Rewarding Learning

Centre Number	
71	

Candidate Number

General Certificate of Secondary Education
2013–2014

Double Award Science: Biology

Unit B1

Higher Tier

[GSD12]

TUESDAY 13 MAY 2014, MORNING

ML

TIME

1 hour, plus your additional time allowance.

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 **3(b)** and **8**.

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

Examiner Only	
Marks	Remark

1 A tomato grower investigated the effects of carbon dioxide and light intensity on the yield (total weight) of his tomato crops.

He set up an investigation using four glasshouses of similar size **A**, **B**, **C** and **D**. Each glasshouse contained the same number of tomato plants.

From April–July the tomatoes produced were collected and weighed.

The tomato grower recorded the yield (total weight) in kilograms (kg), of tomatoes produced from each glasshouse.

The table below shows the results.

Glasshouse	Conditions	Yield/kg	Increase in yield in kilograms compared to A
A (control)	• normal carbon dioxide • normal light	117	0
B	• increased carbon dioxide • normal light	137	20
C	• normal carbon dioxide • increased light	137	20
D	• increased carbon dioxide • increased light	177	

(a) (i) Complete the table by working out the increase in yield (total weight) of tomatoes grown in glasshouse **D** compared to glasshouse **A**. [1]

(ii) What is the percentage change in yield for glasshouse **D** compared to glasshouse **A**?

Show your working.

_____ % [2]

(b) Write about and explain the results for glasshouse **D**.

_____

_____

_____

_____ [2]

(c) Write about **one** other factor that should be kept constant in the glasshouses during this investigation.

_____ [1]

(d) Write about **one** economic factor that the tomato grower would need to think about so that he would make a profit when growing tomatoes.

_____

_____ [1]

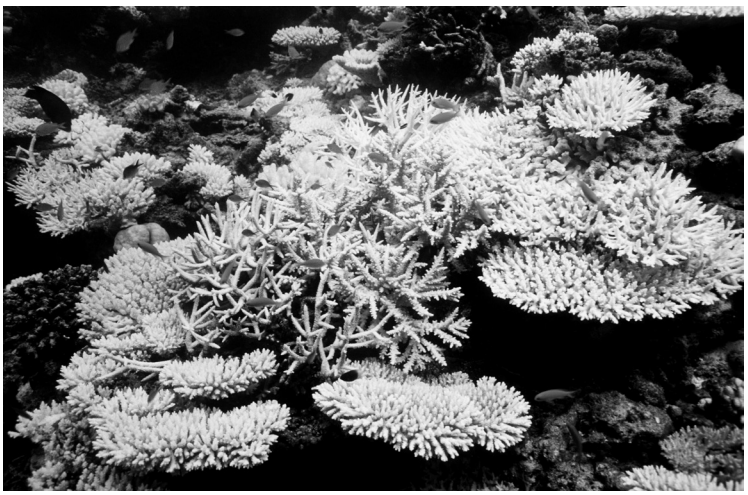
Examiner Only	
Marks	Remark

2 Read the passage below carefully and answer the questions that follow.

Line

Coral reefs protect shallow coastal regions and provide livelihoods for hundreds of millions of people. They are the most biodiverse regions of the ocean. 1 3

Corals are animals and it is their skeletons that form the structure of the reef. **Corals feed on plankton** (tiny floating plants). The corals also have algae that live inside them. These algae carry out photosynthesis and the corals benefit from this by gaining sugar and oxygen. This enables the corals to make their skeletons and grow. 5 7



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There are several factors that can affect coral reefs. 9

Increasing sea temperatures destroy the algae in the corals. The corals then die. 11

In some places the numbers of starfish which eat the corals have gone up due to overfishing of the Triton fish that eat the starfish. 13

This has resulted in the starfish killing large sections of the reefs.

(a) What does biodiversity mean?

_____ [1]

(b) What is the abiotic factor named in the passage? (line 10)

_____ [1]

Examiner Only	
Marks	Remark

Examiner Only	
Marks	Remark

(c) **(i)** Complete the food chain below, using the information from the passage.

_____ corals _____ _____ _____

[2]

(ii) Draw a pyramid of biomass for this food chain. Label the organisms on the pyramid.

[3]

(d) **(i)** How does increasing sea temperatures damage corals?

_____

_____

_____ [2]

(ii) Why is it important to protect coral reefs? Write down **one** reason.

_____ [1]

(iii) Write about **one** other cause of coral reef damage, that has not been mentioned in the passage.

_____ [1]

(iv) What is the name of a species that is used to monitor the state of an ecosystem?

_____ [1]

(e) (i) What apparatus would scientists use to measure water temperatures on the reef?

_____ [1]

(ii) Why do these measurements need to be repeated several times in each place?

_____ [1]

Examiner Only	
Marks	Remark

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(Questions continue overleaf)

Examiner Only	
Marks	Remark

3 Digestion is carried out by enzymes.

(a) (i) Why does food need to be digested?

_____

_____ [2]

(ii) What is the name of the digestive enzyme found in the small intestine that breaks down proteins?
Write down what product is made from this breakdown.

Enzyme _____

Product _____ [2]

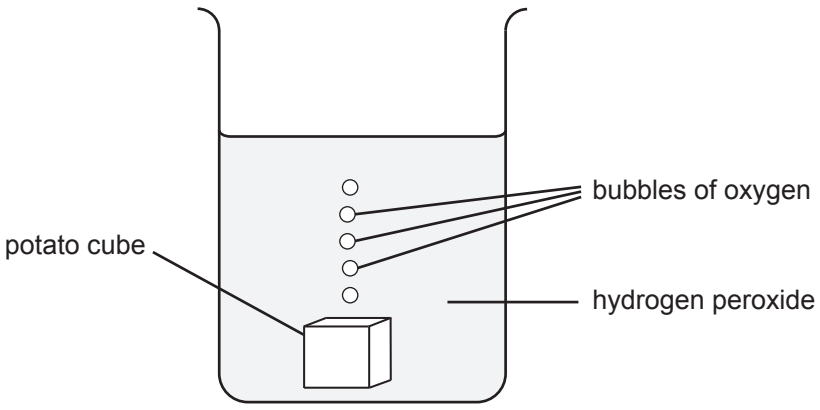
(iii) Write about two ways the small intestine is adapted for its function.

1. _____

2. _____ [2]

(b) Hydrogen peroxide is a waste product formed by cells. It is harmful to all cells, including skin cells. The enzyme catalase works very quickly to break down the hydrogen peroxide into water and oxygen. It is found in many types of living tissue.

The bubbles of oxygen produced can be seen coming off the cells when the tissue is placed in a beaker containing hydrogen peroxide solution.



Write about and describe how you would carry out an experiment to compare the **rate** of catalase action in potato tissue and liver tissue.

Make sure you write about:

- how you would measure the rate of catalase action
- one variable that you would keep constant
- one safety precaution you should take when carrying out the experiment.

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

[6]

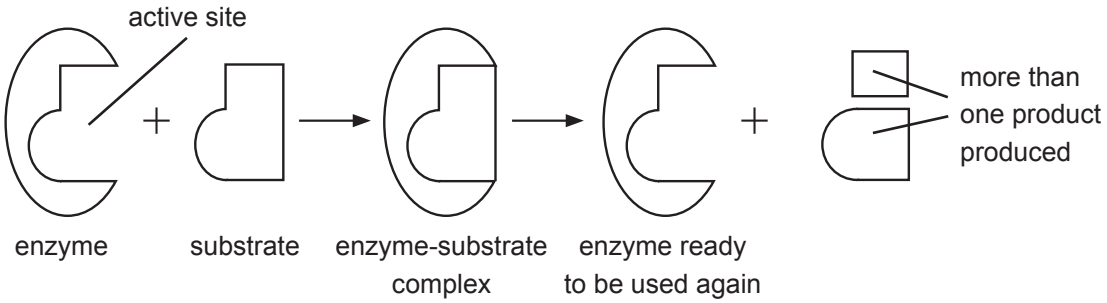
Examiner Only	
Marks	Remark

Examiner Only	
Marks	Remark

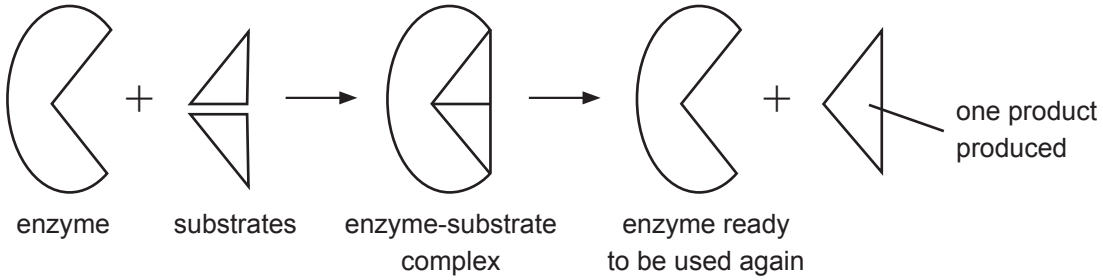
(c) Enzymes are biological catalysts. Two types of reaction are catalysed by enzymes.

These two types of reaction are shown in the diagrams below.

Reaction Type A



Reaction Type B



(i) Write about and describe what has happened to the substrate in reaction type **A**.

A _____

_____

Write about and describe what has happened to the substrate in reaction type **B**.

B _____

_____ [2]

(ii) How do you know that the enzyme lipase carries out reactions of **Type A**? Use the diagram and your knowledge.

_____ [1]

(iii) Write down the name of the model of enzyme action shown for both types of reaction in the diagrams.

_____ [1]

Examiner Only

Marks	Remark

4 Animals respond to stimuli using both their nervous and hormonal systems.

(a) Complete the table to compare the features of the nervous and hormonal systems in animals.

Feature	Nervous system	Hormonal system
how the 'message' travels	along nerve cells (neurones)	
where the 'message' goes		
speed of response		

[4]

Plants respond to stimuli using hormones only.

(b) (i) Write down the name of the hormone produced in the tip of a plant shoot.

_____ [1]

(ii) The tip of a plant shoot will grow towards light coming from one direction.
Write down the name of this process.

_____ [1]

(iii) What is the advantage to the plant, of this response?

_____ [1]

Examiner Only	
Marks	Remark

5 An experiment was carried out to study the effect of different oxygen concentrations on the uptake of minerals by seedlings.

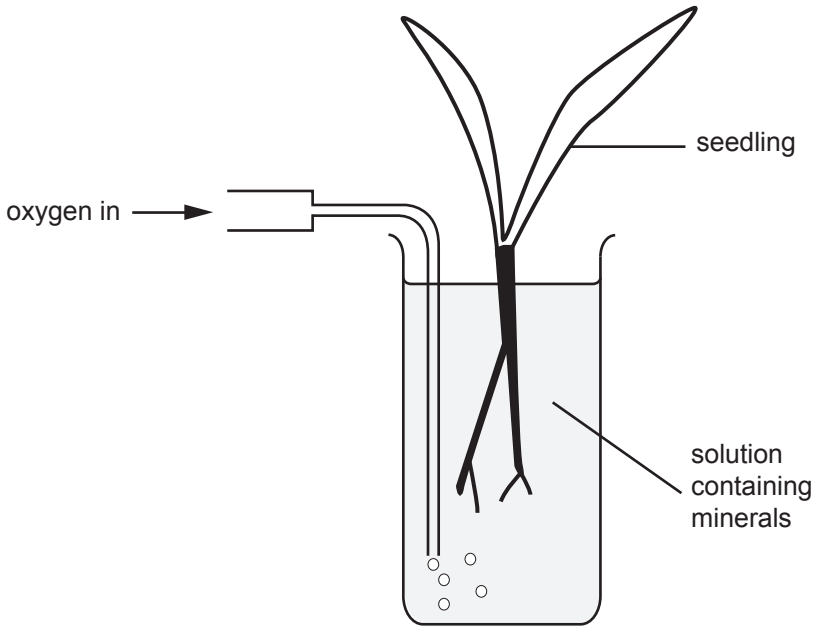
Seedlings of the same mass were placed in six beakers, one in each beaker.

The six beakers were labelled **A** to **F**.

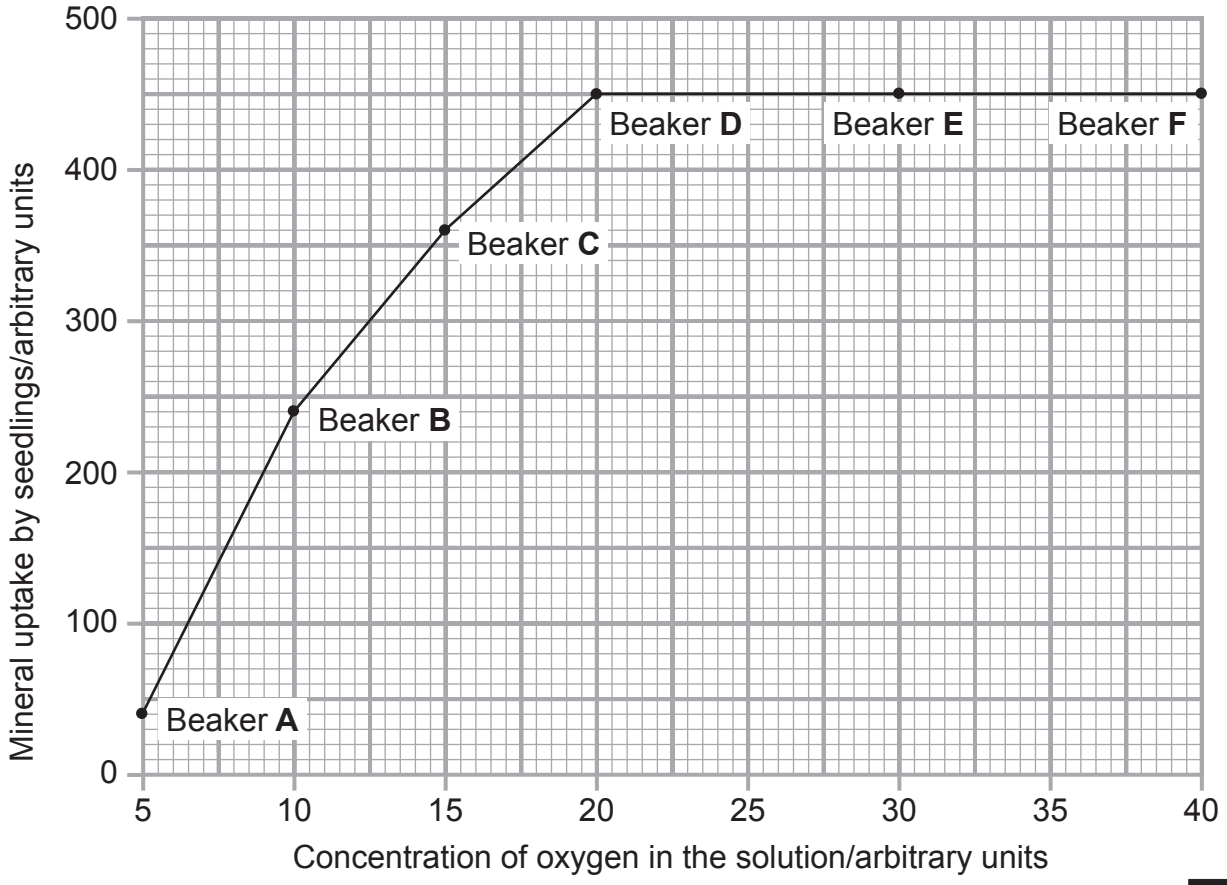
The beakers each contained a solution with the same concentration of minerals.

Each solution had a different amount of oxygen bubbled through it. The diagram below shows the set-up of one of the beakers.

The seedlings were then grown under the same conditions.



Look at the graph below. It shows the uptake of the minerals by each seedling at the different oxygen concentrations.



Examiner Only	
Marks	Remark

Using the graph and your knowledge, answer the following questions.

(a) Write about and explain the difference in mineral uptake by the seedlings in Beaker **C** and Beaker **A**.

_____

_____

_____

_____ [3]

(b) Write down and explain the results for Beakers **D**, **E** and **F**.

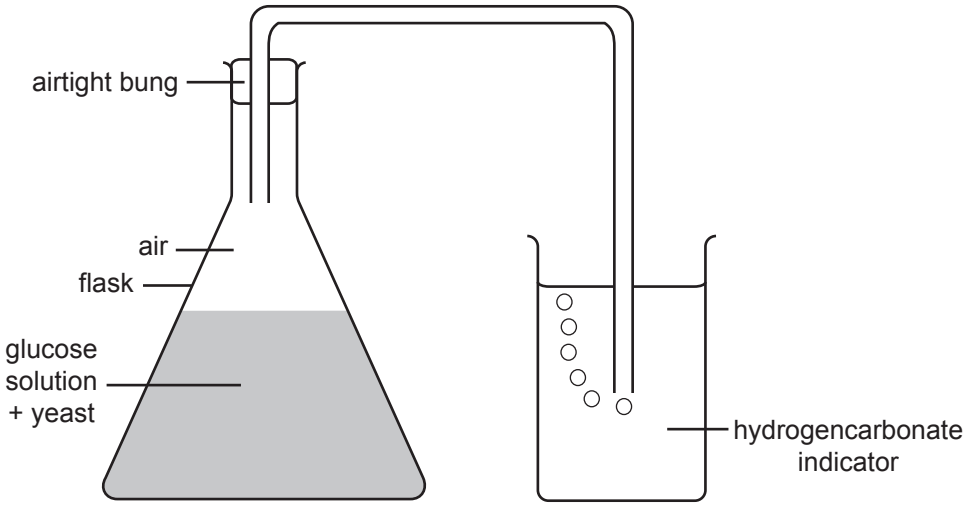
_____

_____

_____ [2]

Examiner Only	
Marks	Remark

6 Look at the diagram below. It shows apparatus used to investigate respiration in yeast cells.
Yeast cells can respire both aerobically and anaerobically.



(a) Write down and explain why the yeast cells respired aerobically at the start of the experiment.

_____ [1]

(b) What is the advantage to the yeast cells of respiring aerobically rather than anaerobically?

_____ [1]

(c) Write down the colour change in the hydrogencarbonate indicator as the experiment progresses.

_____ to _____ [1]

(d) The experiment continued for three days.

What two changes will occur to the contents of the **flask** during this period?

1. _____

2. _____ [2]

(e) The experiment was repeated. Describe what should be done to make sure the yeast respired **anaerobically** instead of **aerobically** from the start of the experiment.

_____

_____

_____

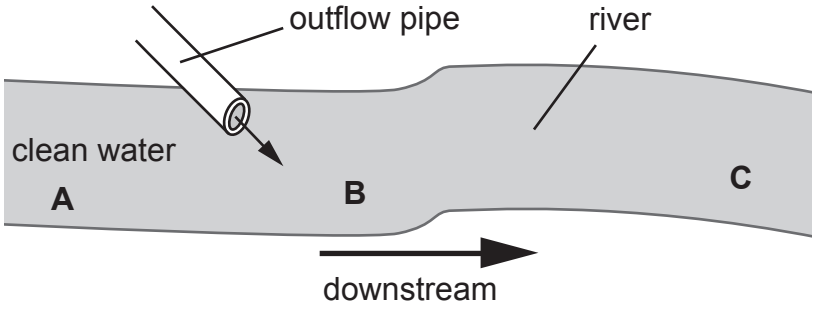
_____ [2]

Examiner Only	
Marks	Remark

Examiner Only	
Marks	Remark

7 Pupils investigated if there was pollution entering a local river from an outflow pipe.

The diagram shows the river with an outflow pipe.



The pupils collected water samples at three points **A**, **B**, and **C** as shown in the diagram.

They took these water samples back to the school laboratory to carry out pollution tests.

(a) Write down **one** safety precaution the pupils should have taken when collecting samples from the river.

_____ [1]

(b) In the laboratory the pupils carried out two chemical tests on their samples.

The first test was for nitrates. The test reagent is a very pale yellow colour in clean water but becomes dark yellow if too many nitrates are present.

In the second test the test reagent used gives a value of the amount of **oxygen used** by aerobic microorganisms. The higher the levels of oxygen used, the more aerobic microorganisms there are in the water sample.

The results are shown in the table below.

	Results for water samples		
Test	**A**	**B**	**C**
1 (nitrate)	very pale yellow	dark yellow	pale yellow
2 (**oxygen used**) mg/l	8	400	200

(i) Write down and explain the results for test 1.

[3]

(ii) Write about and explain the results for the **oxygen used** at point B in test 2.

[3]

(c) Write about the advantage of using two different tests to monitor water pollution.

[1]

Examiner Only

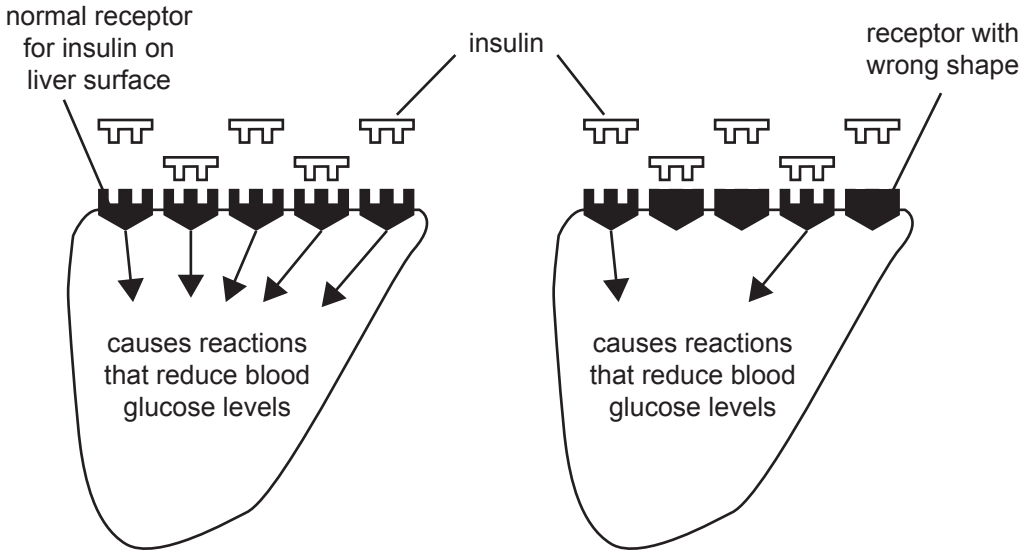
Marks	Remark

8 The liver has receptors for insulin on its surface.

Insulin will only combine with receptors that have a complementary shape.

Once this combination occurs it causes reactions in the liver that lower blood glucose levels.

The diagram below shows a normal liver from a 25-year-old man and a liver from a 65-year-old man who has diabetes.



Normal liver from 25-year-old man

Liver from 65-year-old man who has developed diabetes

Using the diagrams and your knowledge:

- Write about and explain why the older man has difficulty lowering his blood glucose level.
- Write about why the older man's doctor has advised him to lower his sugar (glucose) intake.

Examiner Only

Marks	Remark

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

Examiner Only	
Marks	Remark

[6]

THIS IS THE END OF THE QUESTION PAPER

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