



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

MONDAY 21 NOVEMBER 2022, 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.

13861.06R



24GDW1201

1 The Amazon rainforest is home to many plant and animal species.

The statements give information about some feeding relationships in the Amazon rainforest.

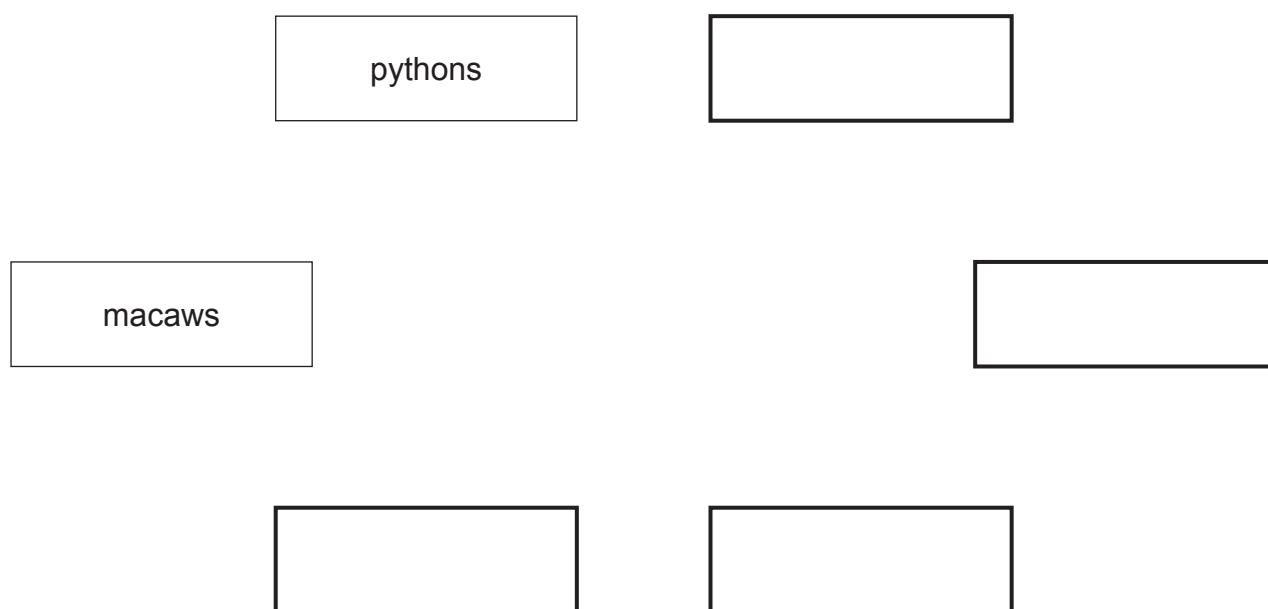
Brazil nut trees and rubber trees carry out photosynthesis.

Macaws and spider monkeys feed on both these trees.

Pythons are predators of macaws.

Jaguars feed on macaws and spider monkeys.

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



[4]

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

[1]

(ii) Complete the sentence below.

The organisms that the jaguars feed on are at trophic level _____.

[1]



- (c) Suggest what would happen to the jaguar population if the number of brazil nut trees **and** rubber trees decreased.
Explain your answer.

[3]

- (d) The brazil nut trees and rubber trees **compete** for a variety of abiotic factors.
Give **one** of these abiotic factors.

[1]

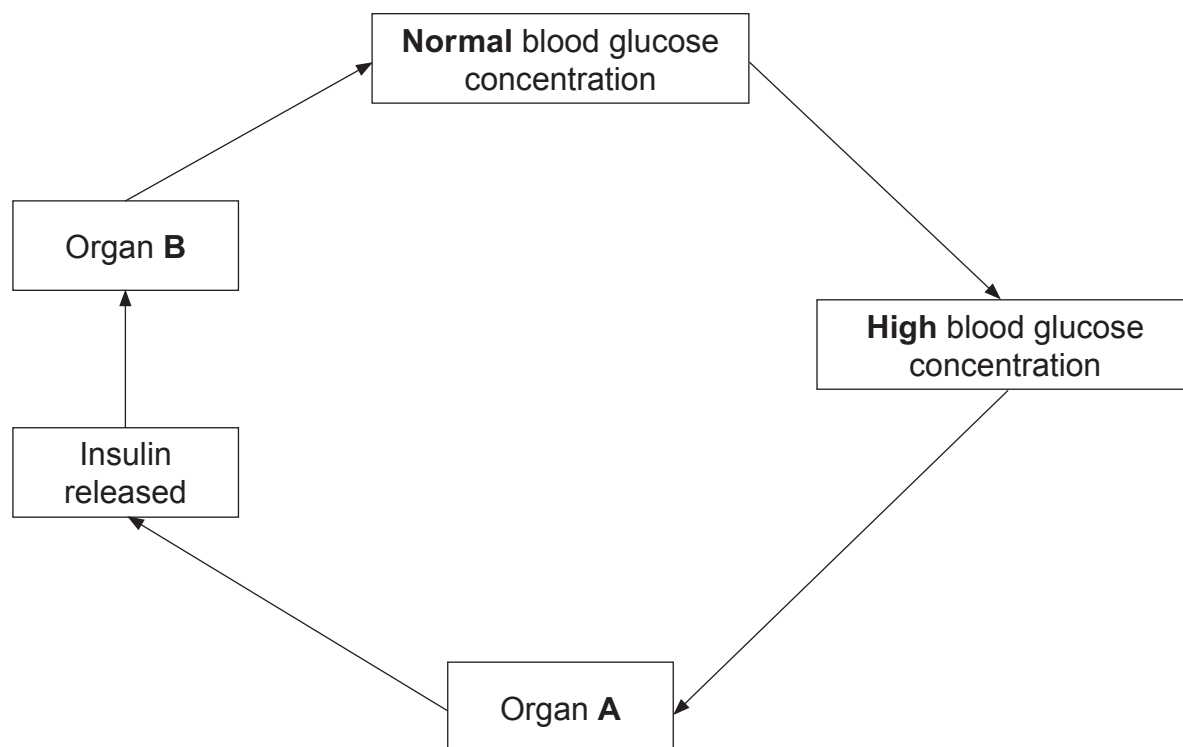
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24GDW1203

- 2 (a) The diagram shows part of the mechanism that controls blood glucose concentration.



- (i) Name organ A.

[1]

- (ii) What type of chemical is insulin?

[1]

- (iii) How does insulin travel to organ B?

[1]

- (b) (i) What effect does insulin have on blood glucose concentration?

[1]



(ii) Give **three** ways insulin acts to cause this effect on blood glucose concentration.

1. _____

2. _____

3. _____ [3]

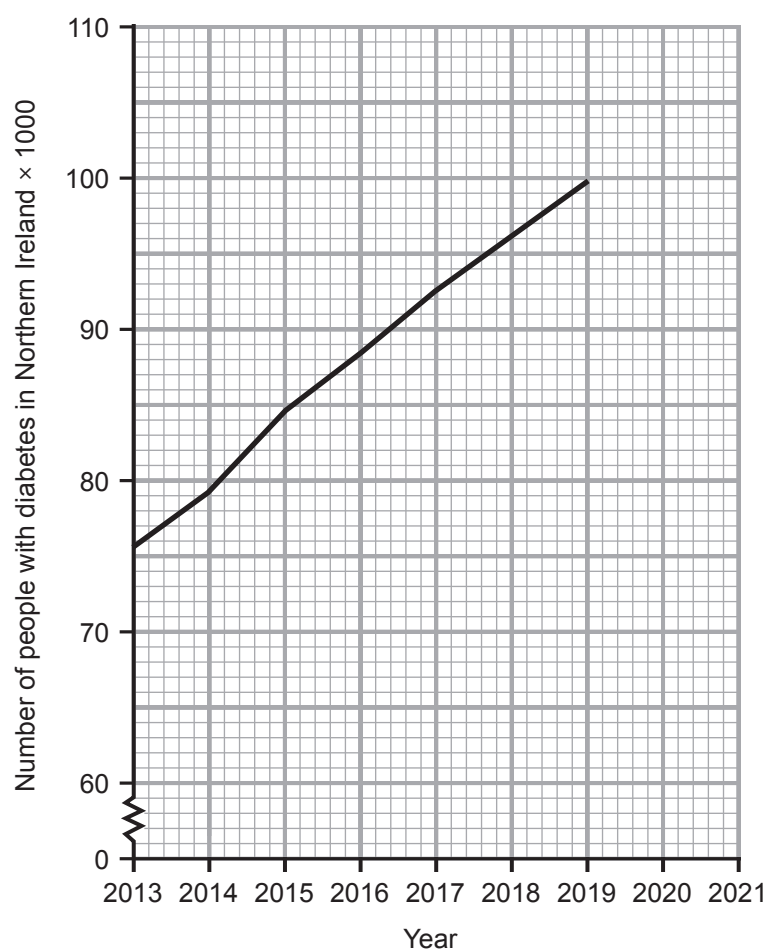
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24GDW1205

- (c) The graph shows the number of people with diabetes in Northern Ireland between 2013 and 2019.



In 2013 there were 75 837 people with diabetes in Northern Ireland.
In 2019 there were 99 833 people with diabetes in Northern Ireland.

- (i) Calculate the percentage (%) increase in the number of people with diabetes in Northern Ireland between 2013 and 2019.

Show your working.

Give your answer to the nearest **whole number**.

_____ % [4]

- (ii) Use a ruler to extend the line on the graph from 2019 to 2021.

Use the line from 2017 to 2019 to help you.

Use the line you have drawn to predict the number of people with diabetes in Northern Ireland in 2021.

_____ thousand [2]

- (d) Suggest a reason for the increase in the number of people with diabetes in Northern Ireland.

_____ [1]

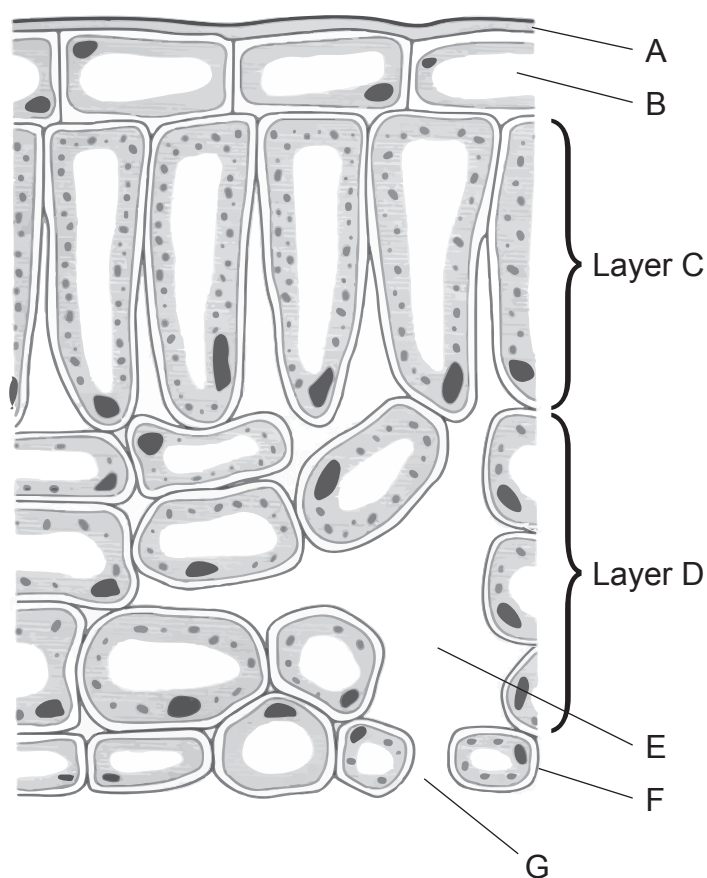
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24GDW1207

3 The diagram shows a cross section of a leaf.



Leaf cells use a gas from the air for photosynthesis.

Name this gas.

Describe how this gas moves from the air outside the leaf to a leaf cell that carries out **maximum photosynthesis**.

You **must** use letters from the diagram in your description.

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



[illegible]

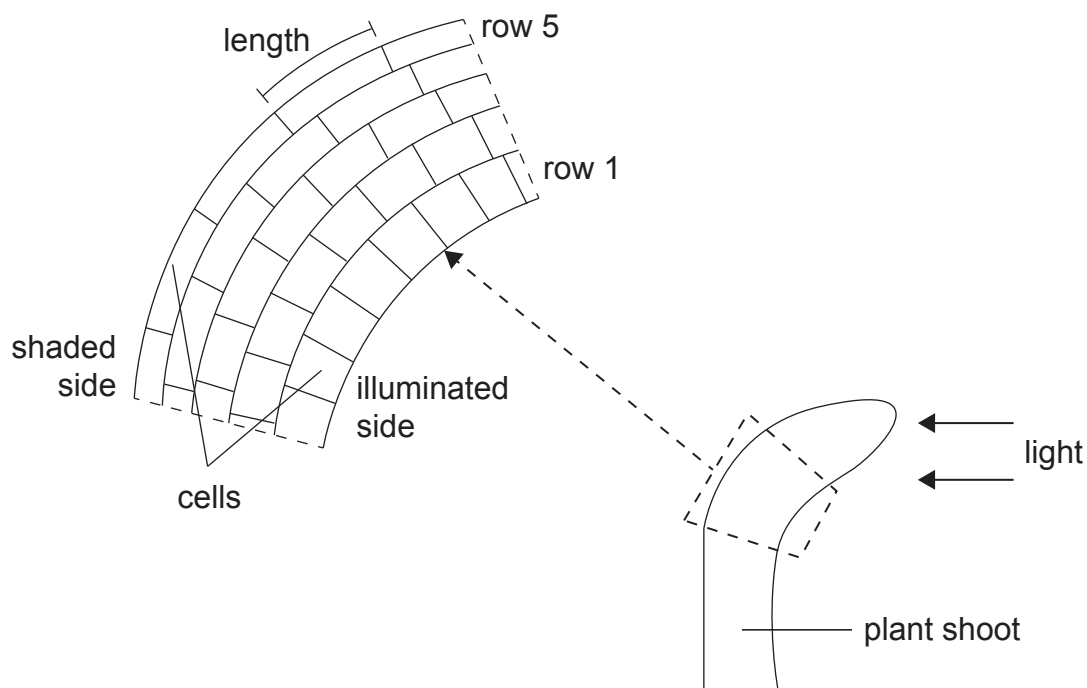
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24GDW1209

- 4 (a) The diagram shows a plant shoot that had light from one direction shining on it, for three days.

Part of the shoot has been magnified to show five rows of cells.



- (i) Name the chemical that causes the differences in the cells shown in the diagram.

[1]

- (ii) Which row of cells contains the **least** amount of this chemical?

[1]



(b) Describe **three** differences between the cells in row 5 and row 1.

1. _____

2. _____

3. _____

[3]

[Turn over

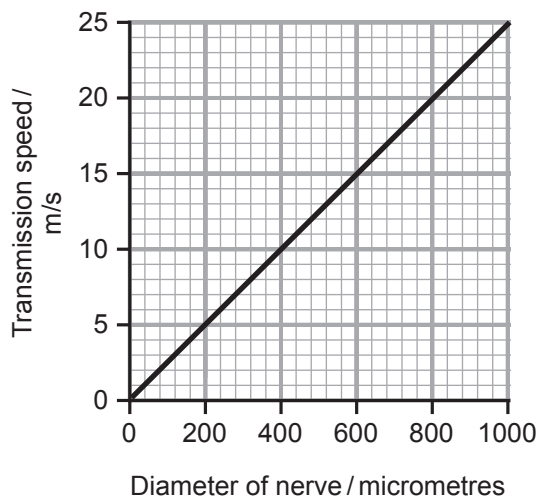
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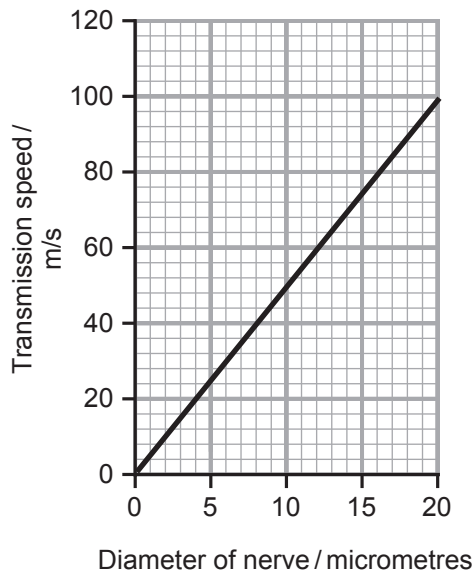
24GDW1211

- 5 The graphs show how the speed of nerve impulse transmission is affected by the diameter of nerves with no covering (Graph 1) and those with a covering (Graph 2).

Graph 1
nerves with **no covering**



Graph 2
nerves with **covering**



- (a) Describe the trend shown in **both** graphs.

_____ [1]

- (b) (i) Use Graph 2 to give the diameter of the nerve that produces a transmission speed of 20 m/s in a nerve **with covering**.

_____ micrometres [1]



- (ii) Use Graph 1 and your answer to (i) to calculate how many **times** greater the diameter of a nerve with **no covering** must be to produce the **same** transmission speed.

Show your working.

_____ times [3]

- (c) Suggest **one** advantage to an organism of having fast speeds of nerve impulse transmission.

_____ [1]

[Turn over



- 6 A scientist investigated the changes in the concentration of lactic acid in the blood of a man when he exercised.

The man breathed normally before exercising.

He pedalled on an exercise bike for 16 minutes, increasing his rate of pedalling every four minutes.

His rate and depth of breathing increased during this investigation.

The concentration of lactic acid in the man's blood was recorded at the end of each period of pedalling.

The table shows the results of the investigation.

Rate of pedalling / arbitrary units	Concentration of lactic acid in the man's blood / arbitrary units
0	0.0
50	0.0
100	0.5
150	1.2
200	2.7

- (a) Suggest why there was no lactic acid in the man's blood for the first two rates of pedalling.

[2]



- (b) (i) Between which two rates of pedalling did the concentration of lactic acid in the man's blood increase the **most**?

_____ and _____ [1]

- (ii) Suggest **why** the concentration of lactic acid in the man's blood kept increasing when his rate of pedalling increased from 100 arbitrary units.

_____ [3]

[Turn over

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24GDW1215

- 7 Waterlogged soils lack oxygen.
These soils contain a large number of denitrifying bacteria.

(a) Describe and explain the effect of a large number of **denitrifying bacteria** on the amount of nitrates in a waterlogged soil.

[2]

(b) Why is less nitrogen from the air converted to nitrates in a waterlogged soil?

[1]

(c) In a waterlogged soil there are few decay bacteria.
Describe how this would result in less nitrates in the soil.

[2]





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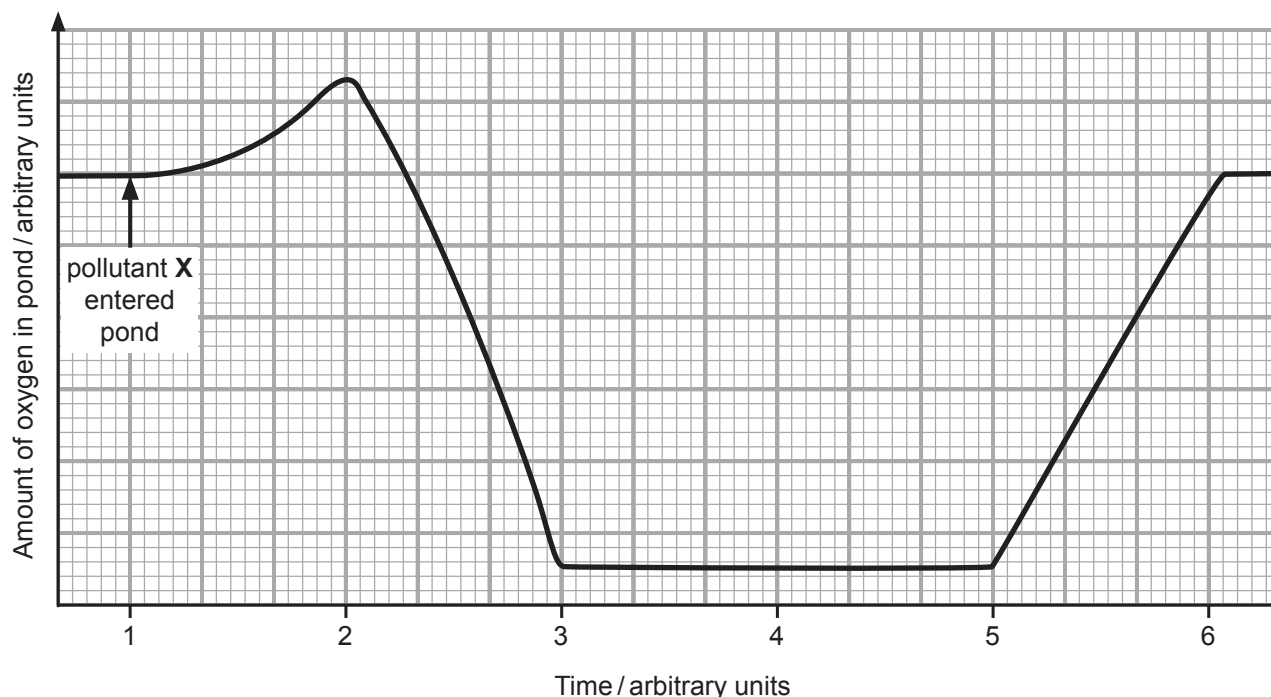
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24GDW1217

- 8 Pollutant **X** entered a pond at time 1, as shown on the graph. The graph also shows the amount of **oxygen** present in the pond when the pollutant entered, and at five other times.



There was a small number of water plants in the pond before pollutant **X** entered.

- (a) Circle the letters of the **two** statements that best explain the change in the amount of oxygen in the pond between times **1** and **2**.

[2]

A	The amount of photosynthesis in the water plants increased .
B	The amount of photosynthesis in the water plants decreased .
C	The same amount of photosynthesis occurred in the water plants as had occurred before pollutant X entered.
D	The presence of pollutant X had no effect on the growth of the water plants.
E	The presence of pollutant X caused increased growth of the water plants.
F	The presence of pollutant X caused the water plants to die.



- (b) (i) Describe the overall change in the amount of oxygen in the pond, between times **2** and **5**, after pollutant **X** had entered.

[1]

- (ii) Explain how **microorganisms** caused this change in the amount of oxygen in the pond, between times **2** and **5**, after pollutant **X** had entered.

[3]

[Turn over

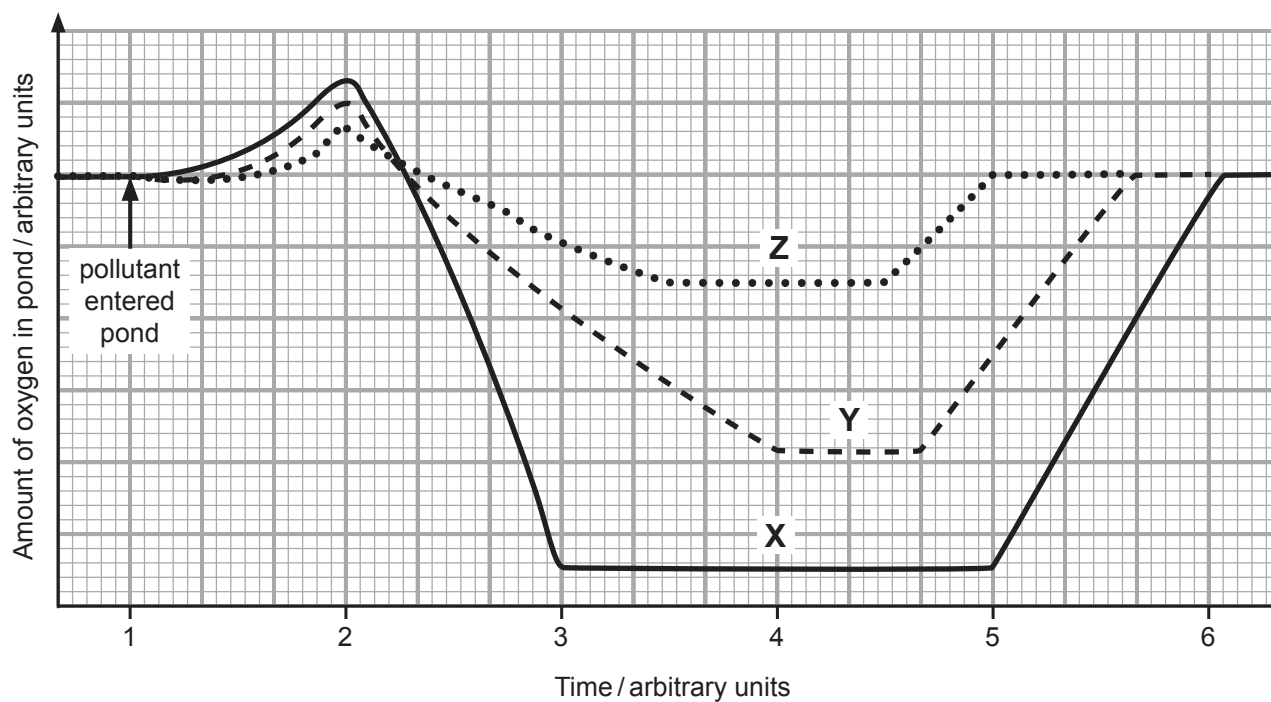
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Two lines have been added to the graph from page 18 to show the effect of another two pollutants, Y and Z, on the amount of oxygen in the pond.

These pollutants entered the pond separately on two other occasions.



(c) Circle the letter of the pollutant that matches each of the following statements.

(i)

Pollutant	
X	caused the fastest rate of decrease of oxygen in the pond.
Y	
Z	

[1]

(ii)

Pollutant	
X	caused the least decrease in the amount of oxygen in the pond.
Y	
Z	

[1]

(iii)

Pollutant	
X	caused the longest time before the oxygen in the pond returned to the original level.
Y	
Z	

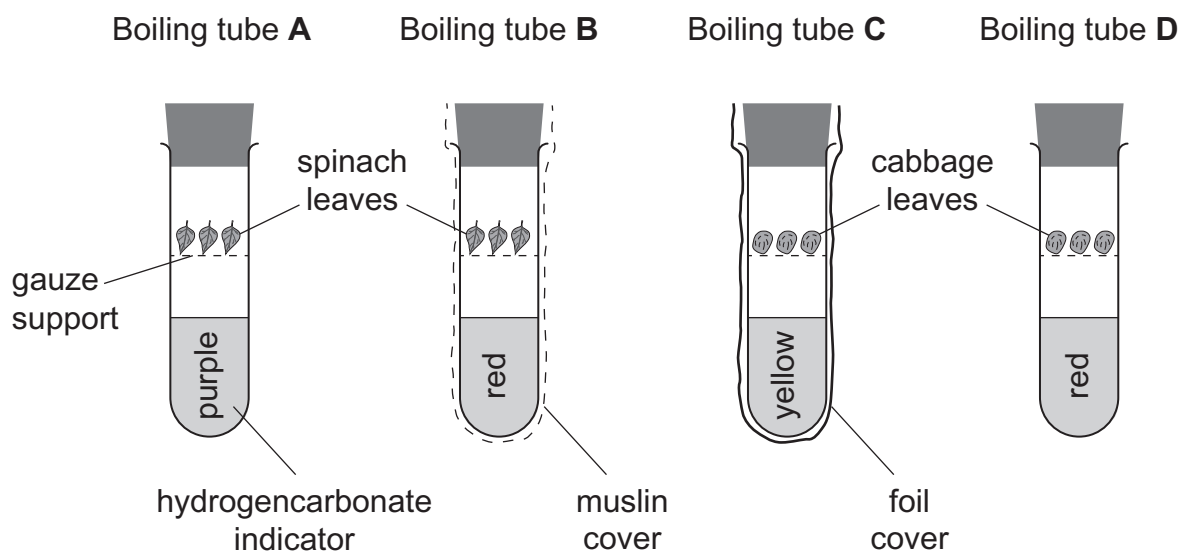
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- 9 The diagram shows four boiling tubes, **A**, **B**, **C** and **D**.
Two boiling tubes contained spinach leaves and two contained cabbage leaves.
Boiling tubes **A** and **D** were left uncovered but boiling tubes **B** and **C** were covered.

The colour of hydrogencarbonate indicator in each boiling tube after one hour in bright light is shown.



List 1 gives statements about photosynthesis and respiration.
List 2 gives statements about the amount of carbon dioxide.

List 1

Statements about photosynthesis and respiration	
1	Only photosynthesis occurred.
2	Only respiration occurred.
3	The rate of photosynthesis was greater than the rate of respiration.
4	The rate of respiration was greater than the rate of photosynthesis.
5	The rate of photosynthesis was the same as the rate of respiration.

List 2

Statements about the amount of carbon dioxide	
6	More carbon dioxide was taken in than given out.
7	Carbon dioxide was given out but not taken in.
8	The same amount of carbon dioxide was given out as taken in.



- (a) Use the information in the diagram and the lists of statements to complete the table below to explain the colour of hydrogencarbonate indicator in boiling tubes **A**, **B** and **C**.

Give the number of **one** statement from list **1** and **one** statement from list **2** that applies to each of the boiling tubes **A**, **B** and **C**.

Boiling tube	Number of statement from:	
	List 1	List 2
A		
B		
C		

[6]

- (b) Why does having a muslin cover make a difference to the results for boiling tube **B** compared to boiling tube **A**?

[1]

The same mass of spinach and cabbage leaves was used in the boiling tubes.

- (c) What can you conclude about spinach and cabbage leaves, using the results for boiling tube **A** and boiling tube **D**?
Explain your answer.

[2]



SOURCES:

Question 2(c) . . . Data from © Diabetes UK (NI)

Question 3 Chief Examiner

Question 4 Chief Examiner

Question 5 Modified from Physiology/Web <https://images.app.goo.gl/QpkheDiVYizu6WXo8>

Question 8 Chief Examiner

Question 9 Chief Examiner

THIS IS THE END OF THE QUESTION PAPER

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For Examiner's use only	
Question Number	Marks
1	
2	
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4	
5	
6	
7	
8	
9	

Total Marks	
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Examiner Number

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