Rewarding Learning

Centre Number	
71	

Candidate Number

General Certificate of Secondary Education
2013–2014

Double Award Science: Biology

Unit B1

Higher Tier

[GSD12]

GSD12

MONDAY 24 FEBRUARY 2014, MORNING

TIME

1 hour.

INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.
Write your answers in the spaces provided in this question paper.
Answer **all eight** questions.

INFORMATION FOR CANDIDATES

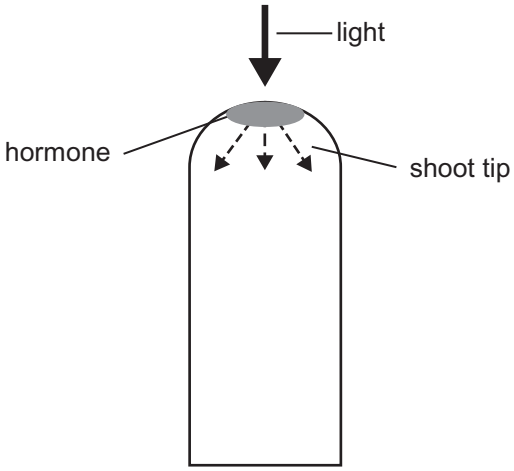
The total mark for this paper is 70.
Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.
Quality of written communication will be assessed in questions **2(c)** and **7(a)**.

For Examiner's use only	
Question Number	Marks
1	
2	
3	
4	
5	
6	
7	
8	
Total Marks	

Examiner Only	
Marks	Remark

1 A hormone is produced in the shoot tip of a plant, as shown in the diagram below.

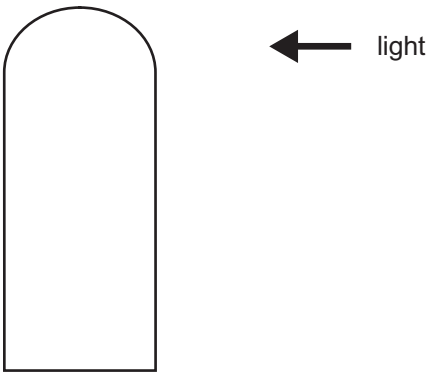
The hormone travels down the shoot tip as shown by the arrows when the light is shone from above.



(a) Name the hormone produced in the shoot tip.

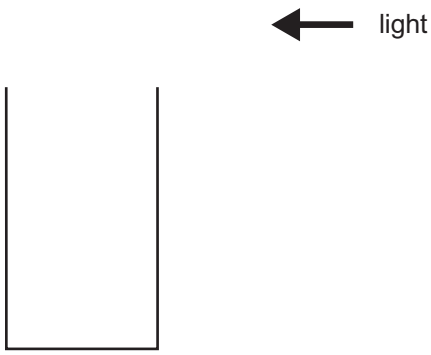
_____ [1]

(b) Draw an arrow on the diagram below, to give the direction the hormone moves in the shoot tip when light shines from the direction shown.



[1]

(c) Complete the diagram below to show the growth of the shoot tip in part **(b)** after a few days.



[1]

(d) Explain how the hormone brings about this growth response in the shoot tip.

_____

_____ [1]

(e) Explain the advantage to the plant of this growth response.

_____

_____ [1]

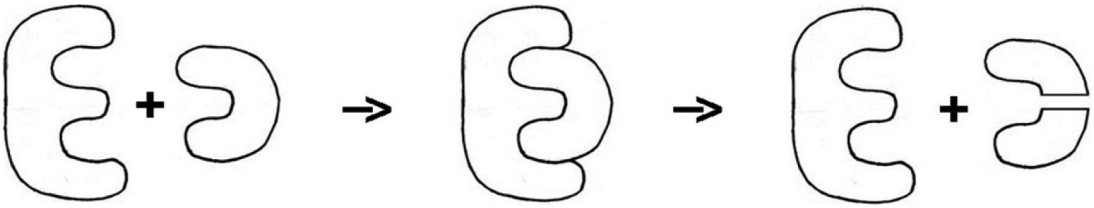
Examiner Only	
Marks	Remark

Examiner Only	
Marks	Remark

2 **(a)** Enzymes speed up chemical reactions in the body. The diagram below shows how an enzyme works.

(i) Label the diagram with the letter:

- E for the enzyme molecule
- S for the substrate molecule
- P for a product molecule



Source: Principal Examiner

[3]

(ii) Name the model of enzyme action shown by the diagram.

_____ [1]

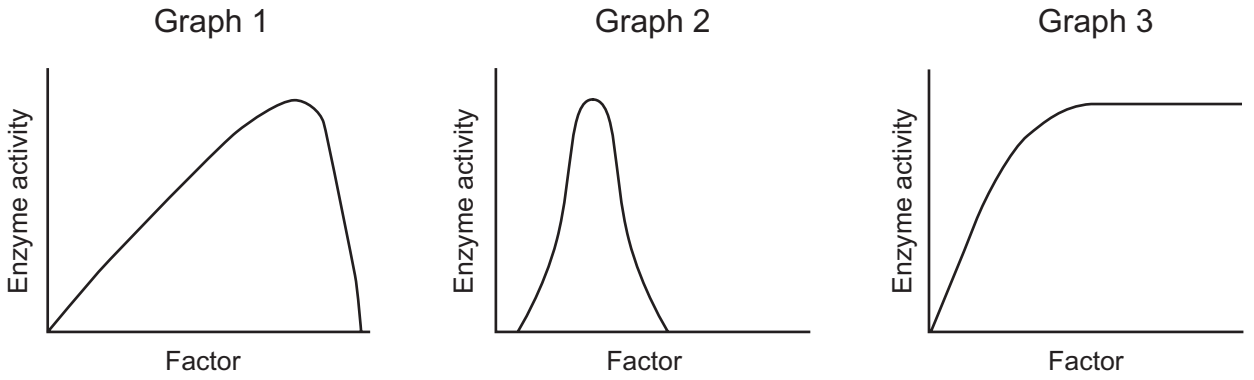
(iii) Using the information in the diagram, describe what happens to the substrate molecule during the reaction.

_____ [1]

(iv) How would this enzyme differ from one with a different specificity?

_____ [1]

(b) The graphs show how enzyme activity in stomach protease varies with three different factors.



Source: Principal Examiner

Examiner Only	
Marks	Remark

(i) Match each graph to the correct factor from the list below.

pH : enzyme concentration : temperature

Graph 1 _____

Graph 2 _____

Graph 3 _____ [2]

(ii) Name the substrate for protease.

_____ [1]

(iii) Apart from the stomach, where else in the digestive system would protease be found?

_____ [1]

(c) The lining of the small intestine in mammals is adapted for absorption of digested food molecules by having villi.

A disease in cows causes the lining of the small intestine to become smooth and flat. Cows with this disease lose weight and die.

Describe how villi are adapted for their role and explain why cows with this disease die.

In this question you will be assessed on your written communication skills, including the use of specialist scientific terms.

[6]

Examiner Only	
Marks	Remark

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(Questions continue overleaf)

Examiner Only	
Marks	Remark

3 It is thought that the barn owl, once a common bird in Northern Ireland, is now reduced to fewer than 50 breeding pairs.

© Linda Wright/Science Photo Library

The following passage is from a news article written by a reporter who visited a farm where barn owls were nesting in an old barn.

'Soon the bird appeared, and what a bird! With its silent flight we never heard it arrive. The owl turns its head so that its sensitive ears can find the faint sounds we make. This is one way the owl finds its prey but also explains why it has difficulty hunting in snow or heavy rain. Grasping old beams with its large talons, it turns its very large eyes on us, eyes that are perfect for night time hunting of rodents, e.g. mice.'

Using the information given and your knowledge, answer the following questions.

(a) Apart from having very large eyes, describe and explain two ways in which the barn owl is adapted for hunting.

1. _____

_____

2. _____

_____ [4]

(b) Suggest why the barn owl has difficulty hunting in snow or heavy rain.

_____ [1]

Many farmers use poisons to limit rodent numbers. The owls eat these poisoned rodents and then die themselves. To give owls a chance of increasing their numbers there are now schemes run by the government to encourage farmers to:

1. leave old barns standing.
2. use cage traps to limit the number of rodents.
3. plant crops such as canola near the edges of woodland. This encourages the rodents that eat the canola to come out into areas where they are clearly visible.

(c) Suggest how **each** of the three measures described above could help increase the barn owl population.

1. _____

_____

2. _____

_____

3. _____

_____ [3]

(d) **(i)** Using the above information, draw a food chain that includes the barn owl.

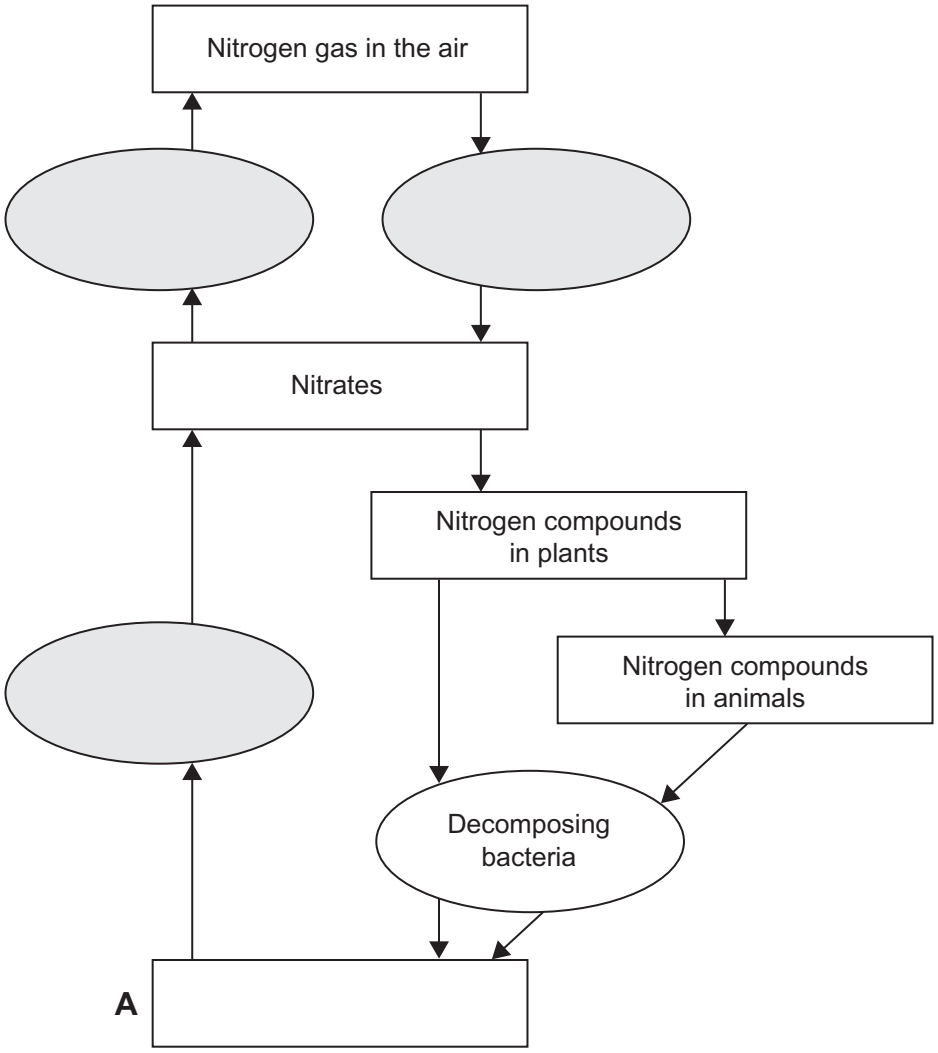
[2]

(ii) In the space below, sketch a pyramid of biomass for the food chain you have drawn. Label your sketch with the names of the organisms.

[2]

Examiner Only	
Marks	Remark

4 The diagram shows an outline of the nitrogen cycle.



(a) (i) Write the name, in box **A**, of the substance produced by decomposing bacteria in the soil when they break down nitrogen compounds in plants and animals. [1]

(ii) Complete the diagram of the nitrogen cycle by writing the names of the three types of bacteria inside the shaded areas. [3]

Examiner Only	
Marks	Remark

(b) **(i)** Name the process by which plants absorb nitrates from the soil.

_____ [1]

(ii) Name the cells in the plant that absorb nitrates from the soil.

_____ [1]

(iii) Describe and explain how the structure of these cells is adapted for the absorption of minerals.

_____

_____

_____ [2]

Examiner Only	
Marks	Remark

Examiner Only	
Marks	Remark

5 **(a)** One communication system in animals is the nervous system.

(i) Name the two parts that make up the Central Nervous System (CNS).

_____ and _____ [1]

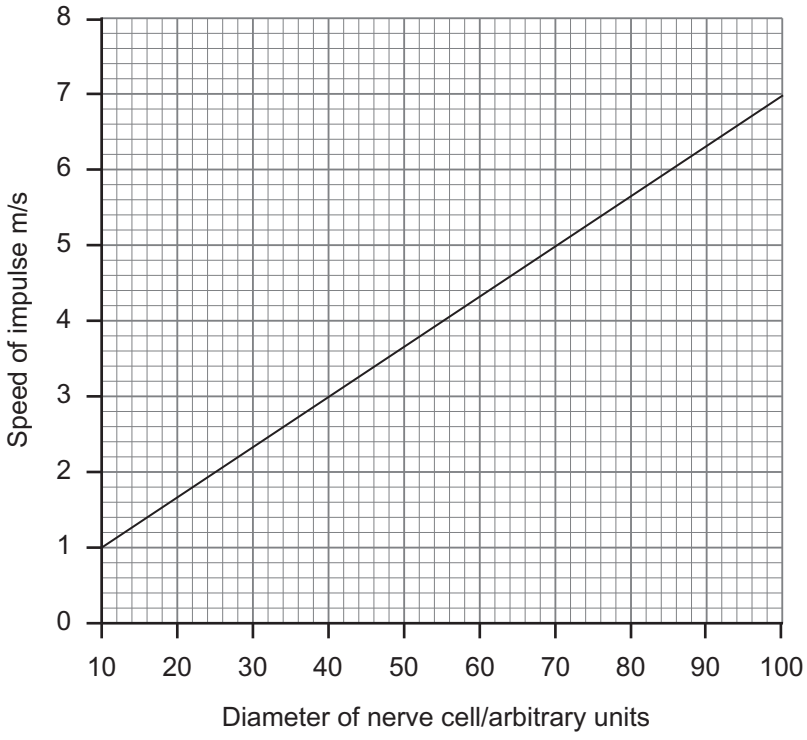
(ii) The CNS controls and coordinates actions between receptors and other structures which bring about responses in the body.

Name the structures that bring about responses.

_____ [1]

(b) An investigation was carried out into how the diameter of nerve cells (neurones) affects the speed of nerve impulses in different animals.

The results are shown in the graph.



Source: Principal Examiner

(i) Using the graph, describe the relationship between the diameter of nerve cells and the speed of nerve impulses.

_____

_____ [1]

Animal A has nerve cells that have a speed of impulse of 3 m/s.

Animal B has nerve cells that have a speed of impulse of 4.6 m/s.

(ii) Using this information and the graph, calculate the difference in diameter of the nerve cells in the two animals.

Show your working.

_____ arbitrary units [2]

(c) The other communication system in animals is the hormonal system.

How does the speed of the hormonal response compare with the speed of nerve impulses?

_____ [1]

Examiner Only	
Marks	Remark

Examiner Only	
Marks	Remark

6 After heavy rain, slurry (animal waste) containing nitrates was found to have entered a river. An investigation to find out the effect on the river was carried out by taking water samples at two points along the river.

Sampling point **A** was 10 metres downstream from where the slurry entered the river. Sampling point **B** was 5 kilometres further downstream.

The table shows the types of invertebrates found, the nitrate levels and the dissolved oxygen levels found in the two water samples.

	Sampling point A	**Sampling point B**
Types of invertebrates found in the water samples	Bloodworm  Sludgeworm  Rat-tailed maggot 	Stonefly  Limpet  Shrimp  Flatworm  Mayfly  Caddis fly larva 
Nitrate level	High	Low
Dissolved oxygen level	Low	High

(a) What do the results show about the biodiversity at sampling point **A** compared to sampling point **B**?

_____ [1]

(b) What term is used to describe species such as bloodworms that are used to monitor water pollution?

_____ [1]

(c) Suggest **one** advantage of using a species such as bloodworms to monitor pollution compared to the chemical analysis of water samples.

Examiner Only

Marks	Remark

_____

_____ [1]

(d) Explain how the high nitrate level in the slurry leads to a low dissolved oxygen level at sampling point **A**.

_____

_____

_____

_____

_____

_____

_____ [4]

(e) Suggest two reasons to explain why there is a low nitrate level at sampling point **B**.

1. _____

2. _____ [2]

(f) Name **one** other substance that could cause the same effect as slurry if it entered a river.

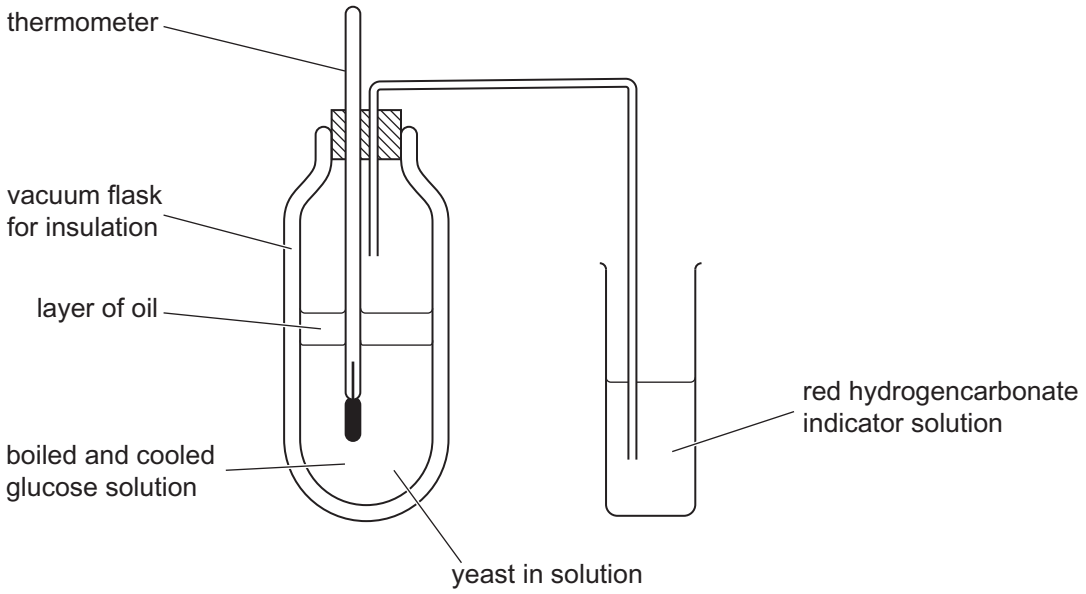
_____ [1]

Examiner Only	
Marks	Remark

7 **(a)** Yeast can carry out respiration without using oxygen. This is known as anaerobic respiration.

A student carried out an investigation into anaerobic respiration in yeast.

The diagram shows the apparatus she used at the start of the investigation.



Source: Principal Examiner

Describe and explain how the investigation could demonstrate anaerobic respiration.

In your answer you should:

- explain the reasons for using a layer of oil and using glucose solution which has been boiled and then cooled before adding the yeast;
- describe and explain any colour changes you would expect in the red hydrogencarbonate indicator solution after two hours.

In this question you will be assessed on your written communication skills, including the use of specialist scientific terms.

[6]

(b) State the equation for anaerobic respiration in **muscles**.

[2]

Examiner Only	
Marks	Remark

Examiner Only	
Marks	Remark

8 **(a)** The table shows results from an investigation into respiration and photosynthesis in a plant.

The amount of carbon dioxide (CO_2) taken up in the light and the amount of carbon dioxide released in the dark were measured at different temperatures.

Temperature/°C	Amount of carbon dioxide/arbitrary units	
	Taken in from the air in the light	Released into the air in the dark
5	1.1	0.2
10	2.2	0.5
15	2.8	0.8
20	3.4	1.1
25	2.8	1.6
30	2.0	2.4

(i) Describe how **respiration** varies with temperature.

_____

_____ [1]

In the light, all the carbon dioxide produced by respiration is used by the plant in photosynthesis.

(ii) Assume that the rate of respiration in the light is the same as in the dark at each temperature.

Calculate the actual amount of carbon dioxide used by the plant in photosynthesis at 30 °C.

Show your working.

_____ arbitrary units [2]

(b) State the temperature that will give most growth in this plant. Explain your answer.

Temperature _____ °C

Explanation _____

_____ [2]

THIS IS THE END OF THE QUESTION PAPER