



Rewarding Learning

General Certificate of Secondary Education
2022–2023

Centre Number

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Candidate Number

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Double Award Science: Biology

Unit B1

Higher Tier



[GDW12]

GDW12

TUESDAY 16 MAY 2023, MORNING

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 in black ink only. **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.

Quality of written communication will be assessed in Question **3(b)(ii)**.

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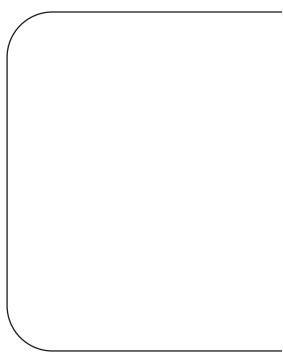


24GDW1201

1 Root hair cells are specialised cells found in plants.

(a) Complete the diagram by drawing:

- the rest of the outline of a root hair cell.
- the other structures found in a root hair cell.



[3]

(b) Name the structures present in leaf palisade cells that are **not** present in root hair cells.

[1]





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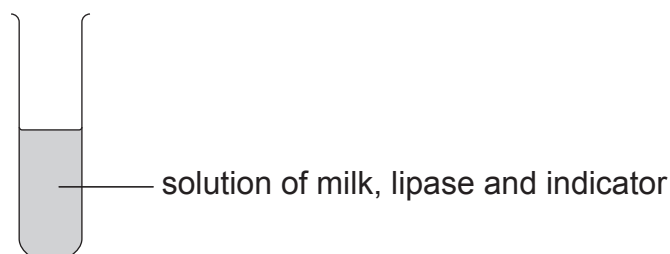
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24GDW1203

- 2 A student investigated the action of the enzyme lipase on milk at different temperatures.
Milk has an alkaline pH.
When lipase breaks down fat in milk, the milk becomes acidic.
The student used an indicator which is pink in alkaline conditions and colourless in acidic conditions.

The diagram shows one of the boiling tubes the student used in the investigation.

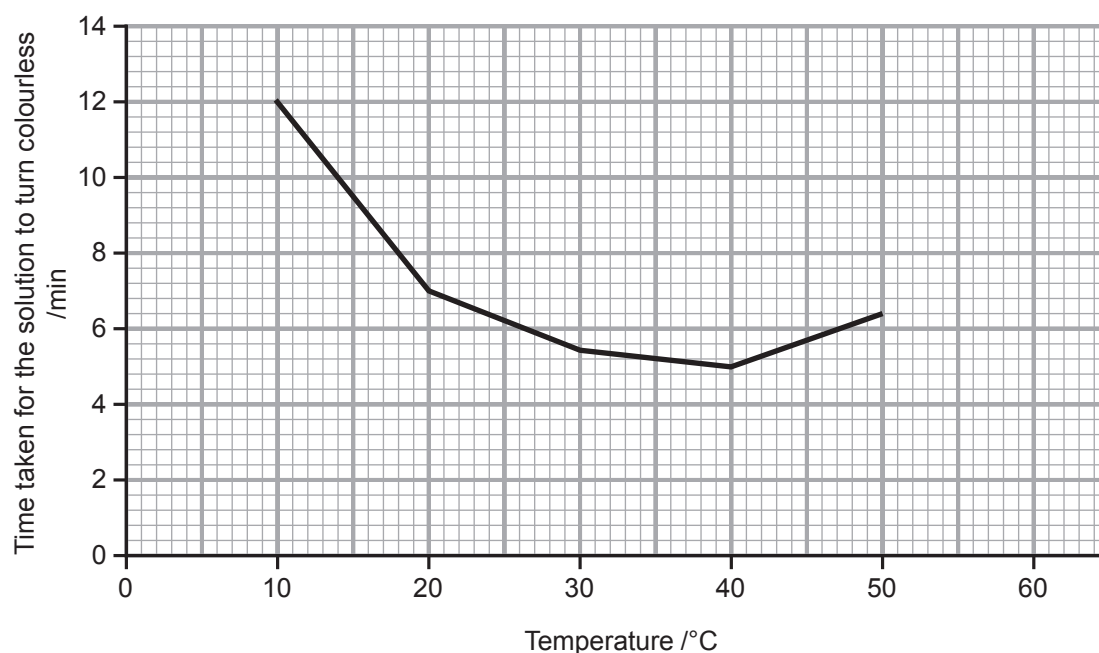


- (a) Name the substance produced by the break down of fat in the milk that caused the **pH** of the solution in the boiling tube to become acidic.

[1]

The student recorded the time taken for the solution of milk, lipase and indicator to turn colourless at different temperatures.
The student used the same volume of milk and the same volume and concentration of lipase in each boiling tube.

The graph shows the student's results.



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24GDW1204

- (b) Use the graph to describe the overall trend between 10 °C and 40 °C.
Give data for 10 °C and 40 °C to support your answer.

[2]

- (c) (i) Use a ruler to extend the line on the graph between 50 °C and 60 °C. [1]

- (ii) Use the line you have drawn to give the time for the solution to turn
colourless at 60 °C.

_____ minutes [1]

- (d) The student repeated the experiment at 80 °C.
The solution did **not** turn colourless. Explain why.

[4]

[Turn over]



- 3 Marsh Harriers are wild birds of prey that live in marshlands in the United Kingdom (U.K.).

The photograph shows a Marsh Harrier.



The statements below give information about the Marsh Harrier and some other organisms in its food web.

Insects eat plants (including crop plants).

Mice eat plants and insects.

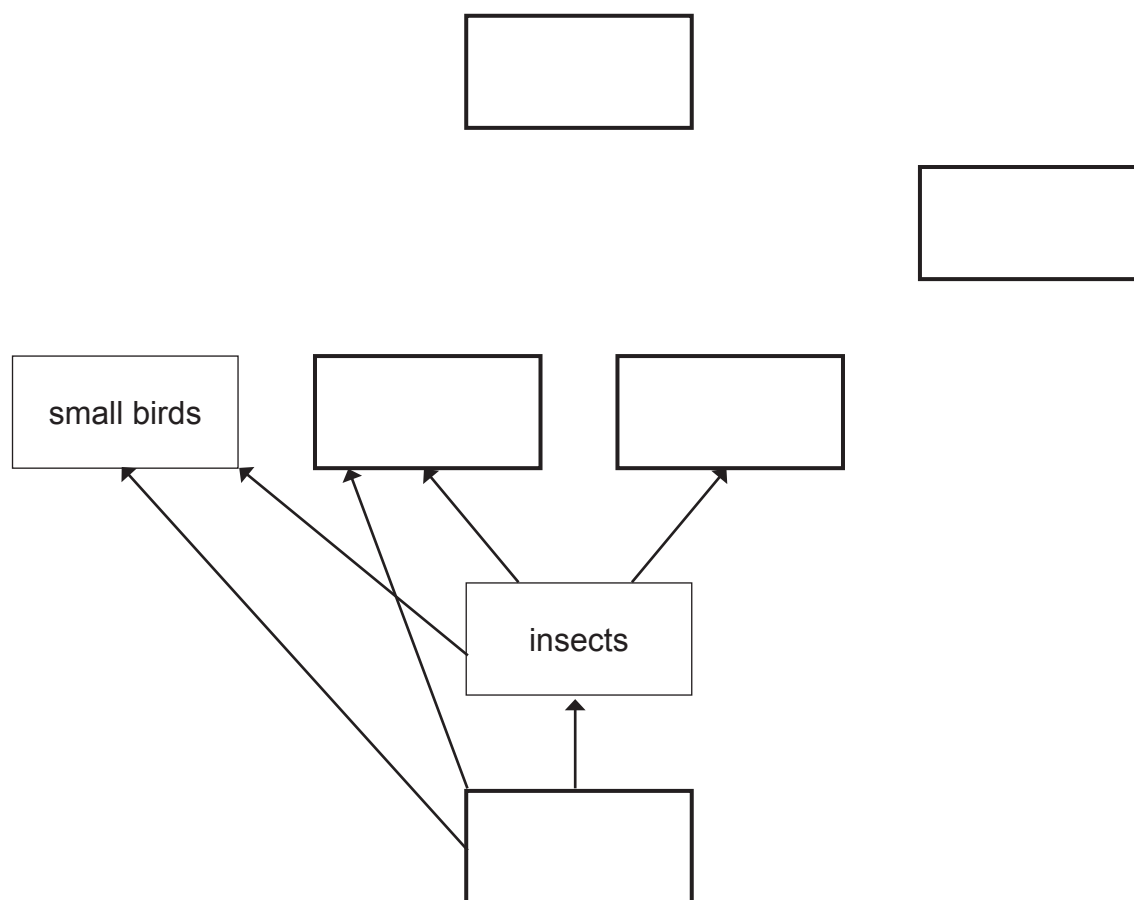
Frogs eat insects.

Reptiles eat frogs, insects and mice.

Marsh Harriers eat mice, small birds, insects, reptiles and frogs.



- (a) Use the statements to complete the food web.
Add the names of the organisms into the empty boxes.
Add arrows to show the direction of energy flow between the organisms.



[4]

[Turn over



- (b) Measures were put in place between 2000 and 2016 in the U.K. to increase the Marsh Harrier population.

In 2000 there were 302 Marsh Harriers.

In 2016 there were 1286 Marsh Harriers.

- (i) Calculate the percentage (%) increase in the number of Marsh Harriers from 2000 to 2016.

Show your working.

Give your answer to the nearest whole number.

_____ % [4]

Two of the measures taken to increase the number of Marsh Harriers in the U.K. were as follows:

Measure 1. Banning the use of pesticides.

- Pesticides kill insects that eat plants.
- They also can damage the shells of Marsh Harrier eggs.

Measure 2. Stopping the draining of some areas of land.

- Draining land destroys areas of marshland.

- (ii) Use **all** the information given to suggest how the measures taken resulted in an **increase** in the Marsh Harrier population in the U.K.

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



[illegible]

Measure 2. Stopping the draining of some areas of land.

(c) Hunting of Marsh Harriers was also banned.
Suggest how this measure brought about an increase in the Marsh Harrier population over this period of time.

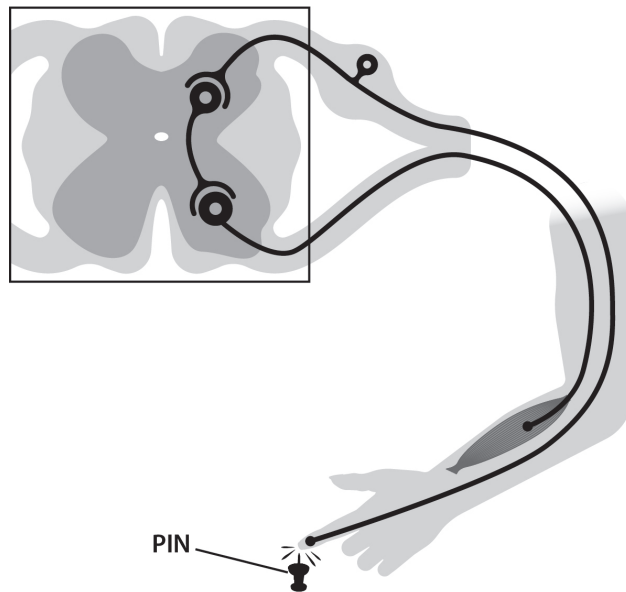
[1]
[Turn over

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24GDW1209

4 The diagram shows a reflex arc.



(a) Label the effector on the diagram above with a line labelled E. [1]

(b) Name the part of the central nervous system inside the box on the diagram. [1]

(c) How many synapses are in **this** reflex arc? [1]

(d) Name the second neurone in **this** reflex arc. [1]





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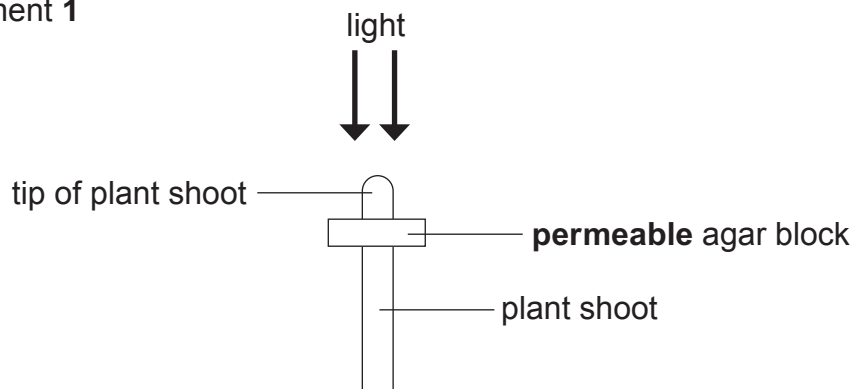
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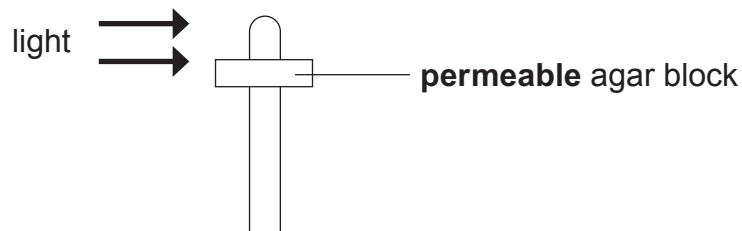
24GDW1211

- 5 A student carried out three experiments into phototropism. The diagrams show the set up of these experiments.

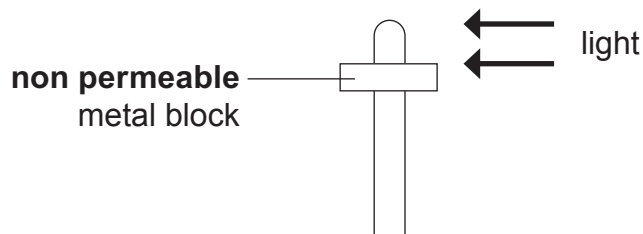
Experiment 1



Experiment 2



Experiment 3



Agar is a permeable, jelly-like substance.
The plant shoots were left in the light for three days.

- (a) Describe the appearance of the plant shoot in experiment 2 after three days.

[2]



The table contains statements about the plant shoots in these experiments.

Statement about plant shoots	Letter
hormone is produced in the tip	A
hormone passes through the block	B
hormone cannot pass through the block	C
even cell elongation	D
uneven cell elongation	E
more cell elongation on the left hand side	F
more cell elongation on the right hand side	G
cell elongation does not occur	H

- (b) Choose the letters of the statements that describe what happens inside the plant shoot in each experiment **1**, **2** and **3**.

Write your answers on the blank lines in the table.

The first letter has been completed for you.

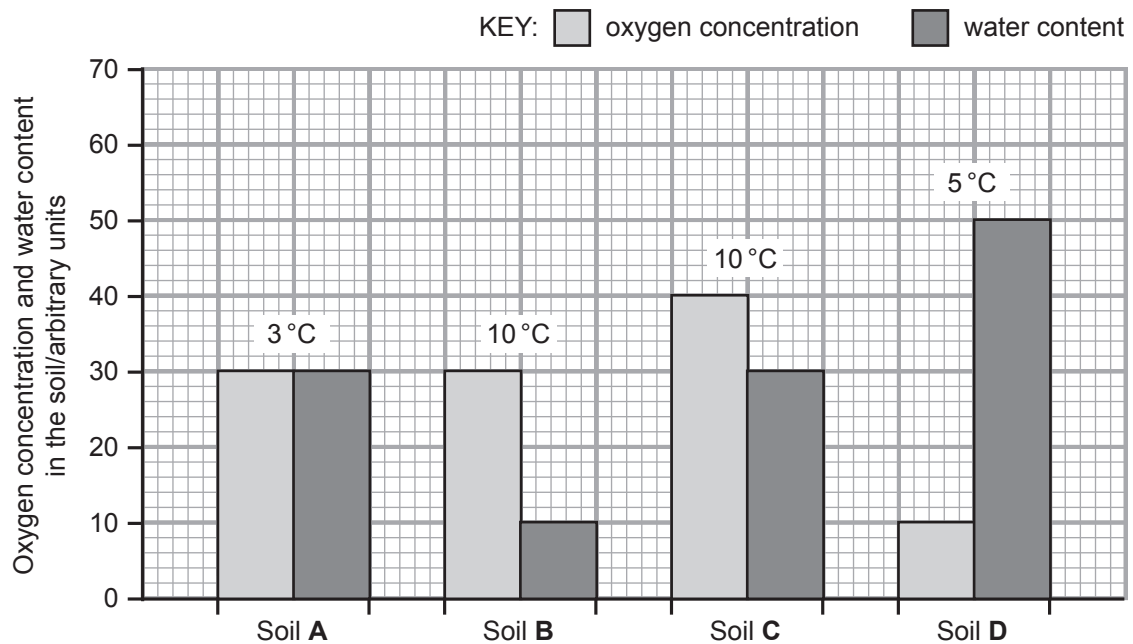
Statements may be used once, more than once, or not at all.

	Experiment	Letters of statements that describe what happens inside each plant shoot	
(i)	1	<u> A </u> <u> </u> <u> </u>	[2]
(ii)	2	<u> A </u> <u> </u> <u> </u> <u> </u>	[2]
(iii)	3	<u> A </u> <u> </u> <u> </u>	[2]

[Turn over



- 6 The bar chart shows information about oxygen concentration, water content and temperature in four different soils, **A**, **B**, **C** and **D**.
Soil with a water content above 32 arbitrary units is waterlogged.



- (a) Soil **C** gives the best conditions for **decomposition**.
Use the information in the bar chart to suggest why.

[3]



A farmer decided to grow wheat in a field containing soil **C**.

He needed to increase the amount of nitrogen fixation in the soil.

To prepare the soil, the farmer needed to choose a plant with nitrogen fixing bacteria in its root nodules.

The table shows the amount of nitrogen fixation carried out by four different types of plant.

Plant	Amount of nitrogen fixation in the root nodules/arbitrary units
clover	100–150
pea	50–100
alder	50–150
alfalfa	150–300

- (b) Which type of plant should the farmer grow to prepare the soil for the wheat?
Explain your answer.

Type of plant _____

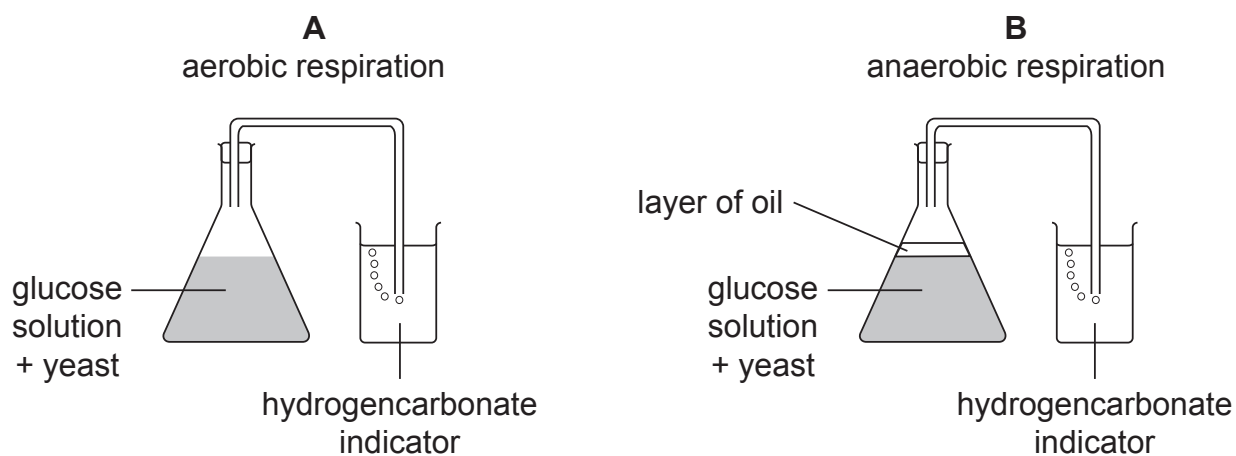
Explanation _____

_____ [4]

[Turn over



- 7 (a) Respiration in yeast can be aerobic or anaerobic. The diagrams show two sets of apparatus, **A** and **B**, a student used to investigate each type of respiration.



- (i) Name the substance produced in apparatus **A** that is **not** produced in apparatus **B**.

[1]

- (ii) Name the substance produced in apparatus **B** that is **not** produced in apparatus **A**.

[1]

- (b) Hydrogencarbonate indicator is used to show respiration is occurring.

- (i) Give the colour change of the hydrogencarbonate indicator during the investigation.

_____ to _____

[2]



- (ii) The hydrogencarbonate indicator changes colour **faster** in apparatus **A**. Suggest why.

[2]

- (iii) Suggest how you can tell when respiration stops.

[1]

- (iv) Suggest why respiration would eventually stop in **both** sets of apparatus.

[1]

- (c) Complete the word equation for anaerobic respiration in mammalian muscle.

glucose →

[1]

[Turn over



- 8 A pollution event occurred after nitrates entered a river from an outflow pipe. This caused eutrophication.

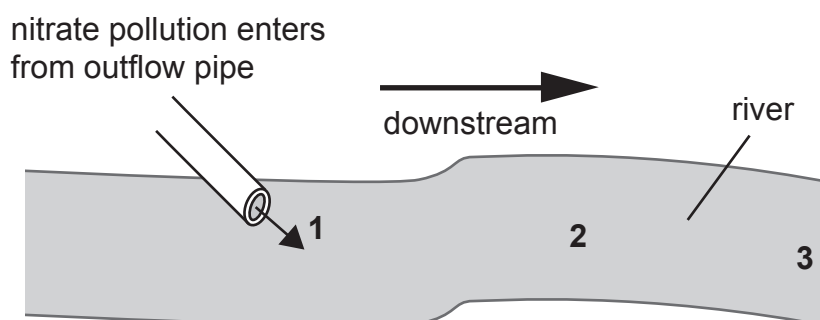
(a) Give **two** possible sources of nitrates entering a river.

1. _____

2. _____

[2]

(b) The diagram below shows the river where the pollution event occurred. Nitrates entered the water at point 1.



The table gives the nitrate level at three points 1, 2 and 3 along the river.

Point	Nitrate level/ arbitrary units
1	30
2	15
3	0

(i) Name the type of organism which causes the change in **nitrate** level between points 1 and 3.

[1]

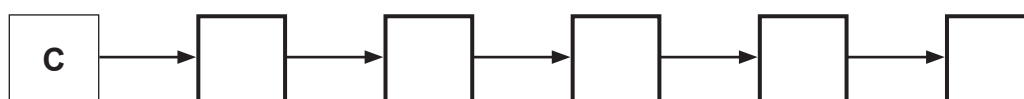


The steps in eutrophication are given in the table.
They are **not** in the correct order.

Step	What happens in each step
A	aquatic animals die
B	oxygen levels in the river become low
C	plants and algae die
D	plants and algae are decomposed
E	oxygen is used by bacteria
F	bacteria respire

(ii) Write a letter in each of the empty boxes to give the correct order of the steps in eutrophication.

The first box has been completed for you.



[3]

After this pollution event, no more nitrates entered this river and gradually the river started to return to normal.

(c) Suggest how the amount of rainfall could affect the **rate** of recovery from eutrophication in this river.

Explain your answer.

[2]

[Turn over



9 A student investigated photosynthesis.

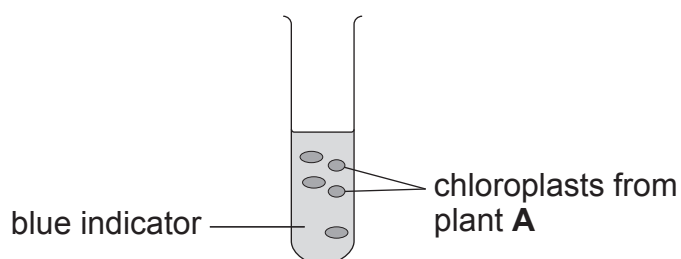
She extracted chloroplasts from the leaves of four different types of plants, **A**, **B**, **C** and **D**.

She set up five boiling tubes containing the same volume of blue indicator.

The student added chloroplasts to tubes **1**, **2**, **3** and **4**.

She placed all the boiling tubes in light.

The diagram shows the contents of boiling tube **1**.



She recorded the time taken for the blue indicator to turn colourless in each boiling tube.

The blue indicator turns colourless when **oxygen** levels are high.

The table shows the student's results.

Boiling tube	Contents	Time taken for the blue indicator to turn colourless/min
1	chloroplasts from plant A and blue indicator	10
2	chloroplasts from plant B and blue indicator	3
3	chloroplasts from plant C and blue indicator	7
4	chloroplasts from plant D and blue indicator	5
5	blue indicator	does not turn colourless



(a) Explain the results for boiling tube 5.

[2]

(b) Photosynthesis occurred at different rates in boiling tubes 1, 2, 3 and 4.
List the number of the boiling tubes from the slowest rate to the fastest rate on the lines below.

Slowest rate of
photosynthesis



Fastest rate of
photosynthesis

Boiling tube number

[2]

(c) Use the results of this investigation to suggest which type of plant **A**, **B**, **C** or **D** you would expect to reach its compensation point **earliest** in the day.

(i) Plant _____

[1]

(ii) Explanation _____

[1]

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Question Number	Marks
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