



General Certificate of Secondary Education
2024–2025

Centre Number

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Candidate Number

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Double Award Science: Biology

Unit B1

Higher Tier



[GDW12]

GDW12

MONDAY 11 NOVEMBER 2024, AFTERNOON

TIME

1 hour.

INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.

You must answer the questions in the spaces provided.

Do not write outside the boxed area on each page or on blank pages.

Complete questions in black ink and use a dark HB pencil for drawings and graphs.

Do not write with a gel pen.

Answer **all nine** 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.

You may use a scientific calculator.

Quality of written communication will be assessed in Question 2.

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20GDW1201

- 1 Leopards are found in Africa.
The photograph shows a leopard.

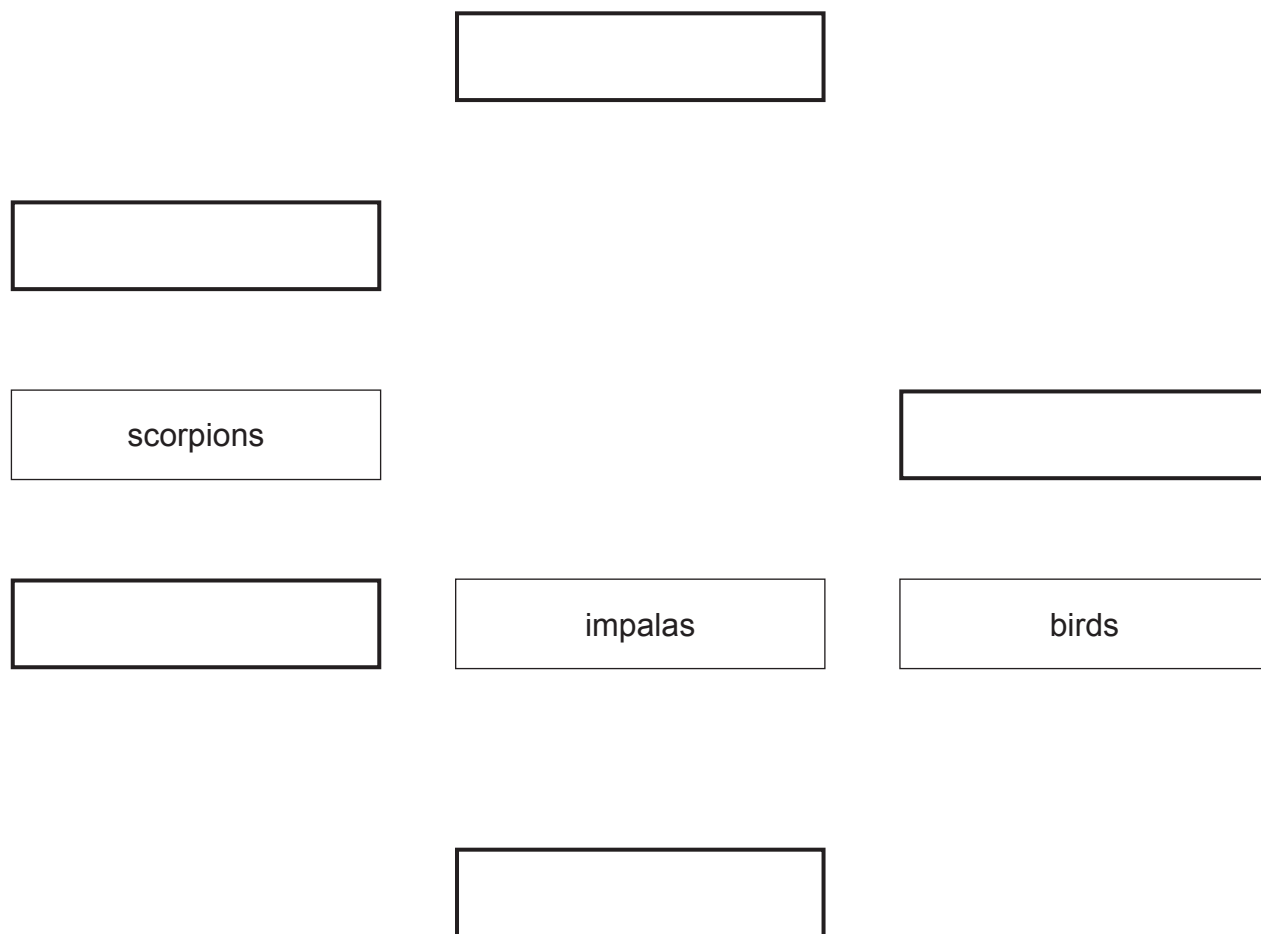


The statements below give information about a food web that includes leopards.

Grass is the producer.
Locusts, impalas and birds are primary consumers.
Scorpions feed on locusts.
Hawks are secondary consumers that feed on birds.
Baboons feed on scorpions.
Leopards feed on impalas and baboons.



(a) Use the statements to complete the food web.



[4]

(b) (i) What is the source of energy for this food web?

[1]

(ii) Name the animal that feeds at **two** trophic levels in this food web.

[1]

[Turn over]



(iii) Use the food web to **explain** why the number of **impalas** would decrease if the number of scorpions decreased.

Circle the correct answer in each list to explain why the number of impalas would decrease.

The baboons have

more food	less food	the same amount of food
-----------	-----------	-------------------------

This means that the leopards feed on

more baboons	fewer baboons	the same number of baboons
--------------	---------------	----------------------------

This means that the leopards feed on

more impalas	fewer impalas	the same number of impalas
--------------	---------------	----------------------------

[3]

Some types of leopards are endangered.

Conservation efforts have increased the population of one type of leopard in the wild from **30** in 1970 to **84** in 2023.

(c) Calculate the percentage (%) increase in the population of this type of leopard in the wild between 1970 and 2023.

Show your working out.

_____ % [3]



- 2 Give the structure and function of each of the large biological molecules, **cellulose**, **starch** and **fat**.

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

Cellulose

Structure _____

Function _____

Starch

Structure _____

Function _____

Fat

Structure _____

Function _____

[6]

[Turn over



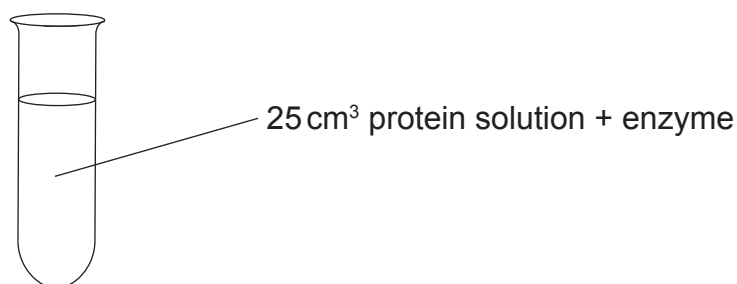
3 Enzymes are biological catalysts that speed up the rate of reactions.

(a) Name the **model** used to illustrate the action of enzymes.

[1]

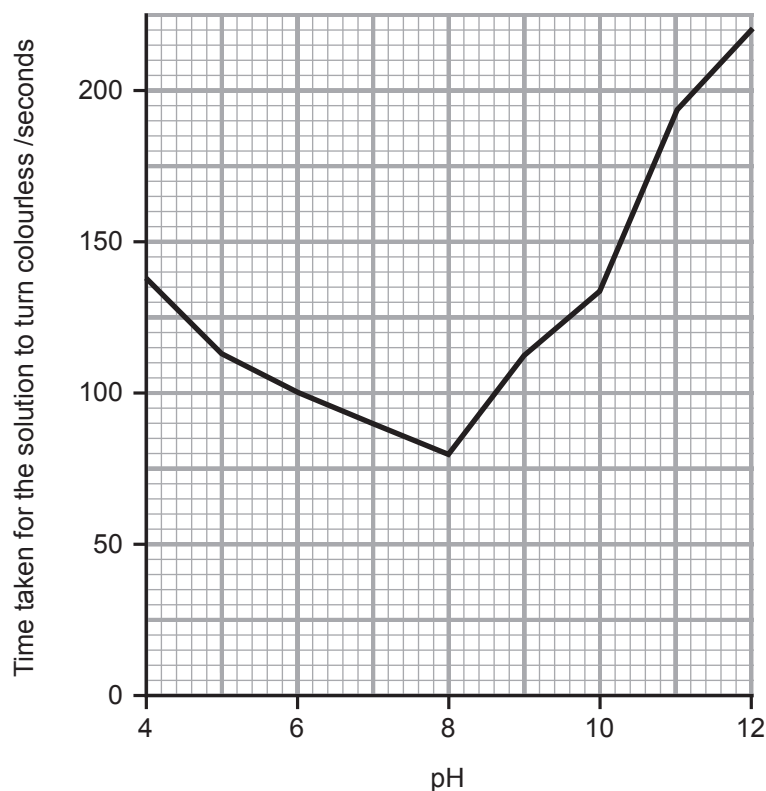
(b) When the protein in a solution is broken down by a particular enzyme, the solution changes from white to colourless.

A student investigated the effect of pH on the activity of this enzyme.
The diagram shows one of the test tubes the student used.



The temperature was maintained at **30 °C** throughout the experiment.

The graph shows the time taken for the solution to turn colourless at each pH value.



- (i) Name the type of enzyme that breaks down protein.

[1]

- (ii) Use the graph to give the optimum pH for **this** enzyme.
Explain your answer.

pH _____

Explanation _____

[2]

- (iii) Use the graph to complete the table to state if the solution was white or colourless at each pH value and time.

Write your answers in the empty boxes.

pH	Time /seconds	White or colourless
4	100	
10	150	

[1]

[Turn over



- (c) The student repeated the investigation but **increased** the temperature from 30 °C to 37 °C.

Circle the correct answer in each list below to complete the statements.

- (i) The time taken for the solution to turn colourless at **pH 8** is most likely to have been

50 seconds

80 seconds

120 seconds

[1]

- (ii) The movement of the molecules in the solution would have

decreased

stayed the same

increased

[1]

- (iii) The number of collisions of the molecules in the solution would have

decreased

stayed the same

increased

[1]



- (d) A second student carried out the experiment using the same protein solution with a **different** enzyme.

Describe and fully explain the result the student would have obtained.

Description _____

Explanation _____

[4]



4 Plant shoots respond to light through the process of phototropism.

(a) Name the hormone produced in plant shoot tips that responds to light.

_____ [1]

(b) Describe what causes an uneven distribution of this hormone in a plant shoot.

_____ [1]

(c) (i) What effect does this hormone have on plant **cells**?

_____ [1]

(ii) What effect does an uneven distribution of this hormone have on the plant **shoot**?

_____ [2]



5 Respiration can be aerobic or anaerobic.

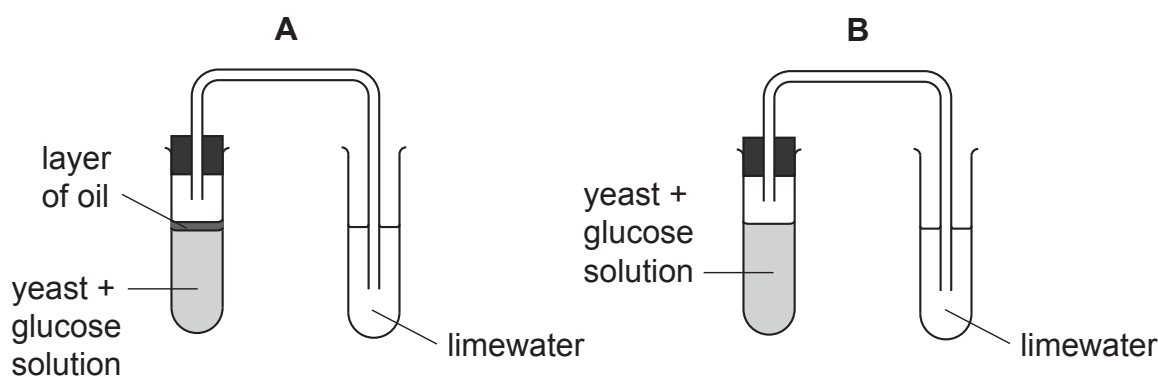
- (a) Complete the balanced chemical equation for **aerobic** respiration.
Write your answers in the empty boxes.



[3]

A student investigated respiration in yeast at room temperature.

The diagram shows two sets of apparatus (**A** and **B**) at the start of the student's investigation.



Limewater turns milky when carbon dioxide is present.

The table contains three statements about the student's investigation.

- (b) Use the diagram to complete the table for the results at the end of the student's investigation.

Place a (✓) or an (X) in **each** box.

Use a tick (✓) for a true statement or a cross (X) for a statement that is not true.

Statement	Apparatus A	Apparatus B
an exothermic reaction took place		
the limewater turned milky		
alcohol was produced		

[3]

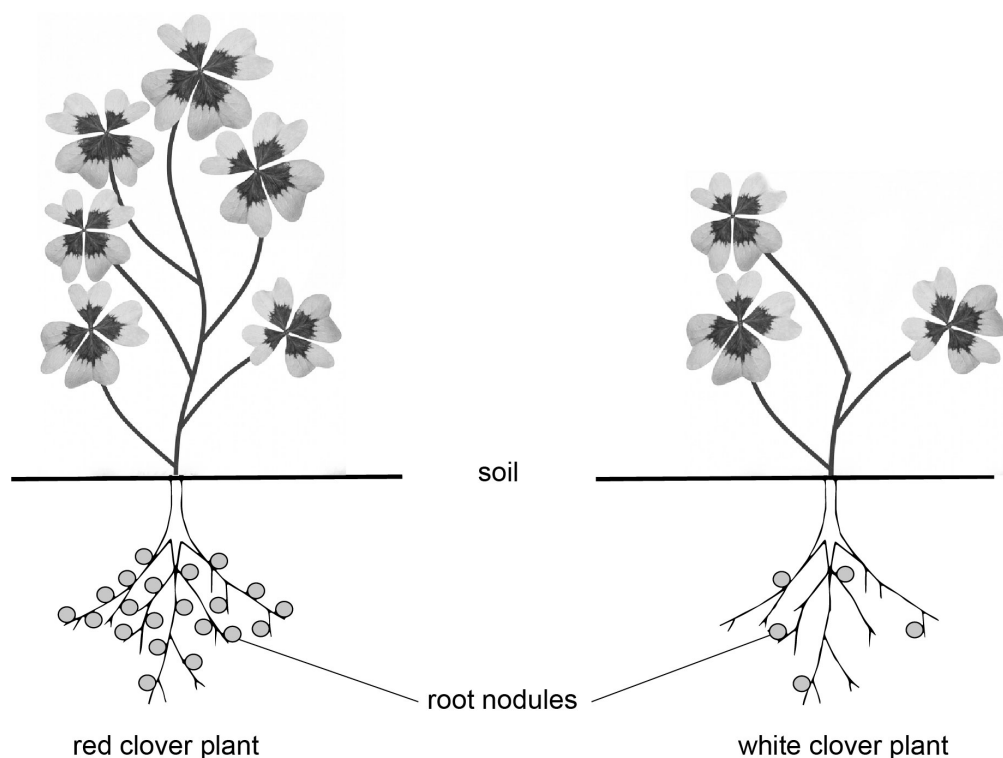
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6 Red and white clover plants have specialised structures called root nodules.

These root nodules contain nitrogen-fixing bacteria.

The diagram shows a red clover plant and a white clover plant with their root nodules.



A farmer decided to grow red clover in a field before he planted grass to use for animal feed.

Use the diagram and your knowledge of the nitrogen cycle to answer the following questions.

(a) Explain the role of nitrogen-fixing bacteria.

[1]



- (b) Explain why the farmer decided to grow **red** clover, rather than white clover, in a field before he planted grass to use for animal feed.

[4]

- (c) Name the type of bacteria in the nitrogen cycle found in large numbers in waterlogged soil and describe their role.

[2]

[Turn over



7 (a) Minerals are absorbed by a plant through root hair cells.

(i) Name the process that absorbs minerals into root hair cells.

[1]

(ii) This process requires oxygen. Explain why.

[3]

(b) Apart from minerals, name **one other** substance that is absorbed by a plant through its root hair cells.

[1]



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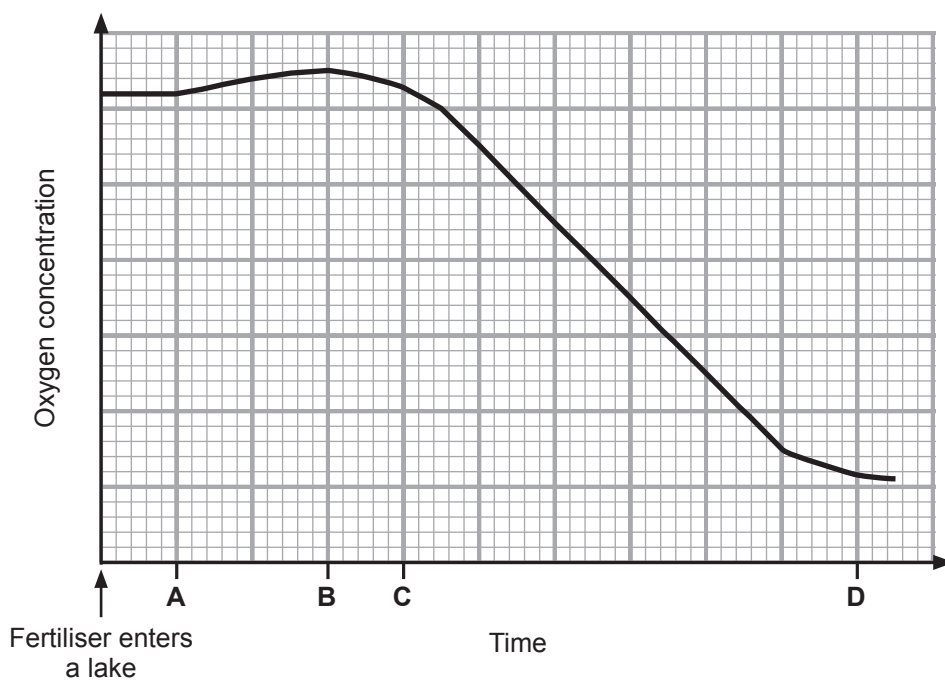
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8 One source of eutrophication in a lake is nitrates in fertiliser run-off.

(a) Name **one other** source of eutrophication.

[1]

The graph shows the effect of nitrates in fertiliser run-off on oxygen concentration in a lake.



(b) Explain the increase in oxygen concentration between A and B.

[2]



(c) (i) What happens to algae in a lake when nitrates are depleted?

_____ [1]

(ii) Explain how bacteria cause the decrease in oxygen concentration between C and D.

_____ [2]

(d) A lake in County Tyrone had a population of 786 000 trout. Fertiliser entered the lake and caused the trout population to decrease by 35%.

Calculate the size of the trout population that **remained** in the lake.

Show your working out.

_____ [3]

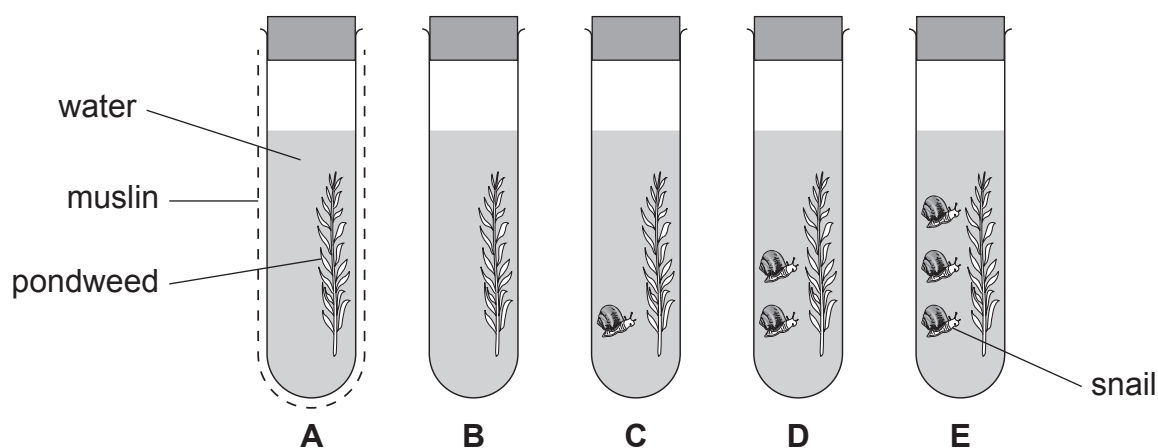
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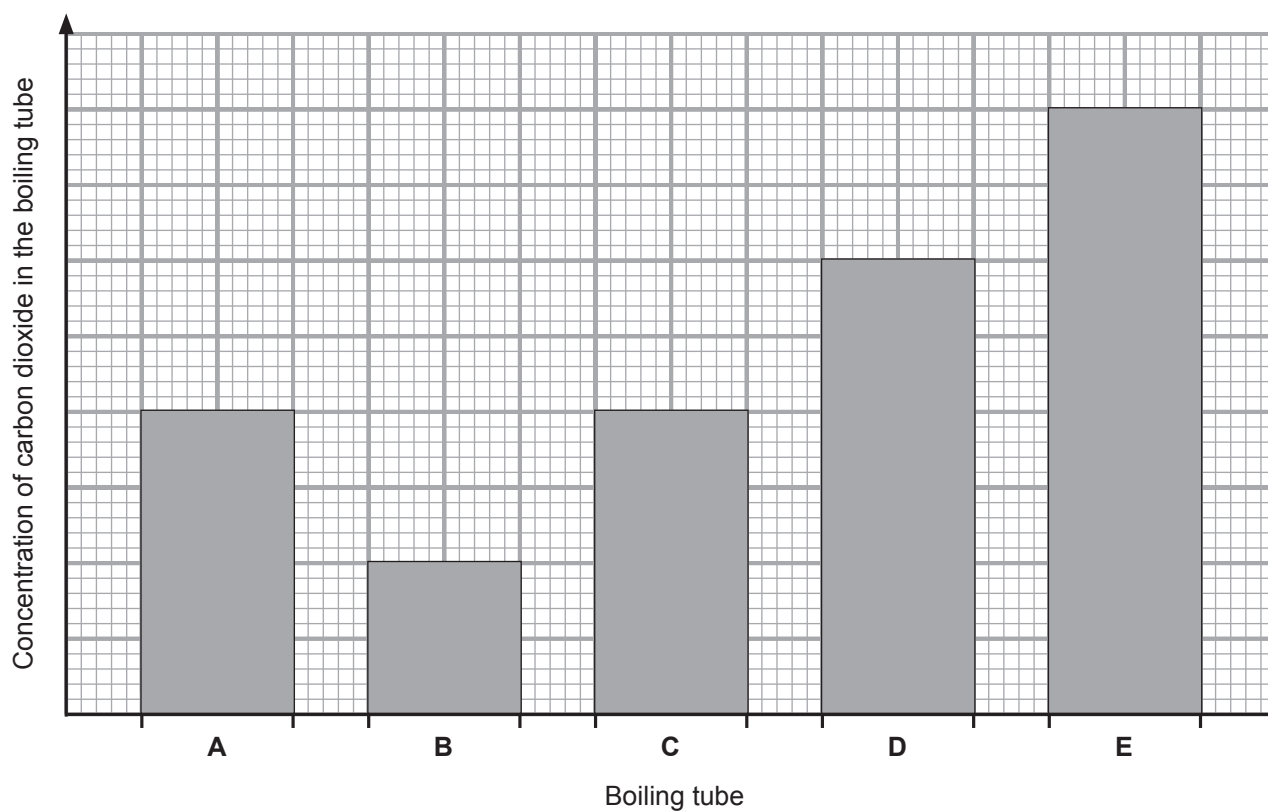
- 9 A student carried out an investigation into photosynthesis and respiration. He investigated how the concentration of carbon dioxide changed in five boiling tubes **A**, **B**, **C**, **D** and **E**. All the boiling tubes contained living organisms.

The five boiling tubes were left in **bright light** for 12 hours.

The diagram shows his investigation.



The bar chart shows the results at the end of the student's investigation after the boiling tubes had been left in bright light for 12 hours.



(a) What is the purpose of the muslin around boiling tube **A**?

_____ [1]

(b) Use the diagram, the bar chart and your knowledge of photosynthesis and respiration to explain the concentrations of carbon dioxide in the boiling tubes **A**, **B** and **E**.

The pondweed in boiling tube **A** was at its **compensation point**.

(i) **A** _____

_____ [2]

(ii) **B** _____

_____ [2]

(iii) **E** _____

_____ [2]

(c) The student added hydrogencarbonate indicator to the boiling tubes at the end of the investigation.

The indicator stayed red in boiling tube **C**.

State the colour of the indicator in boiling tube **D**.

_____ [1]



Sources:

Question 1: © Getty Images

Question 3(b): Principal Examiner

Question 5(a): Principal Examiner

Question 6: © Adapted from Getty Images

Question 9: Principal Examiner

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For Examiner's use only	
Question Number	Marks
1	
2	
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6	
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8	
9	

Total Marks	
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Examiner Number

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