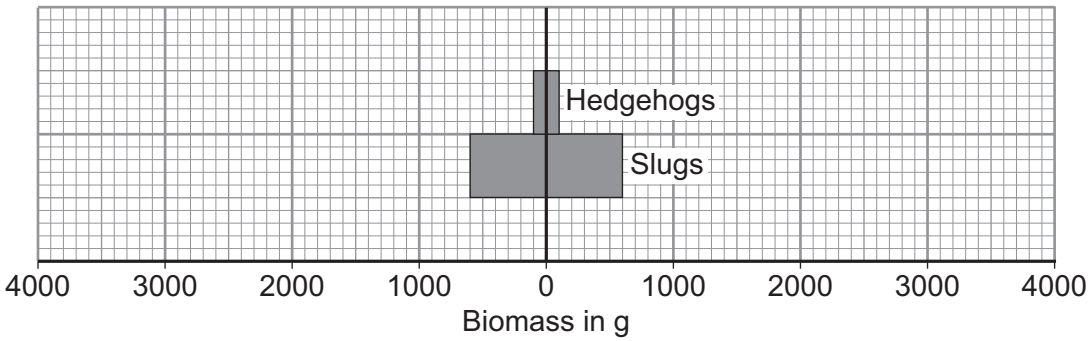
Biomass = ... g

(2 marks)

2 (a) (ii) Use your answer to part (a)(i) to complete the pyramid of biomass.

Show the biomass of the lettuces in the garden.



(2 marks)

Do not write outside the box

2 (b) Hedgehogs eat slugs.

The biomass of the hedgehog population is much less than the biomass of the slug population.

Explain why as fully as you can.

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(3 marks)

7

Turn over for the next question

Do not write outside the box

3 In diabetics blood glucose concentrations are sometimes abnormal.

3 (a) Name the organ that monitors the concentration of glucose in the blood.

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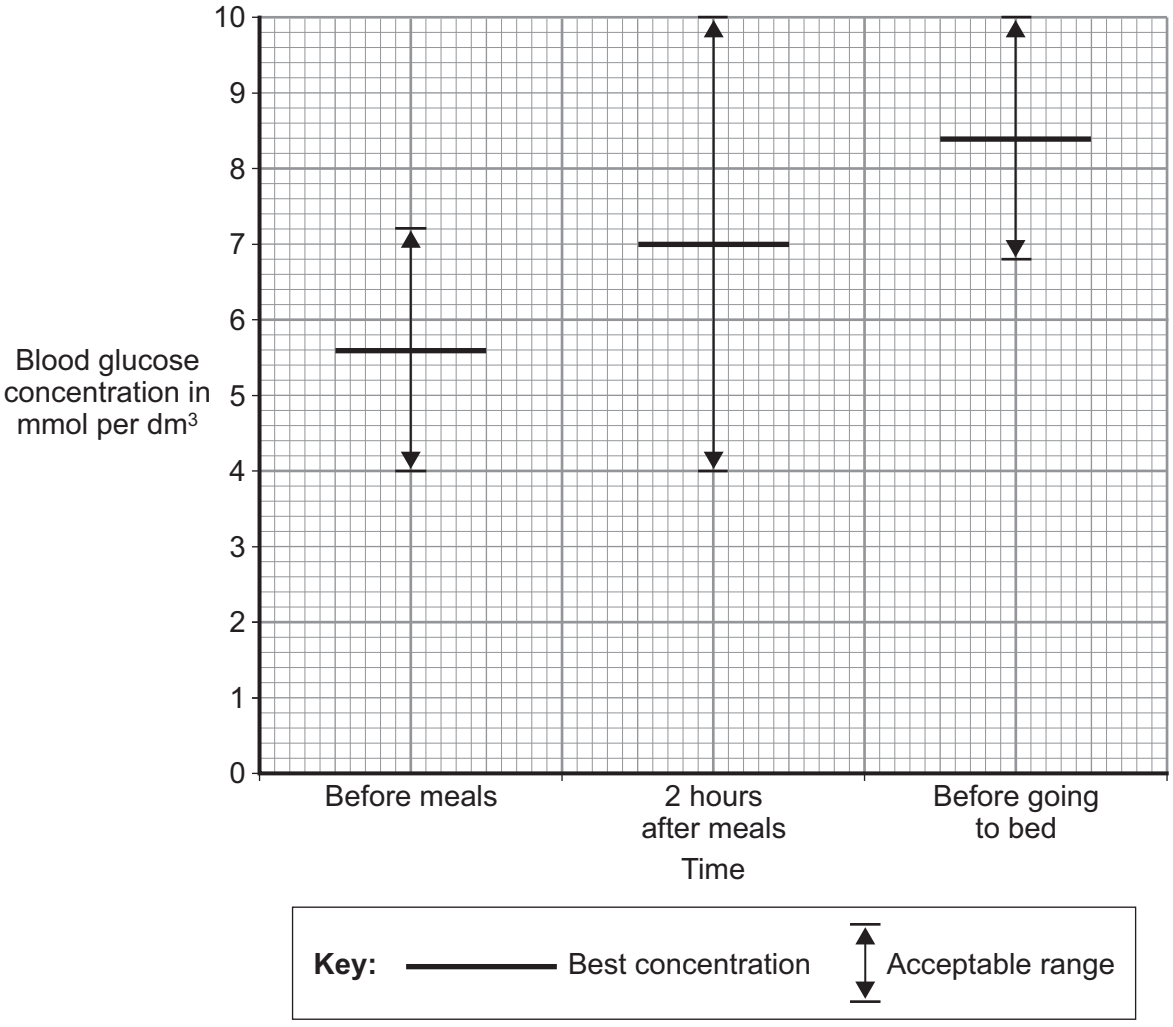
(1 mark)

3 (b) Diabetics can measure their blood glucose concentration.

The graph shows the best blood glucose concentration and the acceptable range of blood glucose concentration at different times.



What is the acceptable range for the blood glucose concentration before meals?

From ..... to ..... mmol per dm^3

(1 mark)

Do not write outside the box

3 (c) The amount of insulin a diabetic injects can be changed so that blood glucose concentration is kept near to the best level.

Two hours after eating breakfast a diabetic measures his blood glucose concentration. His blood glucose concentration is 13 mmol per dm^3.

He reads these instructions:

- for every 2 mmol per dm^3 of blood glucose *above* the best concentration, inject 1 unit *more* of insulin
- for every 2 mmol per dm^3 of blood glucose *below* the best concentration, inject 1 unit *less* of insulin.

How should he change his normal insulin injection to bring his blood glucose level to the best concentration?

Show clearly how you work out your answer.

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Answer = ...

(3 marks)

5

Turn over for the next question

Do not write outside the box

4 A certain allele increases the chance of women developing one type of breast cancer.

A woman has this allele. She wants to be sure that she will not have daughters who also have the allele.

Doctors:

- collect several eggs from her ovaries
- fertilise the eggs with sperm, in dishes.

4 (a) The doctors expect half the embryos produced to be female.

Explain why.

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(2 marks)

4 (b) The embryos grow to around 100 cells.

Doctors:

- remove one cell from each embryo
- check the cell for the allele.

Complete the sentence.

This process is known as embryo ..... .

(1 mark)

Do not write outside the box

4 (c) One of the female embryos did not have the allele.
This female embryo was implanted into the woman's uterus.

Evaluate the advantages and disadvantages of the whole procedure.

Use information from all parts of this question and your own knowledge.

Remember to give a conclusion to your evaluation.

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(4 marks)

7

Turn over for the next question

Do not write outside the box

5 There are enzymes in biological washing powders. Biological washing powder has to be used at temperatures below 45 °C.

5 (a) The enzymes in biological washing powders do **not** work on the stains on clothes at temperatures above 45 °C.

Explain why.

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(2 marks)

5 (b) Some bacteria, called thermophilic bacteria live in hot springs at temperatures of 80 °C.

Scientists have extracted enzymes from these thermophilic bacteria. These enzymes are being trialled in industrial laundries.
The laundries expect to increase the amount of clothes they can clean by using enzymes from thermophilic bacteria instead of using the biological washing powders the laundries use now.

5 (b) (i) The laundries expect to be able to increase the amount of clothes that they can clean each day.

Suggest why.

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(2 marks)

Do not write outside the box

5 (b) (ii) Using washing powders with enzymes from thermophilic bacteria may be more harmful to the environment than using the biological washing powders that laundries use now.

Suggest why.

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(2 marks)

6

Turn over for the next question

Do not write outside the box

6 Cystic fibrosis and Huntington's disease are inherited disorders.

6 (a) Someone can be a carrier of cystic fibrosis.

Explain how.

You may include a genetic diagram in your answer.

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(2 marks)

6 (b) Why does only one parent need to have the Huntington's disease allele for a child to inherit Huntington's disease?

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(1 mark)

3

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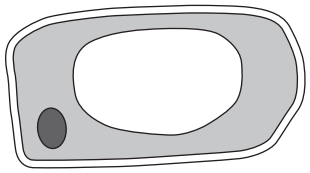
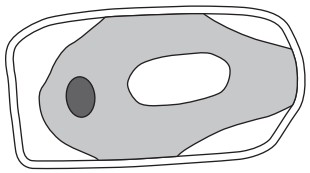
7 The diagram shows the same plant cell:

- after 1 hour in distilled water
- after 1 hour in strong sugar solution.



After 1 hour in distilled water



After 1 hour in strong sugar solution

7 (a) Describe **two** ways in which the cell in the strong sugar solution is different from the cell in distilled water.

1 .....

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2 .....

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(2 marks)

7 (b) Explain how the differences between the cell in the strong sugar solution and the cell in distilled water were caused.

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(2 marks)

4

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8 The temperature in a sauna is much hotter than core body temperature.

A woman sits in a sauna.
The high temperature of the sauna causes the woman's core body temperature to rise.

8 (a) When the woman's core body temperature rises, the woman's rate of sweating increases.

Explain why.

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(2 marks)

8 (b) The woman comes out of the sauna.
The woman's skin looks redder than when she went into the sauna.

Describe what happened to the blood circulation in her skin to cause this change in colour.

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(2 marks)

8 (c) After coming out of the sauna the woman gets into a bath of icy water.
This makes the woman shiver.

8 (c) (i) What process brings about shivering?

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(1 mark)

Do not write outside the box

8 (c) (ii) Shivering increases body temperature.

Explain how.

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(2 marks)

7

END OF QUESTIONS

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