



Centre Number

71	
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Candidate Number

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General Certificate of Secondary Education
2013–2014

Double Award Science: Biology

Unit B1

Higher Tier

[GSD12]

MV18

TUESDAY 13 MAY 2014, MORNING

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 at the end of each question indicate the marks awarded to each question or part question.

Quality of written communication will be assessed in Questions **3(b)** and **8**.

- 1 A grower investigated the effects of carbon dioxide and light intensity on the yield of his tomato crops.

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

Over a period of several months, April–July, the tomatoes produced were collected and weighed.

The 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)	<ul style="list-style-type: none">• normal carbon dioxide• normal light	117	0
B	<ul style="list-style-type: none">• increased carbon dioxide• normal light	137	20
C	<ul style="list-style-type: none">• normal carbon dioxide• increased light	137	20
D	<ul style="list-style-type: none">• increased carbon dioxide• increased light	177	

- (a) (i) Complete the table by calculating the increase in yield of tomatoes grown in glasshouse **D** compared to glasshouse **A**. [1 mark]

(ii) What is the percentage change in yield for glasshouse **D** compared to glasshouse **A**? [2 marks]

Show your working.

_____ %

(b) Explain the results for glasshouse **D**. [2 marks]

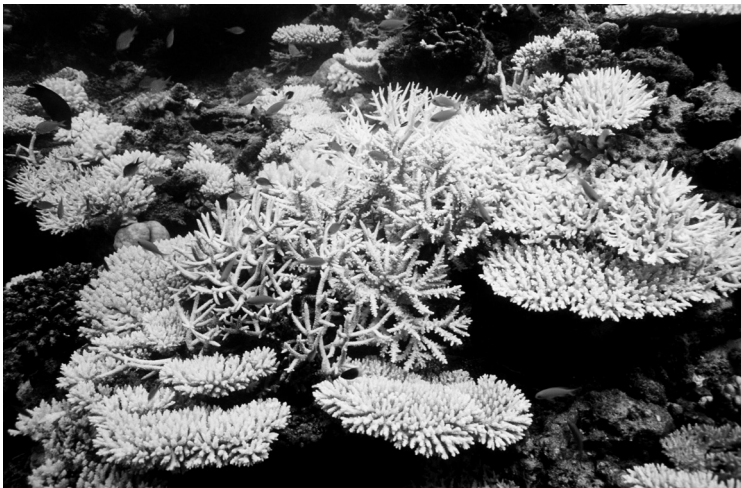
(c) Give **one** other factor that should be kept constant in the glasshouses during this investigation. [1 mark]

(d) Give **one** economic factor that the grower would need to consider if he was going to make a profit when growing tomatoes. [1 mark]

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
9



There are several factors that can affect coral reefs. 11

Increasing sea temperatures destroy the algae in the corals. The corals then die. 13

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. 15

This has resulted in the starfish killing large sections of the reefs. 17

(a) What is meant by biodiversity? [1 mark]

(b) Give the abiotic factor named in the passage. (line 12)
[1 mark]

(c) (i) Using the information in the passage, complete the food chain below. [2 marks]

_____ corals _____ _____

(ii) Draw a pyramid of biomass for this food chain.
Label the organisms on the pyramid. [3 marks]

(d) (i) Explain how increasing sea temperatures damage corals. [2 marks]

(ii) Suggest **one** reason why it is important to protect coral reefs. [1 mark]

(iii) Other than those mentioned in the passage, suggest **one** other cause of coral reef damage. [1 mark]

(iv) What name is given to a species that is used to monitor the state of an ecosystem? [1 mark]

(e) (i) What apparatus would scientists use to measure water temperatures on the reef? [1 mark]

(ii) Explain why these measurements would need to be repeated several times in each location. [1 mark]

3 Digestion is carried out by enzymes.

(a) (i) Explain why food needs to be digested. [2 marks]

(ii) Name the digestive enzyme found in the small intestine that breaks down proteins and give the product of the breakdown. [2 marks]

Enzyme _____

Product _____

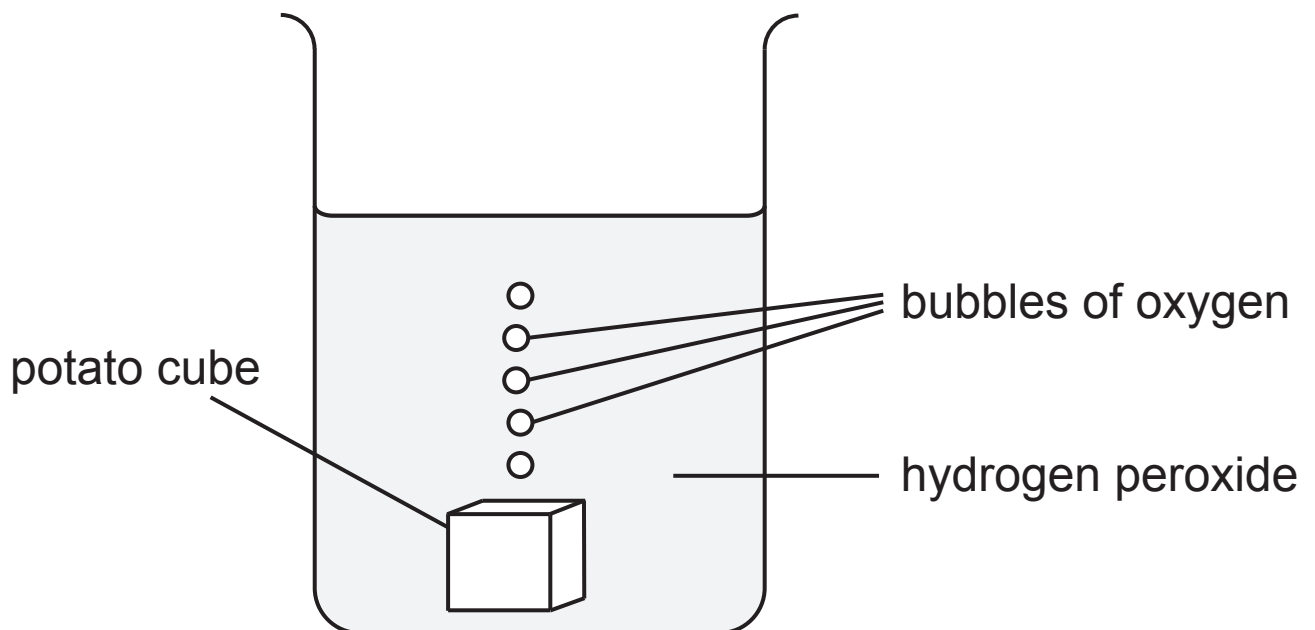
(iii) Give two ways the small intestine is adapted for its function. [2 marks]

1. _____

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 if the tissue is placed in a beaker containing hydrogen peroxide solution.



Describe how you would carry out an experiment to compare the **rate** of catalase action in potato and liver tissues. [6 marks]

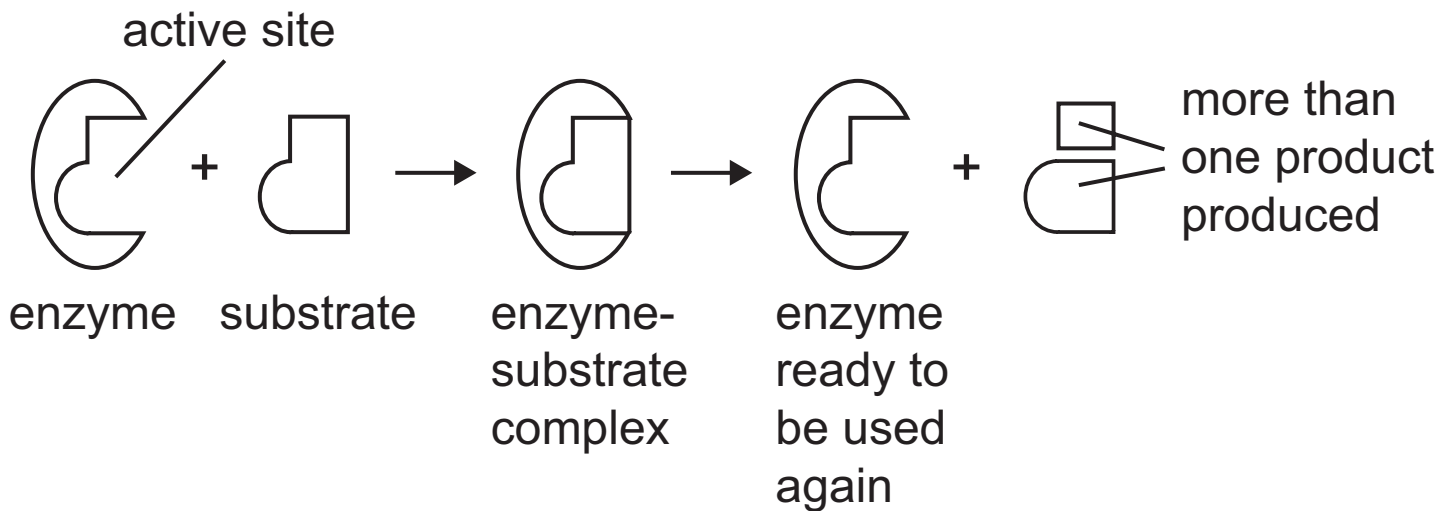
Your account should include:

- 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.

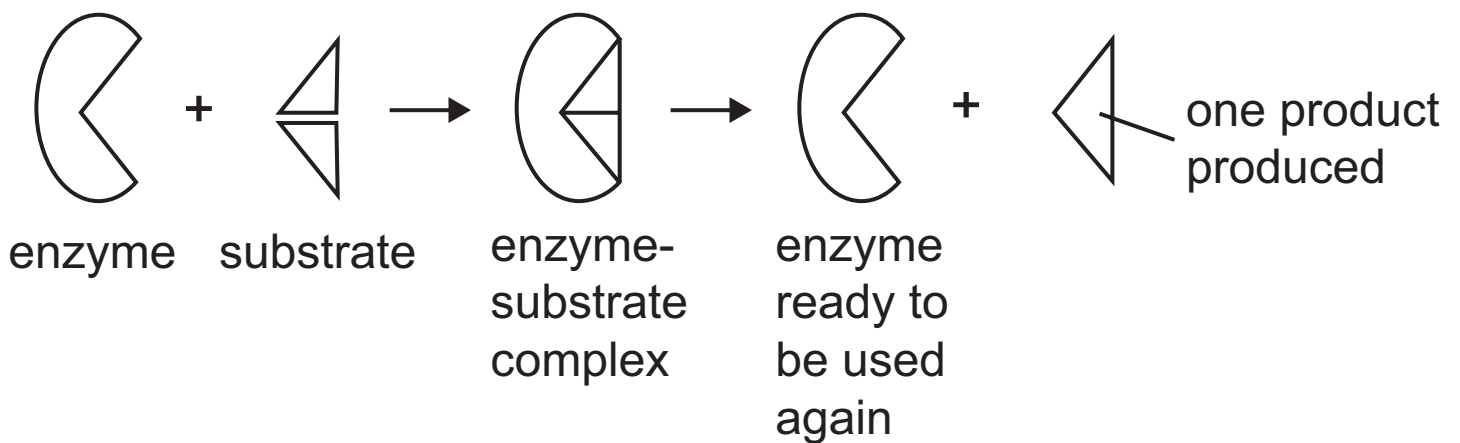
(c) Enzymes are biological catalysts. Two types of reaction are catalysed by enzymes.

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

Reaction Type A



Reaction Type B



- (i) Describe what has happened to the substrates in the two types of reaction, **A** and **B**. [2 marks]

A _____

B _____

- (ii) Using the diagram and your knowledge, explain how you know that the enzyme lipase carries out reactions of **Type A**. [1 mark]

- (iii) Name the model of enzyme action shown for both types of reaction in the diagrams. [1 mark]

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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. [4 marks]

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

Plants respond to stimuli using hormones only.

(b) (i) Name the hormone produced in the tip of a plant shoot. [1 mark]

(ii) The tip of a plant shoot will grow towards light coming from one direction. Name this process. [1 mark]

(iii) Give the advantage to the plant of this response. [1 mark]

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

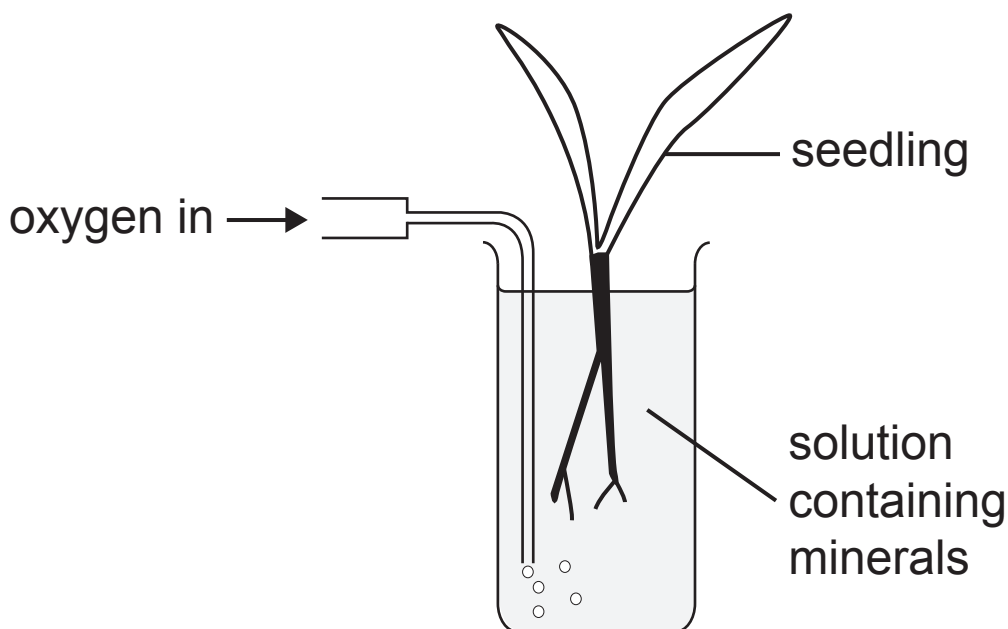
Seedlings of the same mass were placed in six beakers, one in each beaker.

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

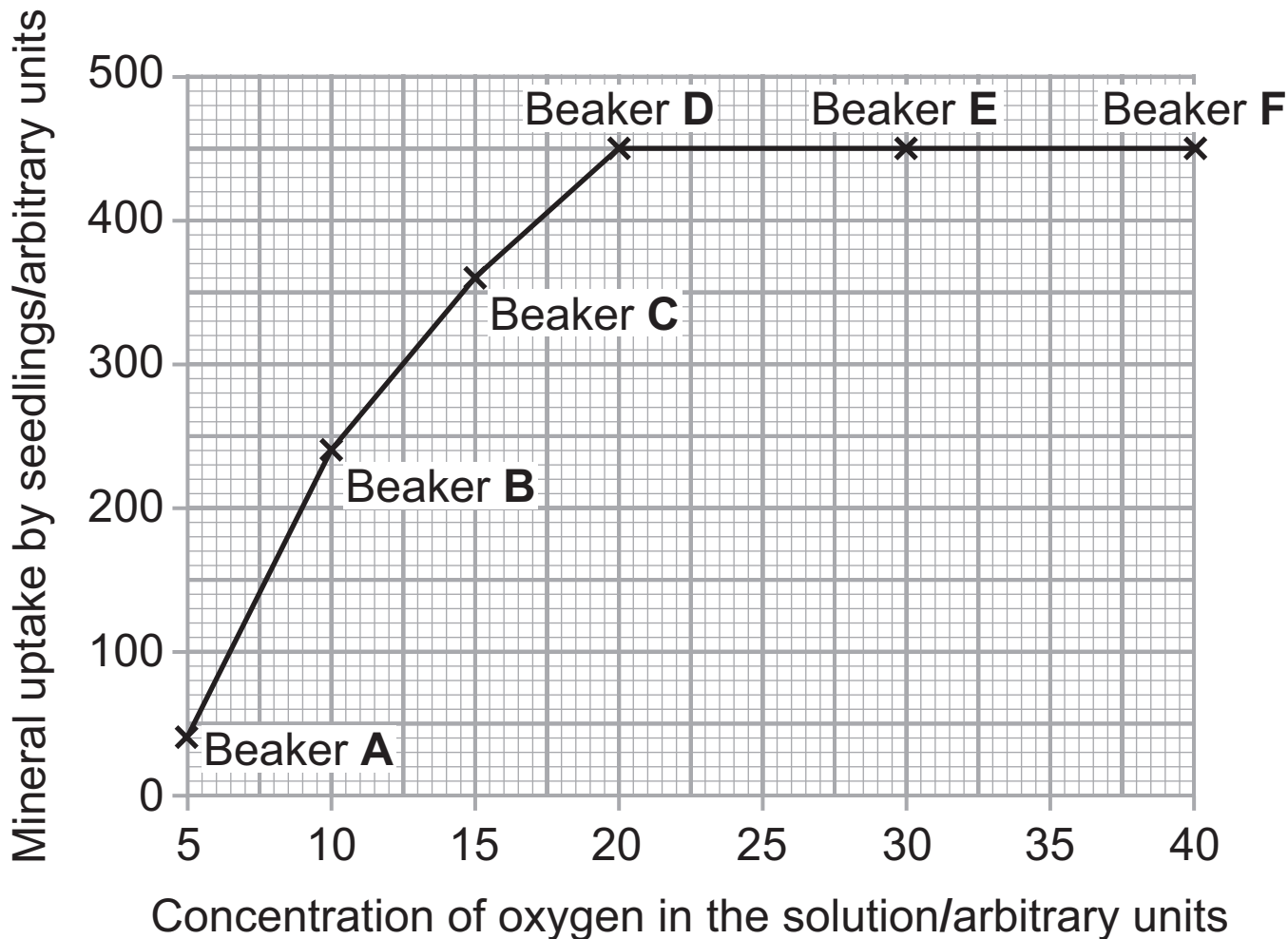
The beakers each contained a solution with the same concentration of minerals.

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.



The uptake of the minerals by each seedling at the different oxygen concentrations is shown in the graph opposite.



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

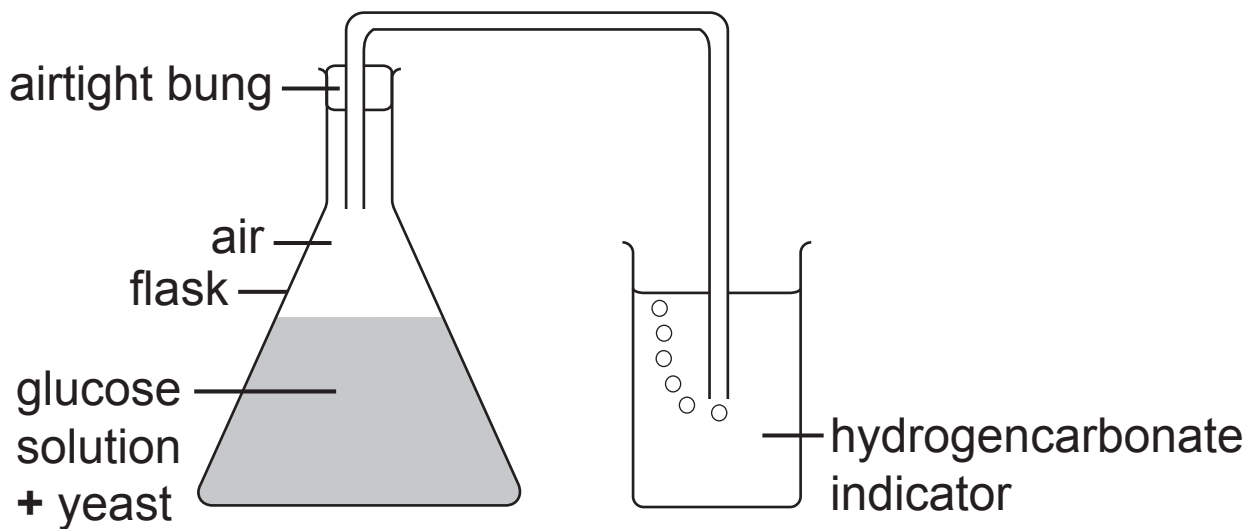
(a) Explain the difference in mineral uptake by the seedlings in Beaker C and Beaker A. [3 marks]

(b) Describe and suggest an explanation for the results for Beakers **D**, **E** and **F**. [2 marks]

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(Questions continue overleaf)

- 6** The diagram shows apparatus used to investigate respiration in yeast cells.
Yeast cells can respire both aerobically and anaerobically.



- (a)** Explain why the yeast cells respired aerobically at the start of the experiment. [1 mark]

- (b)** What is the benefit to the yeast cells of respiring aerobically rather than anaerobically? [1 mark]

- (c)** Give the colour change in the hydrogencarbonate indicator as the experiment progresses. [1 mark]

_____ to _____

(d) The experiment continued for three days.

Suggest two changes that will occur to the contents of the **flask** during this period. [2 marks]

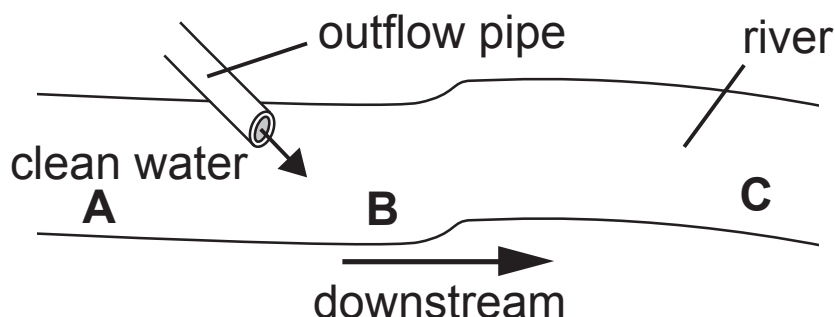
1. _____

2. _____

(e) If the experiment was repeated, describe the steps you would take to ensure the yeast respired **anaerobically** instead of **aerobically** from the start of the experiment. [2 marks]

- 7 As part of a field study, pupils investigated if there was pollution entering a local river from an outflow pipe.

The diagram shows the river with an outflow pipe.



They 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) Suggest **one** safety precaution the pupils should have taken when collecting samples from the river. [1 mark]
-

- (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 excess 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 opposite.

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

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

(i) Explain the results for test 1. [3 marks]

(ii) Using the results for test 2, describe and explain the results for the **oxygen used** at point B. [3 marks]

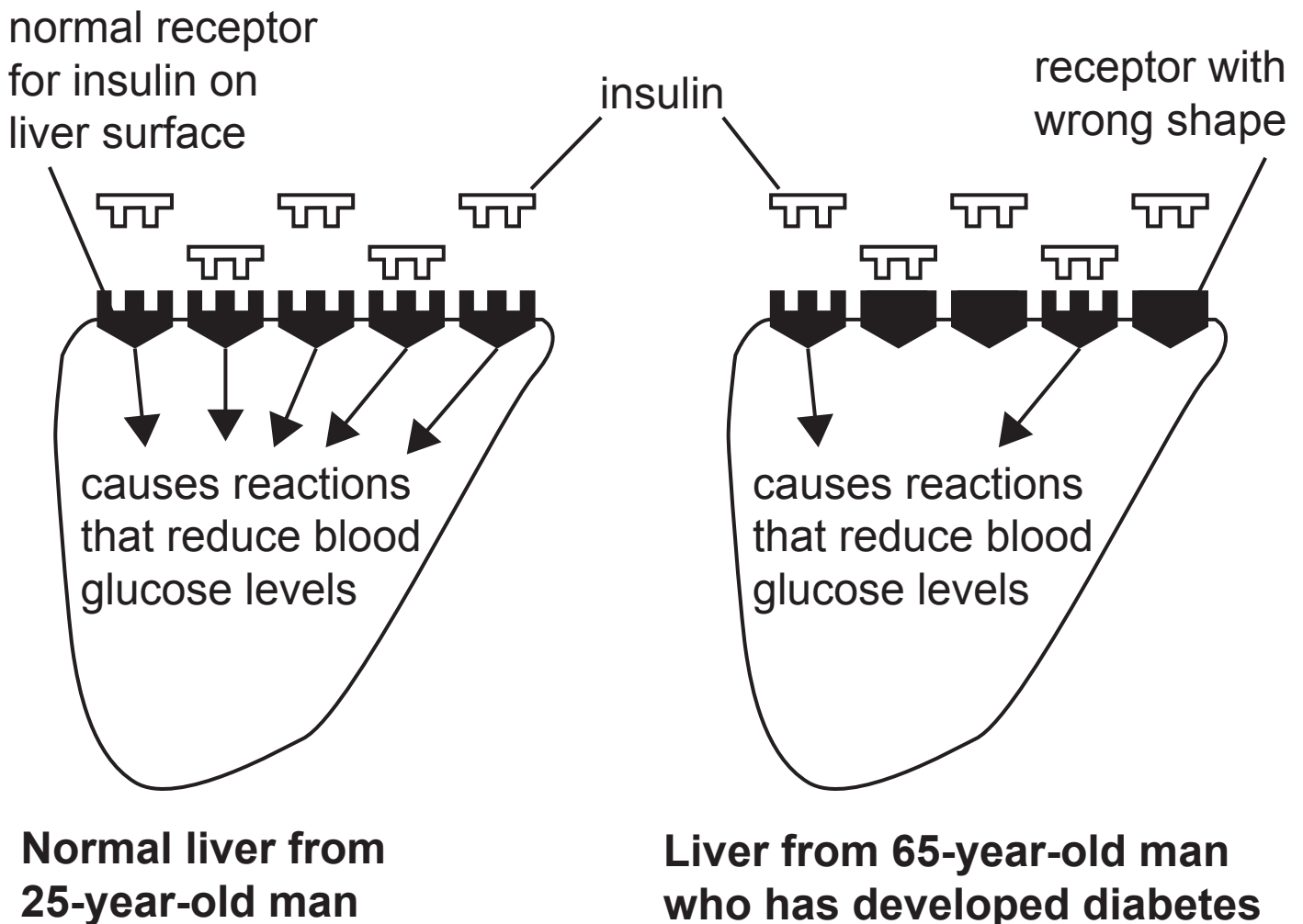
(c) Suggest the advantage of using two different tests to monitor water pollution. [1 mark]

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 which bring about a lowering of blood glucose levels.

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



Using the diagrams and your knowledge:

- describe and explain why this older man has difficulty lowering his blood glucose level.
- suggest why this older man’s doctor has advised him to lower his sugar (glucose) intake. [6 marks]

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

SOURCES

Pg4 Q2, Photograph of coral, © Georgette Douwma/Science Photo Library

Pg14 Q5, Diagram re uptake of minerals by seedlings, © CCEA

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Question Number	Marks
1	
2	
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8	
Total Marks	

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