Rewarding Learning

Centre Number

Candidate Number

General Certificate of Secondary Education
2016–2017

Double Award Science: Biology

Unit B1

Higher Tier

[GSD12]

GSD12

TUESDAY 16 MAY 2017, AFTERNOON

TIME

1 hour.

INSTRUCTIONS TO CANDIDATES

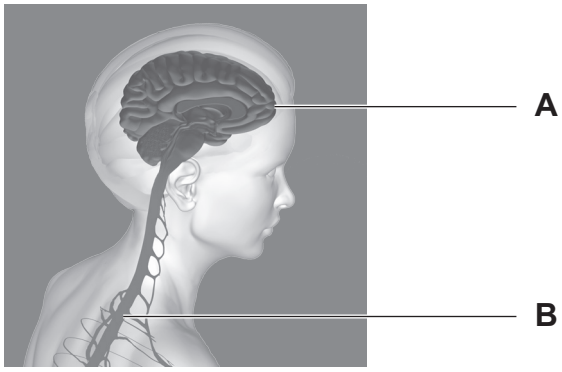
Write your Centre Number and Candidate Number in the spaces provided at the top of this page.
You must answer the questions in the spaces provided.
Do not write outside the boxed area on each page or on blank pages.
Complete in black ink only. **Do not write with a gel pen.**
Answer **all eight** questions.

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 **4(a)**.

10758

1 The nervous system is one communication system in the body.
The central nervous system (CNS) is part of this communication system.
The diagram shows part of the CNS.



(a) Name structures **A** and **B**.

Structure **A** _____

Structure **B** _____ [2]

(b) The hormonal system is the other communication system in the body.

The table gives four options about the hormonal and nervous systems.

Option	Slow or fast response	Chemical messenger in the bloodstream
1	Slow	No
2	Slow	Yes
3	Fast	No
4	Fast	Yes

(i) Choose the option 1, 2, 3 or 4 that correctly describes the **hormonal** system.

_____ [1]

(ii) Choose the option 1, 2, 3 or 4 that correctly describes the **nervous** system.

_____ [1]

2 Diabetes is a condition that occurs when the body cannot control blood glucose levels.
The poster gives some of the common symptoms of diabetes in children.
Two symptoms, **A** and **B**, have been left blank.

Image removed due to copyright

(a) Give symptoms **A** and **B**.

Symptom **A** _____

Symptom **B** _____ [2]

(b) **(i)** Name the hormone produced by the body to control blood glucose levels and name its target organ.

Hormone _____

Target organ _____ [2]

(ii) Give **two** ways this hormone controls blood glucose levels.

1. _____

_____

_____

2. _____

_____

_____ [2]

[Turn over

(c) The table gives information about children with diabetes in England and Wales in 2013–14.

Age Group/ years	**Total number** of children with diabetes	**Percentage** of total number of children who were **newly diagnosed** with diabetes
0–4	1620	25
5–9	5335	14
10–14	10 829	9

(i) Describe the trend for the **percentage** of total number of children who were **newly diagnosed** with diabetes in 2013–14.
Give **data** to support your answer.

_____

_____

_____

_____ [2]

(ii) Calculate the **number** of children in the 0–4 years age group who were **newly diagnosed** with diabetes in 2013–14.

Show your working.

_____ [2]

(iii) Two students, Kim and Mike, each wrote a conclusion based on the data given in the table opposite.

Write a tick (✓) in the box which best describes each conclusion.

	Correct	Incorrect	Cannot tell from the data
Kim wrote: "In the 5–9 years age group, there were only 14 children with diabetes."	☐	☐	☐
Mike wrote: "There were less 13-year-old children than 12-year-old children with diabetes."	☐	☐	☐

[2]

[Turn over

3 **(a)** The red kite is a bird that has recently been re-introduced into Northern Ireland.

The photograph shows a red kite.

© Linda Wright / Science Photo Library

Read the passage about the red kite and answer the questions that follow.

"I watched a red kite flying high above a field in search of a meal. With a twist of its forked tail, the red kite swooped down low for a closer look. After two or three swoops, the red kite carefully landed next to a dead rabbit. Its sharp beak tore at the flesh, while long curved talons held it firm. After its feed, it took off once more, flying high above the hills."

© The Royal Society for the Protection of Birds - Adapted from KS 2/3 Teacher Notes, Activity 6: Adaptation, hunting and feeding

(i) Suggest **one** advantage to the red kite of flying high above the field when searching for a meal.

_____

_____ [1]

(ii) Describe **one** way the red kite is adapted for feeding.

_____

_____ [1]

(b) The population of red kites in Northern Ireland is **14 breeding pairs**.
Each breeding pair has **two** chicks in one breeding season.
Only 50% of the chicks will still be alive at the end of the breeding season.

(i) Calculate the **total number** of red kites expected in the population after one breeding season.

Show your working.

_____ [3]

At the end of each breeding season there were less red kites than expected.

(ii) Suggest **two** reasons why.

1. _____

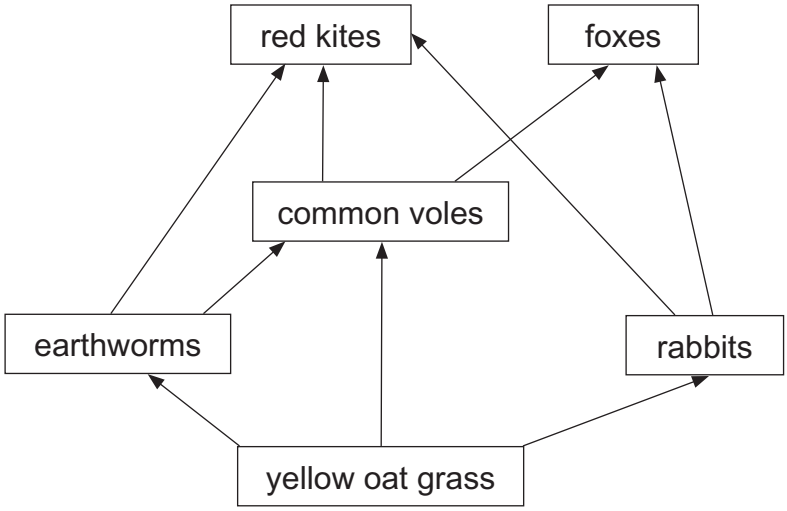
_____

2. _____

_____ [2]

[Turn over

(c) The diagram shows a food web.



Yellow oat grass is a producer.

(i) What is a producer?

_____

_____

_____ [2]

The red kites and foxes feed at two trophic levels.

(ii) Name another organism in the food web that feeds at two trophic levels.

_____ [1]

(iii) Use the information in the food web to draw a food chain containing **four** organisms, including the red kite.

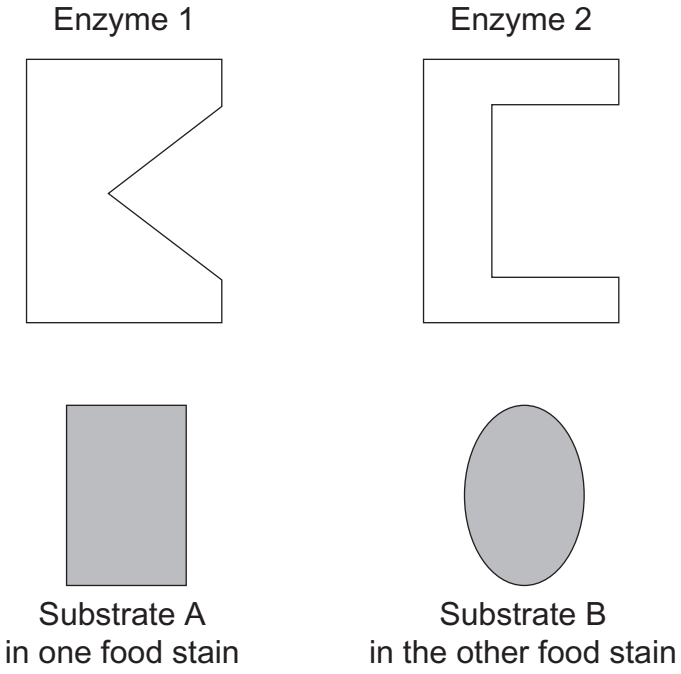
[2]

BLANK PAGE

DO NOT WRITE ON THIS PAGE

(Questions continue overleaf)

4 The diagram shows two enzyme molecules present in a biological washing powder. It also shows two substrate molecules present in two food stains on a shirt.



The shirt was washed using the biological washing powder at 30 °C, as recommended by the manufacturer.

(a) Use the diagram and your knowledge to describe and explain the effect of the biological washing powder on each of the two substrate molecules present in the food stains on the shirt.

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

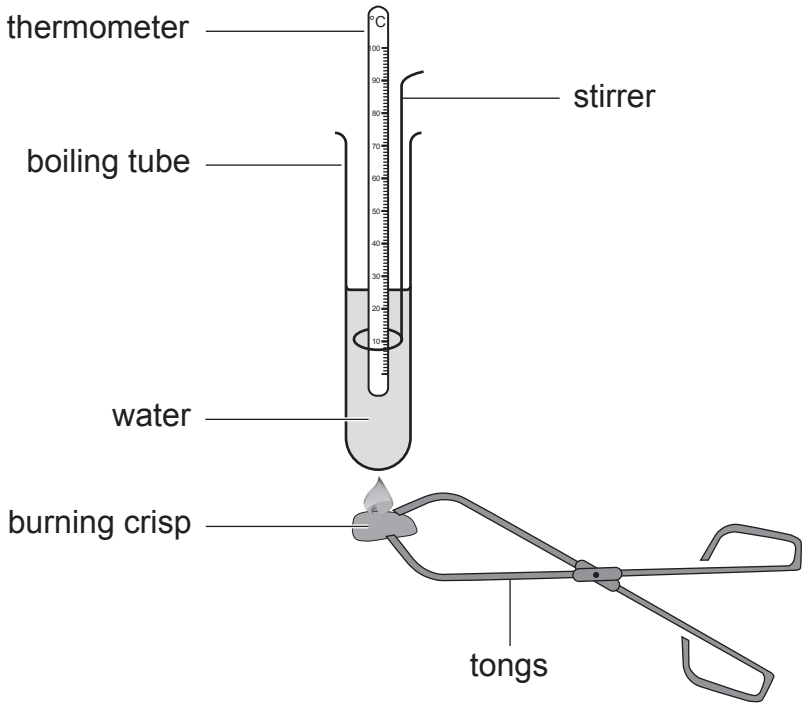
[6]

(b) Explain why the washing powder would **not work** as effectively at 60 °C.

[2]

5 A pupil carried out an investigation to compare the energy content of two types of crisp, baked and fried.

The diagram shows the apparatus she used.



Source: Principal Examiner

The pupil burned each type of crisp and recorded the rise in water temperature.

The mass of each type of crisp used was 1 g.
The volume of water used for each type of crisp was 20 cm^3.

(a) Give **one other** variable which needs to be controlled.

_____

_____ [1]

(b) The table gives some of the pupil's results.

Type of crisp	Rise in water temperature/°C	Energy content of crisp/J
Baked	10	840
Fried		1512

The energy content of each type of crisp is calculated using the following equation.

Energy content of crisp (J) = volume of water (cm^3) × rise in water temperature (°C) × 4.2

(i) Use the equation and data in the table to calculate the rise in water temperature the pupil recorded for the fried crisp.

Show your working.

_____ °C [2]

(ii) Suggest a reason for the difference in the energy content between the baked and fried crisps.

_____

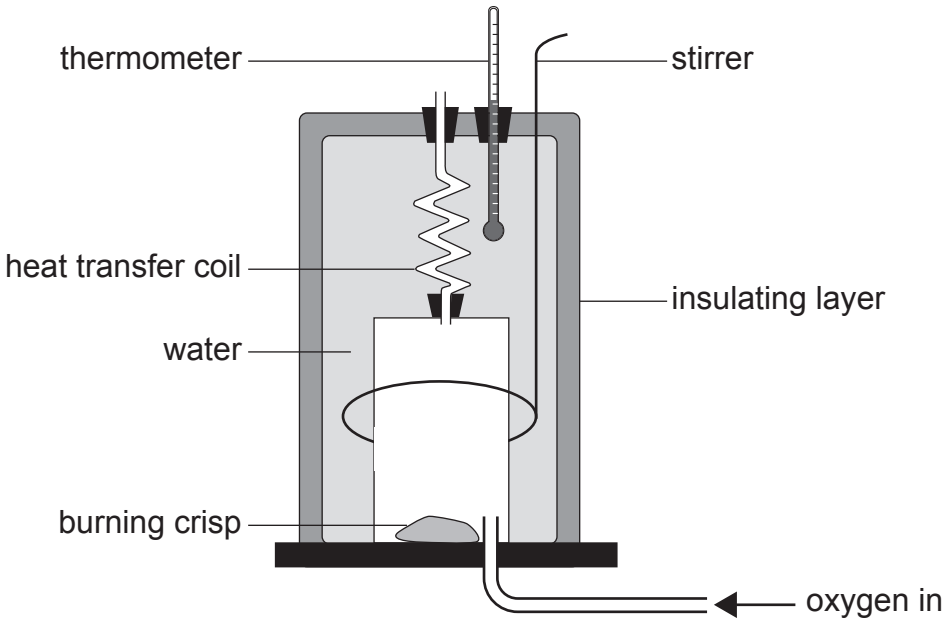
_____

_____ [1]

[Turn over

The energy content calculated for each type of crisp was lower than the energy content given on the crisp packets.

The diagram shows apparatus a manufacturer would use to get more accurate results for the energy content of the crisps.



Source: Principal Examiner

(c) Suggest **two** reasons why this apparatus would give more accurate results for the energy content of the crisps.

1. _____

_____

2. _____

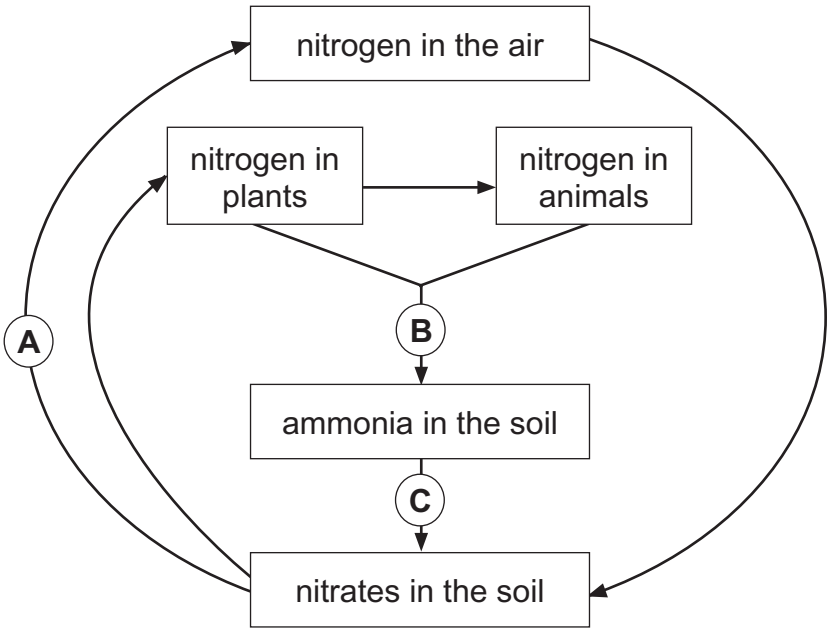
_____ [2]

BLANK PAGE

DO NOT WRITE ON THIS PAGE

(Questions continue overleaf)

6 The diagram shows part of the nitrogen cycle.



(a) The letters **A**, **B** and **C** represent three processes in the nitrogen cycle.
Name processes **A**, **B** and **C**.

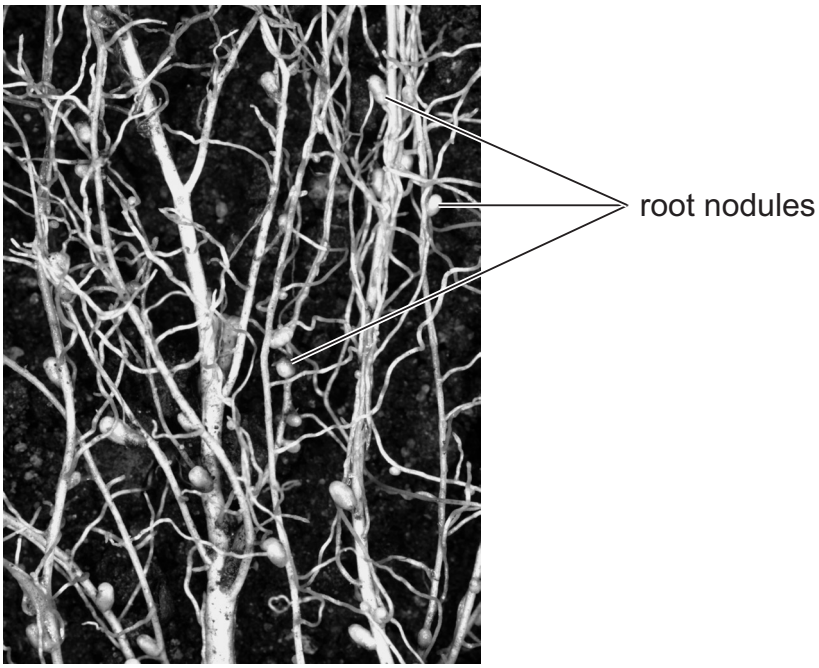
Process **A** _____

Process **B** _____

Process **C** _____ [3]

(b) Clover plants have specialised root structures called root nodules. Root nodules contain nitrogen-fixing bacteria.

The photograph shows root nodules on the roots of a clover plant.



The nitrogen-fixing bacteria in the root nodules benefit from the plant's ability to carry out photosynthesis.

(i) Name **one** substance these bacteria obtain from the clover plant.

_____ [1]

(ii) Explain how root nodules containing nitrogen-fixing bacteria improve the growth of **clover** plants.

_____

_____

_____

_____ [2]

[Turn over

(c) A farmer investigated two methods of increasing nitrate levels in the soil in two fields, A and B.

Field A
The farmer grew clover plants during Year 1.
At the end of Year 1, the clover plants were ploughed back into the soil and left to decompose.

Field B
The farmer left the field fallow during Year 1.
This means no plants were grown in the field during Year 1.

In the spring of Year 2 and Year 3, he planted wheat in both fields.
He harvested the wheat in the autumn of Year 2 and Year 3.

He measured the wheat yield obtained from each field in the autumn of Year 2 and Year 3.

The table shows some of his results.

Field	**Method of increasing nitrate levels in the soil**	**Wheat yield/kg/hectare**			
		Year 1	Year 2	Year 3	Total
A	Grow clover in Year 1	0	2610	1574	4184
B	Leave fallow in Year 1	0			3495

A hectare is an area of land.

(i) Suggest why the wheat yield from Field A was lower in Year 3 than in Year 2.

_____

_____

_____ [1]

(ii) In Field B, 60% of the total wheat yield was obtained in Year 2.
Calculate the wheat yield obtained from Field B in Year 2 and Year 3.

Show your working.

Year 2 _____ kg/hectare

Year 3 _____ kg/hectare [3]

(iii) Use the information given in parts **(b)** and **(c)** and your knowledge of the nitrogen cycle to suggest why Field A had a higher total wheat yield than Field B.

_____

_____

_____

_____

_____

_____

_____

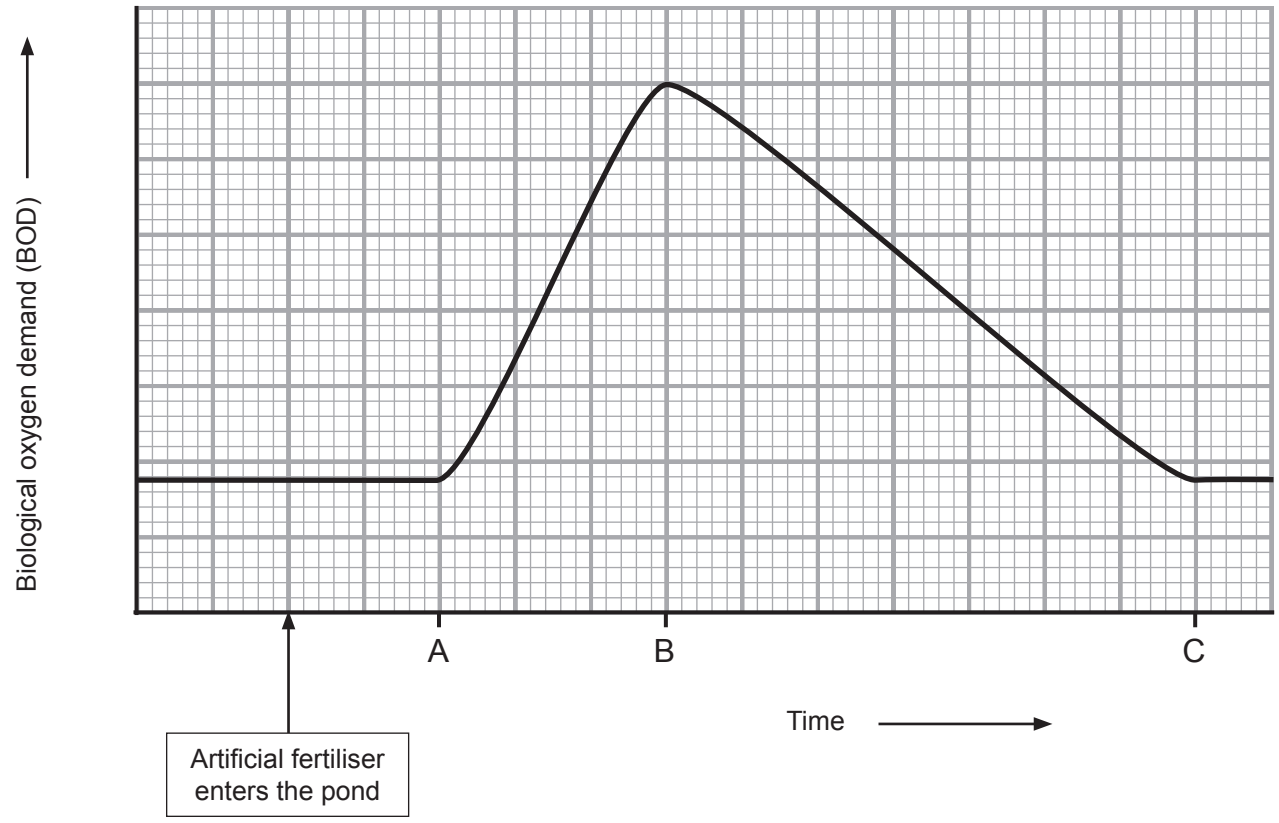
_____

_____ [3]

[Turn over

7 **(a)** Biological oxygen demand (BOD) is a measure of the amount of oxygen used by bacteria in water.
Increased numbers of bacteria result in a higher BOD.

The graph shows the BOD in a pond over a period of time.



Source: Principal Examiner

(i) Name the process that occurs when the artificial fertiliser enters the pond.

_____ [1]

(ii) Artificial fertiliser enters the pond and causes rapid growth of algae.
Use the information given and your knowledge to describe and explain the BOD in the pond between times A and B.

[4]

(b) Describe the change in biodiversity in the pond between times B and C.

[1]

(c) Name an indicator species of water pollution.

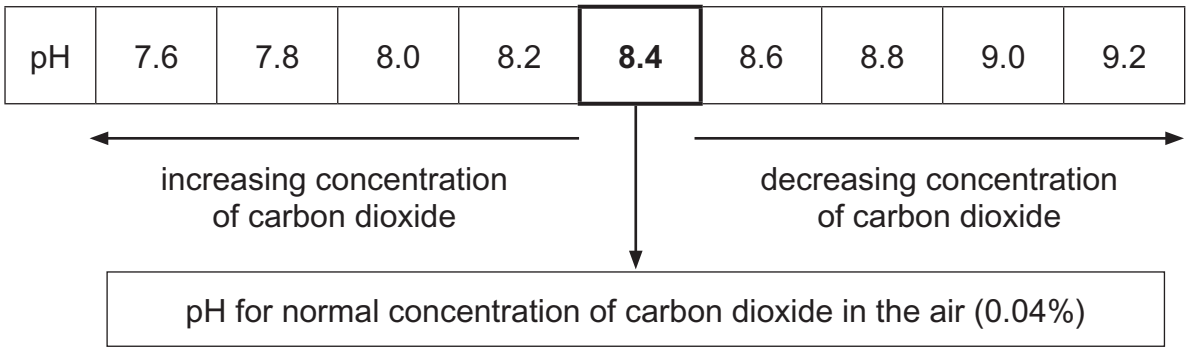
[1]

[Turn over

8 Hydrogencarbonate indicator can be used to monitor the concentration of carbon dioxide.

Diagram 1 shows how the pH of hydrogencarbonate indicator changes as the concentration of carbon dioxide changes.

Diagram 1



Laura investigated photosynthesis and respiration in pondweed in red light, blue light, green light and no light.

Diagram **2A** shows the set-up of Laura's experiment using different colours of light.

Diagram **2B** shows the set-up of Laura's experiment when light is blocked from reaching the pondweed (no light).

Diagram 2A

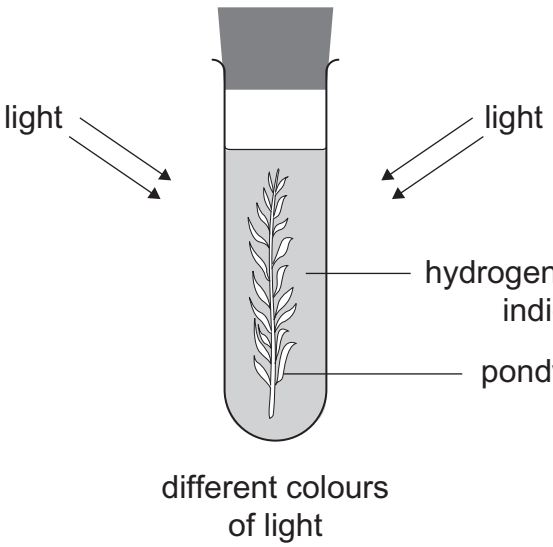
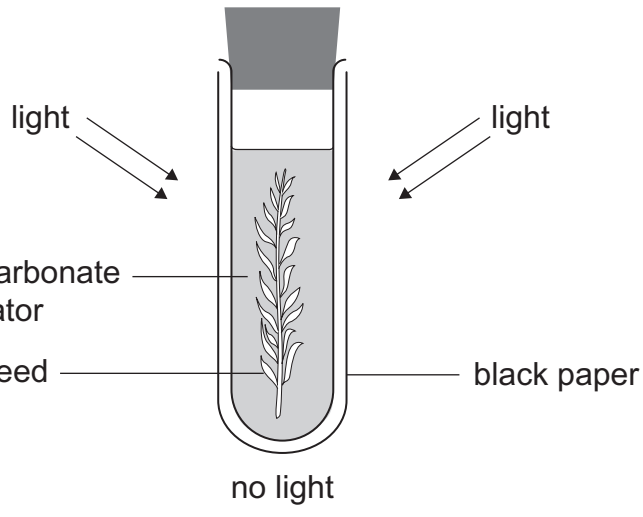


Diagram 2B



At the start of each experiment the hydrogencarbonate indicator was **pH 8.4**.
After one hour, Laura recorded the pH of the hydrogencarbonate indicator.

The table shows her results.

Colour of light	pH of hydrogencarbonate indicator after 1 hour
Red	8.4
Blue	8.6
Green	7.8
No light	7.6

Use the information in the table and Diagram 1 opposite to help answer questions **(a)**–**(c)**.

(a) **(i)** Give the colour of light which results in the rate of photosynthesis being equal to the rate of respiration in the pondweed.

_____ [1]

(ii) Explain your choice.

_____

_____

_____ [1]

(b) Explain the change in the pH of the hydrogencarbonate indicator for pondweed receiving **no light**.

_____

_____

_____

_____

_____

_____ [2]

[Turn over

(c) **(i)** Give the colour of light which caused most photosynthesis.

_____ [1]

(ii) Explain your choice.

_____

_____

_____

_____ [2]

(d) When the investigation was repeated using white (normal) light, the concentration of carbon dioxide in the test tube decreased.

Give the colour change of **hydrogencarbonate indicator** in the test tube.

Red to _____ [1]

THIS IS THE END OF THE QUESTION PAPER

BLANK PAGE

DO NOT WRITE ON THIS PAGE

BLANK PAGE

DO NOT WRITE ON THIS PAGE

BLANK PAGE

DO NOT WRITE ON THIS PAGE

DO NOT WRITE ON THIS PAGE

For Examiner's use only	
Question Number	Marks
1	
2	
3	
4	
5	
6	
7	
8	
Total Marks	

Examiner Number