Rewarding Learning

Centre Number

Candidate Number

General Certificate of Secondary Education
2016–2017

Double Award Science: Biology

GSD12

Unit B1
Higher Tier

[GSD12]

WEDNESDAY 9 NOVEMBER 2016, MORNING

TIME

1 hour.

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 seven** 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 **2(a)**.

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

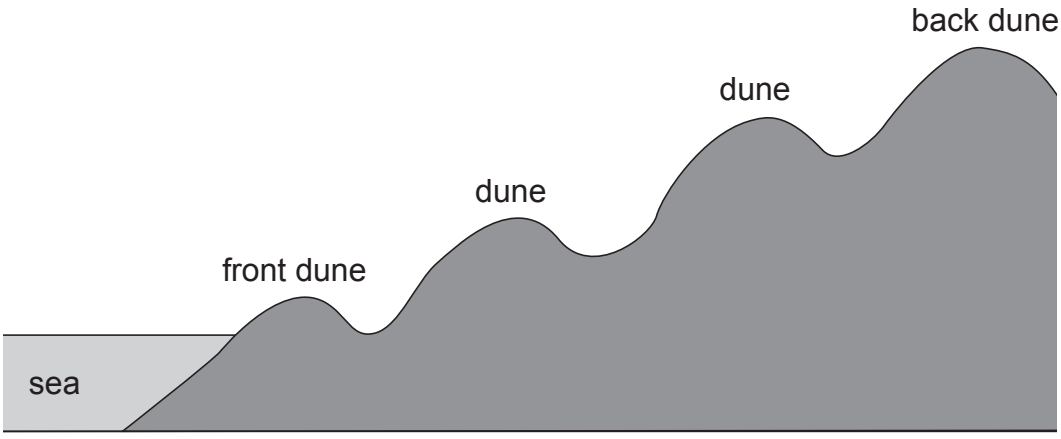
Examiner Only	
Marks	Remark

1 Marram grass is a plant found growing on sand dunes.

The photograph shows marram grass growing on sand dunes.

© Annie Haycock / Science Photo Library

The diagram shows four sand dunes.



Source: Principal Examiner

(a) Describe the method pupils used to carry out an investigation into how the percentage cover (distribution) of marram grass changed from the front sand dune to the back sand dune.

[3]

Examiner Only	
Marks	Remark

Examiner Only	
Marks	Remark

(b) The pupils investigated two abiotic factors.
These were the salt content and the pH of the sand the marram grass was growing in.

The table shows the pupils' results.

Distance from the front sand dune/metres	Percentage cover of marram grass	Salt content/ arbitrary units	pH
0	10	6.5	7.4
8	20	6	7.6
16	33	5.5	7.8
24	40	4.5	7.9
32	50	2.5	8.1
40	5	1.5	7.2

Source: Principal Examiner

Use the results in the table to answer the following questions.

(i) Describe the **trend** in the percentage cover of marram grass from the front sand dune to the back sand dune.

_____

_____

_____ [1]

(ii) Give the salt content and pH of the sand that is best for the growth of the marram grass.

Salt content _____ arbitrary units

pH _____ [2]

(c) What would the pupils have used to measure the pH of the sand?

_____ [1]

(d) Give **one biotic** factor that may affect the distribution of the marram grass in the sand dunes.

_____ [1]

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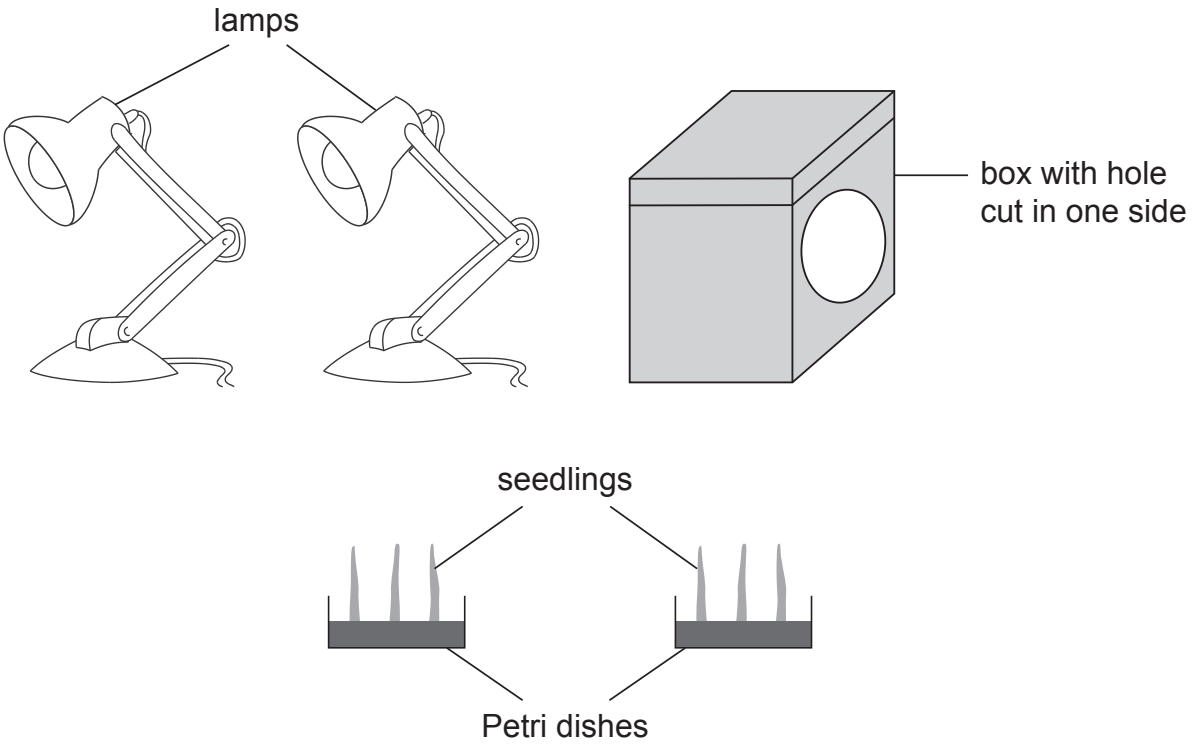
(Questions continue overleaf)

Examiner Only	
Marks	Remark

2 The growth response of a plant to light is called phototropism.
Cathy was asked to carry out an experiment to compare the **growth response** of plant seedlings to light shining from above and to light shining from one side.

(a) Describe how she would use the apparatus and materials in the diagram to carry out this experiment.



Source: Principal Examiner

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

Examiner Only

Marks	Remark

[6]

(b) Describe the results you would expect Cathy to obtain.

[2]

(c) Give **two** factors she would have controlled in this experiment.

1. _____

2. _____ [2]

(d) **(i)** Which part of the seedlings responds to light?

[1]

(ii) Name the plant hormone which causes this response to light.

[1]

Examiner Only
Marks | Remark

3 **(a)** When the leaves of trees drop to the ground they are decomposed by various types of fungi.
These fungi produce enzymes to break down the different substances in the leaves.
Table 1 gives information about three types of fungi and the enzymes they produce.

Table 1

Fungus	Enzyme produced	Substance broken down by enzyme
Type 1	Lignase	Lignin, a woody substance in plant cell walls
Type 2	Amylase	Starch, found in leaf cells
Type 3	Cellulase	Cellulose, found in plant cell walls

Table 2 shows the percentage of substances **remaining** in the decomposing leaves over a period of 15 weeks.

Table 2

Time/weeks	Percentage of substance **remaining**/%		
	Lignin	**Starch**	**Cellulose**
0	100	100	100
5	100	70	100
10	100	40	80
15	90	10	60

Source: Principal Examiner

(i) Use the information in **Table 2** opposite to suggest which substance will take the **longest** time to be broken down.

Substance _____

Explain your answer using **data** from **Table 2**.

_____

_____

_____

_____ [3]

(ii) Use the information in **Tables 1** and **2** opposite to give the **type of fungus** that gave the fastest rate of substance breakdown in the leaves.

Type _____ [1]

(iii) Use the data in **Table 2** opposite to calculate the rate of breakdown of starch **per week** in the leaves over the 15 week period.

Show your working.

_____ % per week [2]

(iv) What substance will be produced when amylase breaks down starch in the leaves?

_____ [1]

Examiner Only	
Marks	Remark

Examiner Only	
Marks	Remark

(b) Other fungi and bacteria continue to decompose the leaves. This results in minerals being released into the soil.

(i) Name the plant cells that absorb minerals from the soil.

_____ [1]

(ii) Name **another** substance, apart from minerals, that these cells absorb from the soil.

_____ [1]

(iii) What substance do plants make from the nitrates they absorb from the soil?

_____ [1]

(c) **(i)** State **three** features that give the small intestine a large surface area for the absorption of digested foods in humans.

1. _____

2. _____

3. _____ [3]

(ii) Other than having a large surface area, give **two** adaptations of respiratory surfaces in humans.

1. _____

2. _____ [2]

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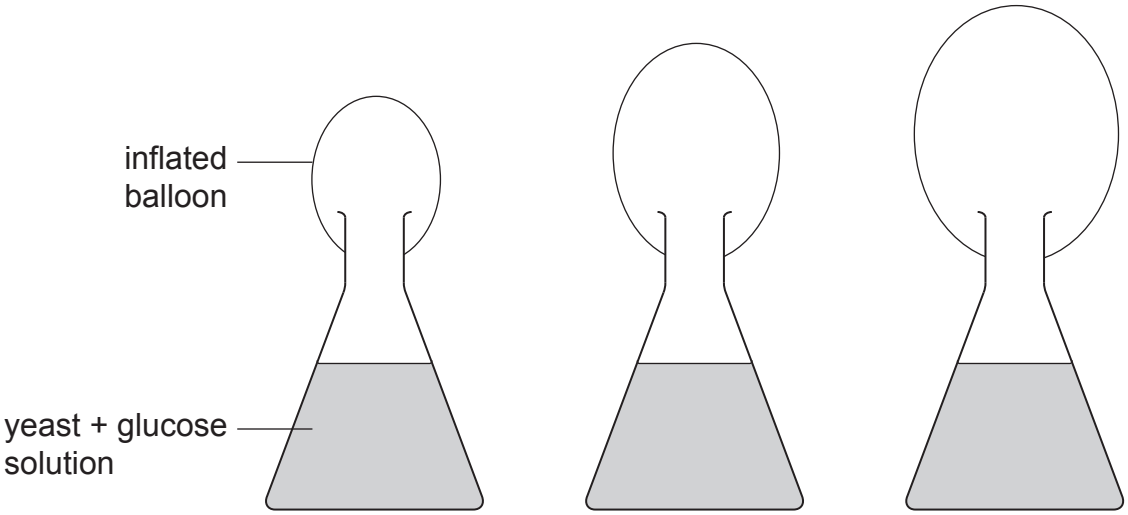
(Questions continue overleaf)

Examiner Only	
Marks	Remark

4 Paula carried out an investigation into the effect of temperature on the growth of yeast.
She added an equal amount of a yeast and glucose solution to each of three flasks.
Paula then attached a deflated balloon to the top of each flask.
She kept the flasks at the temperatures shown on the diagram for four hours.

The diagram shows the results Paula obtained.



Source: Principal Examiner

(a) Explain why the balloon in flask 3 had the **biggest** increase in size.

_____

_____

_____

_____

_____

_____

_____ [3]

Examiner Only	
Marks	Remark

(b) Paula took a sample of the contents of flask 3 at the start of her investigation and again after four hours, when the balloon had stopped inflating.
She carried out a Benedict's test on the two samples.

Describe and explain the results that Paula would have obtained from both samples.

(i) At the start _____

_____

_____

_____

_____ [2]

(ii) After four hours _____

_____

_____

_____

_____ [2]

The yeast carried out anaerobic respiration.
As well as a gas, another substance was produced by the yeast in the flasks.

(c) Name this substance.

_____ [1]

Examiner Only	
Marks	Remark

5 **(a)** The Central Nervous System (CNS) controls and coordinates the responses in the body between the receptors and effectors.

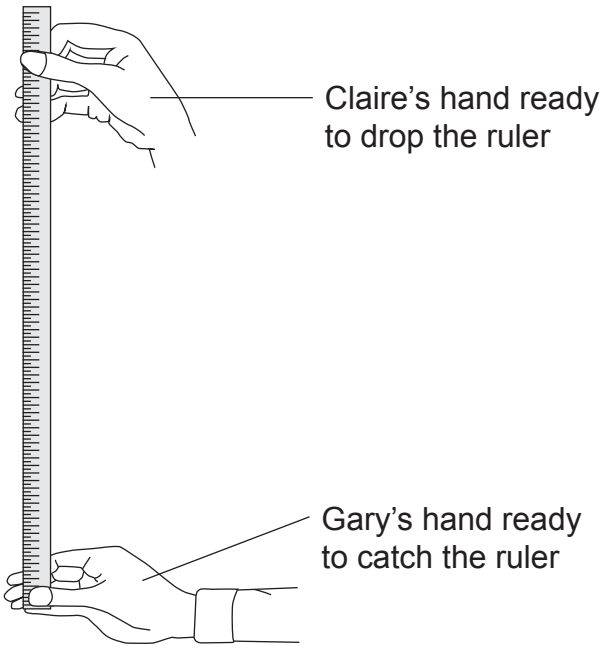
(i) Name the parts of the Central Nervous System (CNS).

_____ and _____ [1]

(ii) Name **one** effector in the body.

_____ [1]

(b) The diagram shows an experiment two students carried out to measure the time taken to catch a ruler.



Claire dropped the ruler four times and recorded the distance it dropped each time before Gary caught it.
These distances were converted to the time taken to catch the ruler.

The table shows the results.

Ruler drop	Time taken to catch the ruler/s	
1	0.168	
2	0.165	
3	0.120	
4	0.169	
	Average time	0.156

(i) The result from ruler drop 3 made this experiment less reliable.
Explain why.

_____

_____

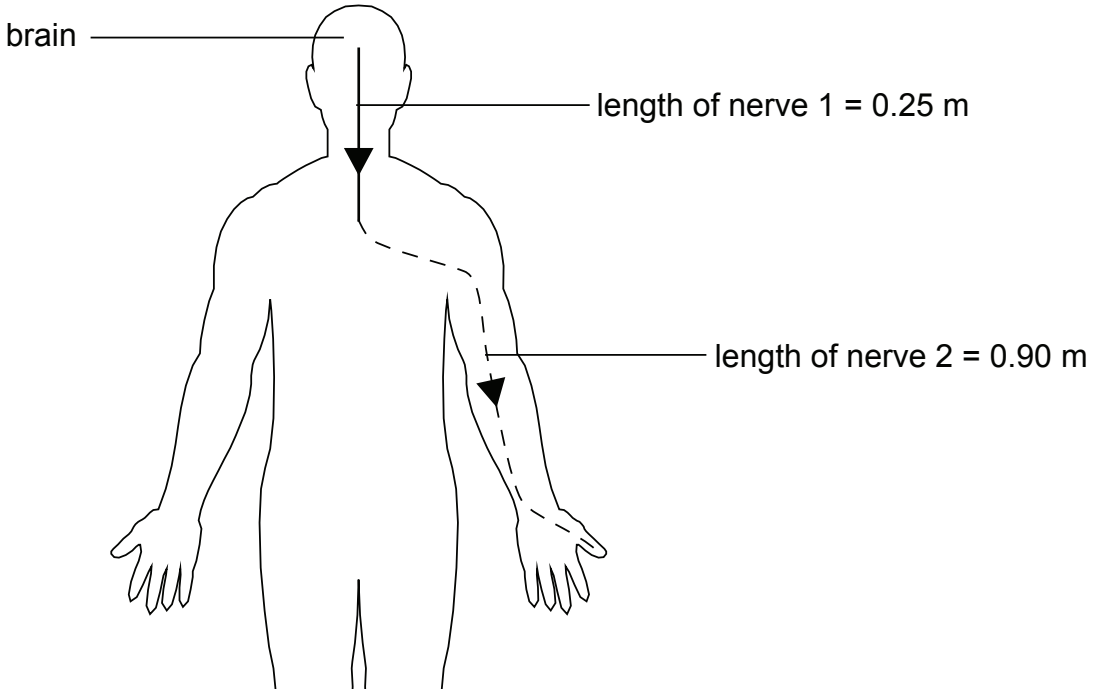
_____ [1]

Examiner Only

Marks	Remark

Examiner Only	
Marks	Remark

The diagram shows the approximate lengths of Gary's nerves involved in catching the ruler.



Source: Principal Examiner

The speed of a nerve impulse can be obtained using the equation

$$\text{Speed m/s} = \frac{\text{Distance travelled by the impulse along the nerves}}{\text{Time}}$$

The average time taken for Gary to catch the ruler was 0.156 s.

(ii) Use this average time and the information above to calculate the speed of Gary's nerve impulse when catching the ruler.
Give your answer to two decimal places.

Show your working.

_____ m/s [2]

(c) The nervous system is one communication system in the body.

Name another communication system in the body.

_____ [1]

Examiner Only	
Marks	Remark

Examiner Only	
Marks	Remark

6 Phytoplankton are small plants found in ponds, lakes and seas.
Zooplankton are small animals which feed on the phytoplankton.
The food chain in a lake is given below.

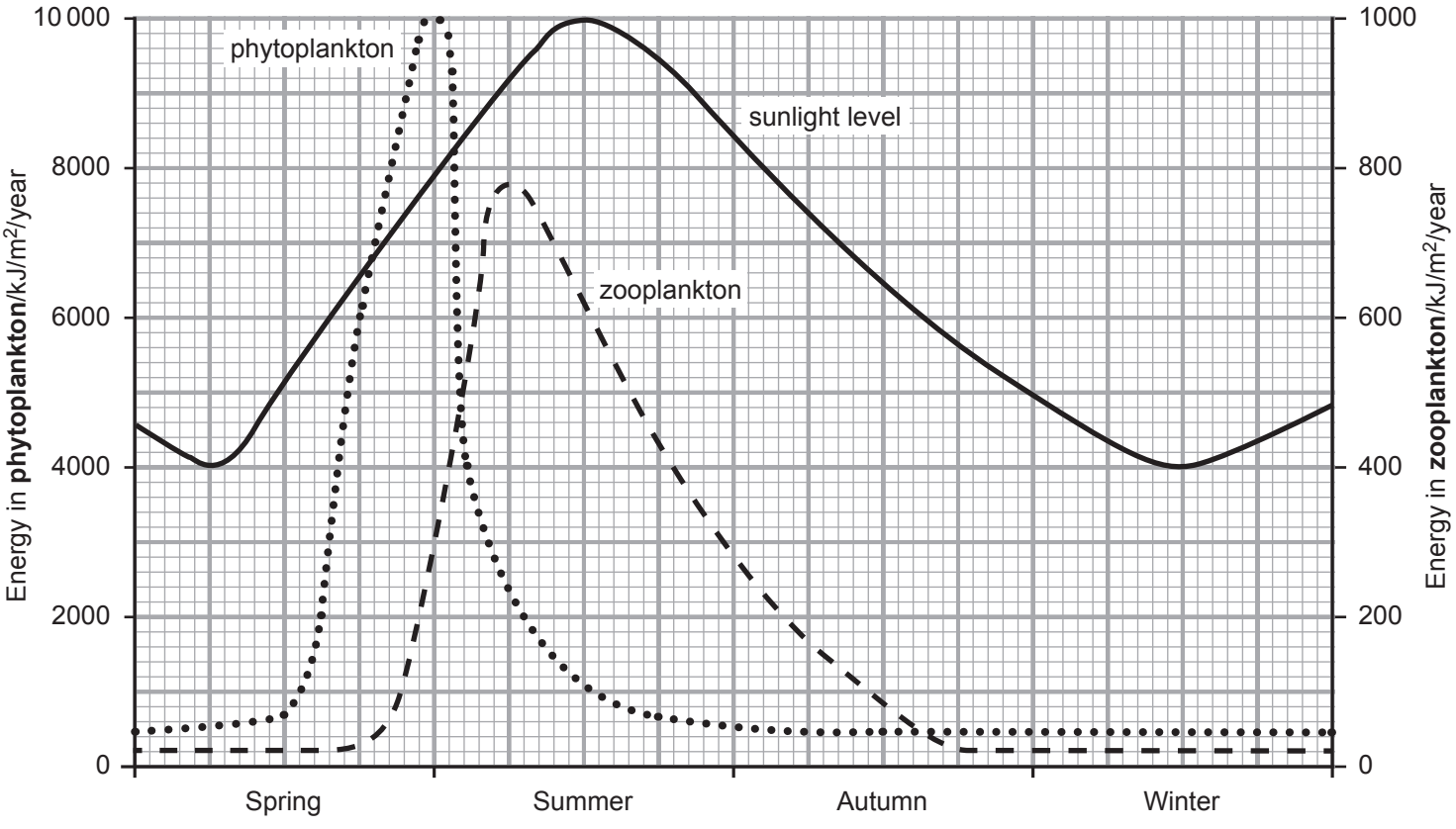
phytoplankton ⟶ zooplankton ⟶ small fish ⟶ large fish

(a) Suggest **one** reason why very little of the sunlight energy reaching the lake is converted into energy in the phytoplankton.

_____

_____ [1]

(b) The graph shows data for the amount of **energy** (kJ/m^2) in a lake in one year for phytoplankton and zooplankton.
The graph is using **two different scales**.
The graph also shows the sunlight levels.



Source: Principal Examiner

(i) Use the information in the graph and your knowledge to suggest **two** reasons for the increase in **energy** in phytoplankton in the spring of this year.

1. _____

_____

2. _____

_____ [2]

(ii) Use data from the graph to calculate the percentage of the energy in the phytoplankton that is converted to the energy in the **zooplankton** when both are at their maximum values.

Show your working.

_____ % [2]

(iii) Use the information in the graph and the food chain opposite to suggest why the numbers of small fish start to decrease in this lake in late summer/early autumn.

_____

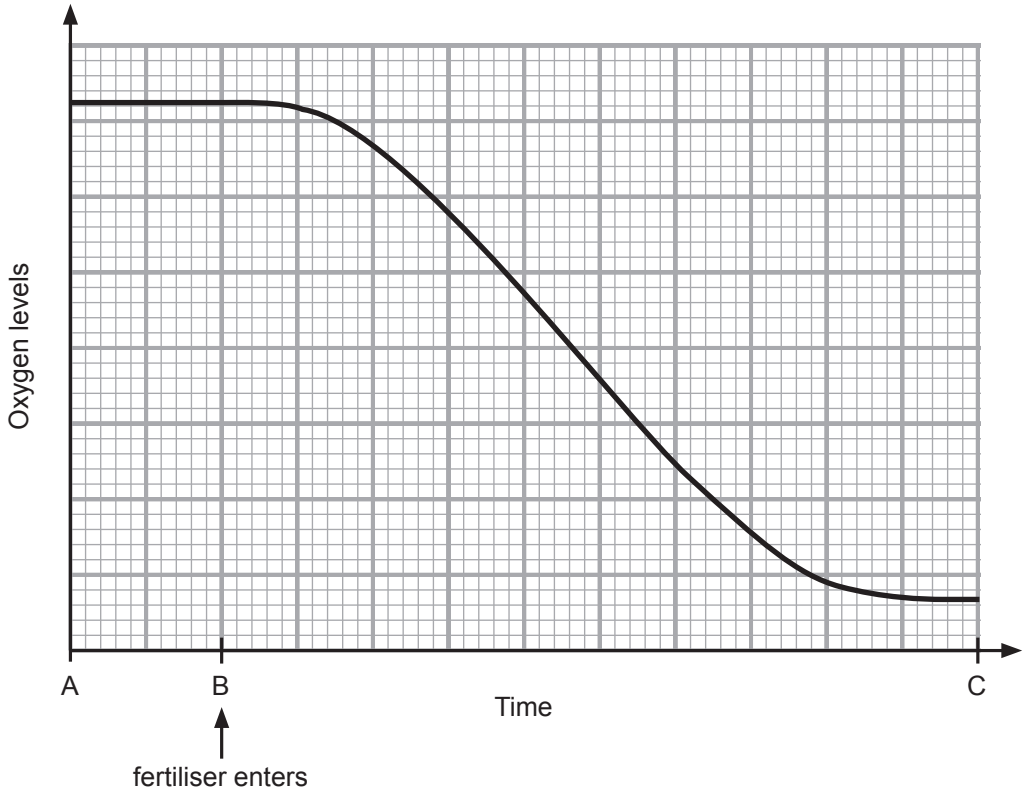
_____

_____ [2]

Examiner Only	
Marks	Remark

Examiner Only	
Marks	Remark

(c) In one other year excess fertiliser entered the lake from nearby fields. The graph shows oxygen levels in the lake before and after the excess fertiliser had entered the lake.



Source: Principal Examiner

(i) Explain what happened in the lake to cause the decrease in oxygen levels between times B and C.

Examiner Only	
Marks	Remark

_____

_____

_____

_____ [4]

(ii) Excess fertiliser entered the lake in the summer.
This had a greater effect on oxygen levels in the lake than if it had entered the lake in the winter.
Explain why.

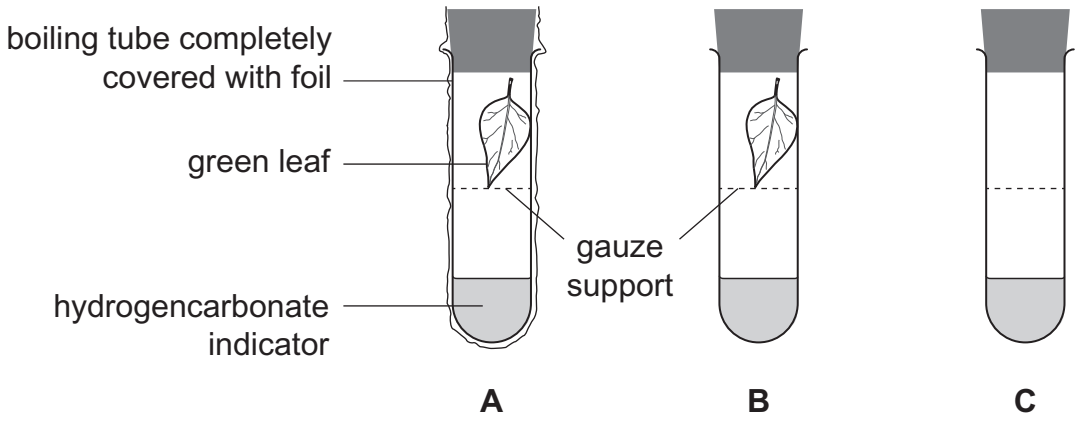
_____

_____

_____ [2]

7 John carried out an investigation into photosynthesis and respiration.
The diagram shows how he set up the investigation.

Examiner Only	
Marks	Remark



He left the boiling tubes for two days **in light** and then recorded the colour of the hydrogencarbonate indicator in each test tube.

Complete the table by writing in the empty boxes.

	Boiling tube	Colour of hydrogen carbonate indicator	Explanation	
(a)	**A**			[3]
(b)	**B**			[3]
(c)	**C**	red		[2]

THIS IS THE END OF THE QUESTION PAPER

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