Rewarding Learning

Centre Number

Candidate Number

General Certificate of Secondary Education
2023–2024

Double Award Science: Biology

Unit B1

Higher Tier

[GDW12]

GDW12

MONDAY 13 NOVEMBER 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 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 **3**.

14348

24GDW1201

1 Snails are often found on ground-level plants.

The photographs show a snail and a wooden pathway built in an area where snails are common.

A food chain for some organisms living in this area is shown.

ground-level plants → snails → thrushes → hawk

(a) What do the arrows represent in this food chain?

_____ [1]

(b) What is the trophic level of snails in this food chain?

_____ [1]

Students carried out two investigations.

The first investigation was to estimate the size of the snail population in this area. This technique involved:

- collecting a 1st sample of snails and marking their shells with coloured nail varnish
- releasing these snails
- collecting a 2nd sample of snails a few days later containing both marked and unmarked snails.

The equation below shows how to calculate an estimate of the population of snails in this area.

$$\text{Estimate of population} = \frac{\text{number of snails in 1st sample} \times \text{total number of snails in 2nd sample}}{\text{number of } \textbf{marked} \text{ snails in 2nd sample}}$$

(c) (i) Use the numbers given below and the equation above to calculate an estimate of the population of snails in this area.

The 1st sample contained 106 snails.
The total number of snails in the 2nd sample (both marked and unmarked) was 115 snails.
The 2nd sample contained 69 **unmarked** snails.

Show your working.

_____ [3]

[Turn over

(ii) Suggest **one** reason why the coloured nail varnish used to mark the shells should **not** be on the **top** of the shells.

_____

_____ [1]

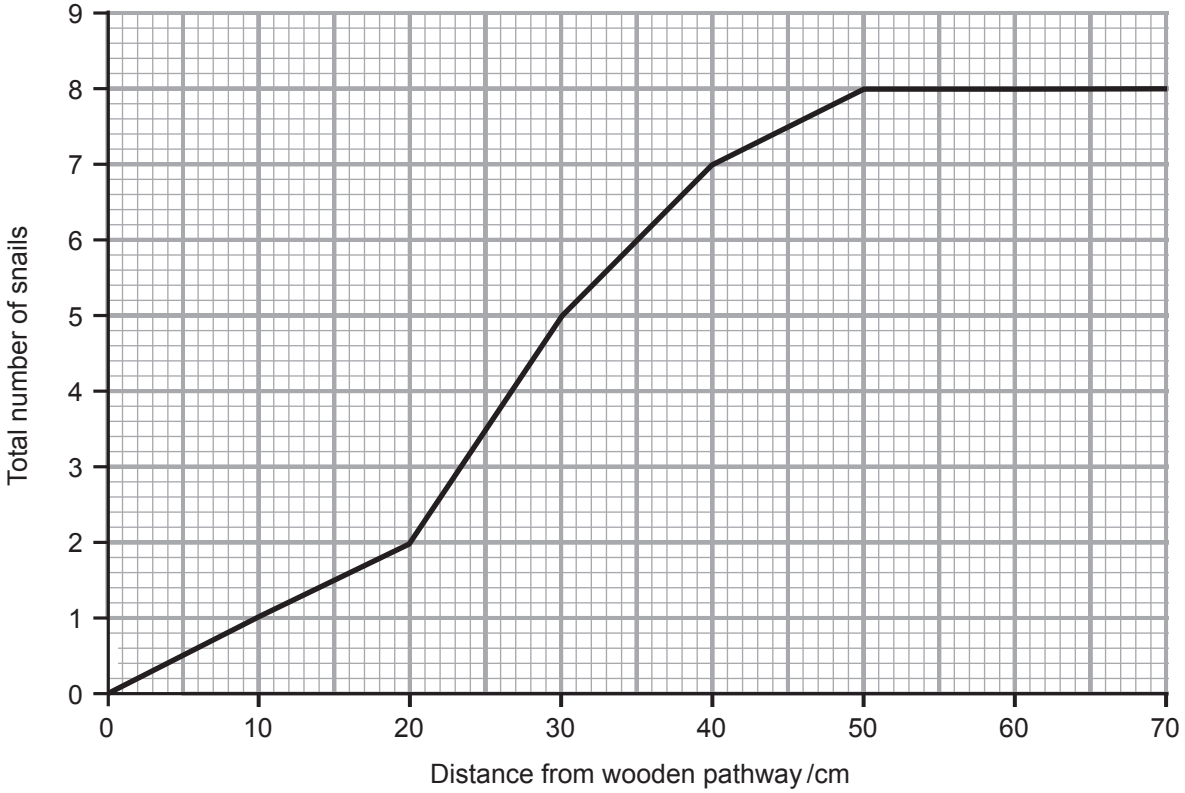
The students carried out a second investigation.

They counted the total number of snails present at different distances from each side of the wooden pathway.

The wooden pathway was built to try to stop people walking on the ground-level plants.

Most people walk on or close to the wooden pathway.

The graph shows the students' results.



(d) Describe the trends shown in the graph between distances of:

- 0 – 50 cm from the wooden pathway
- 50 – 70 cm from the wooden pathway.

0 – 50 cm

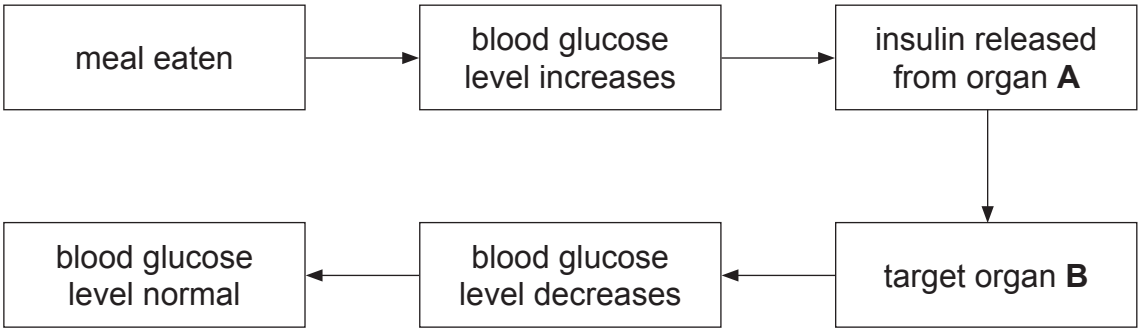
50 – 70 cm

Suggest **two** explanations for the trend between **0 – 50 cm** from the wooden pathway.

[4]

2 The body must maintain a constant blood glucose level to function correctly.

(a) The diagram shows how insulin changes a person's blood glucose level after eating a meal high in complex carbohydrates.



(i) Explain why eating a meal high in complex carbohydrates causes the blood glucose level to increase.

_____

_____

_____

_____ [2]

(ii) Name organ **A**.

_____ [1]

A different hormone is released when a person's blood glucose level decreases below normal.

This hormone acts in the **opposite way** to insulin.

(b) Suggest **two** ways that **this** hormone acts to return a person's blood glucose level to normal.

1. _____

_____

2. _____

_____ [2]

Diabetes is a condition in which the blood glucose control mechanism fails.
There are two types of diabetes, Type 1 and Type 2.

The table gives statements about both types.

(c) Write a tick (✓) in the box to identify the correct answer for each statement.

Statement	**Only** true for **Type 1** diabetes	**Only** true for **Type 2** diabetes	True for **both** Type 1 and Type 2 diabetes
Thirst is a symptom			
Always treated with insulin			
Usually occurs later in life			
Heart disease is a long-term complication			
Linked to obesity			

[5]

[Turn over

The table shows the number of people with diabetes in Northern Ireland between 2016 and 2019.

Year	Number of people with diabetes in Northern Ireland
2016	88 305
2017	92 480
2018	96 114
2019	99 833

(d) Use the data in the table to calculate the percentage (%) increase in the number of people with diabetes in Northern Ireland between 2016 and 2019.

Show your working.

Give your answer to **one** decimal place.

_____ % [4]

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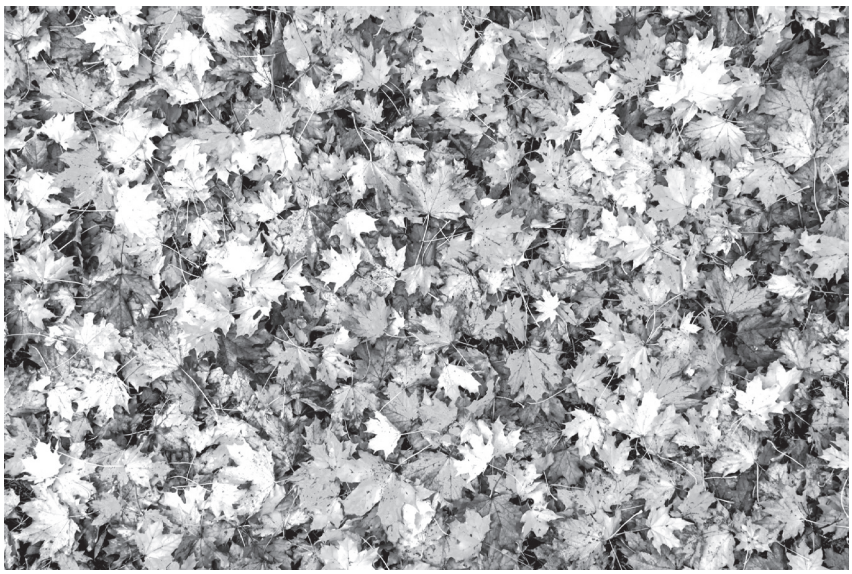
(Questions continue overleaf)

3 The photograph shows leaf litter.
Leaf litter is dead plant material that has fallen to the ground.



Leaf litter is decomposed after it falls to the ground.

Describe the process of decomposition.

Name **one** abiotic factor that affects the rate of decomposition. Explain how this factor affects the rate of decomposition.

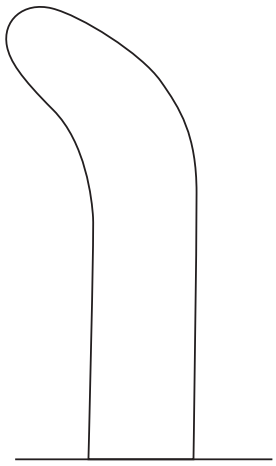
In this question you will be assessed on the quality of your written communication skills, including the use of specialist scientific terms.

Description of the process of decomposition

Abiotic factor and how it affects the rate of decomposition

[6]

4 The diagram shows the growth response of a plant shoot to light that is coming from one direction.



(a) Draw an arrow on the diagram to show the direction of the light that has produced this growth response in the plant shoot. [1]

Auxin causes this growth response in plant shoots.

(b) Name this growth response in plant shoots.

_____ [1]

(c) What type of substance is auxin?

_____ [1]

(d) Explain how auxin causes this growth response in plant shoots.

_____

_____

_____

_____

_____ [2]

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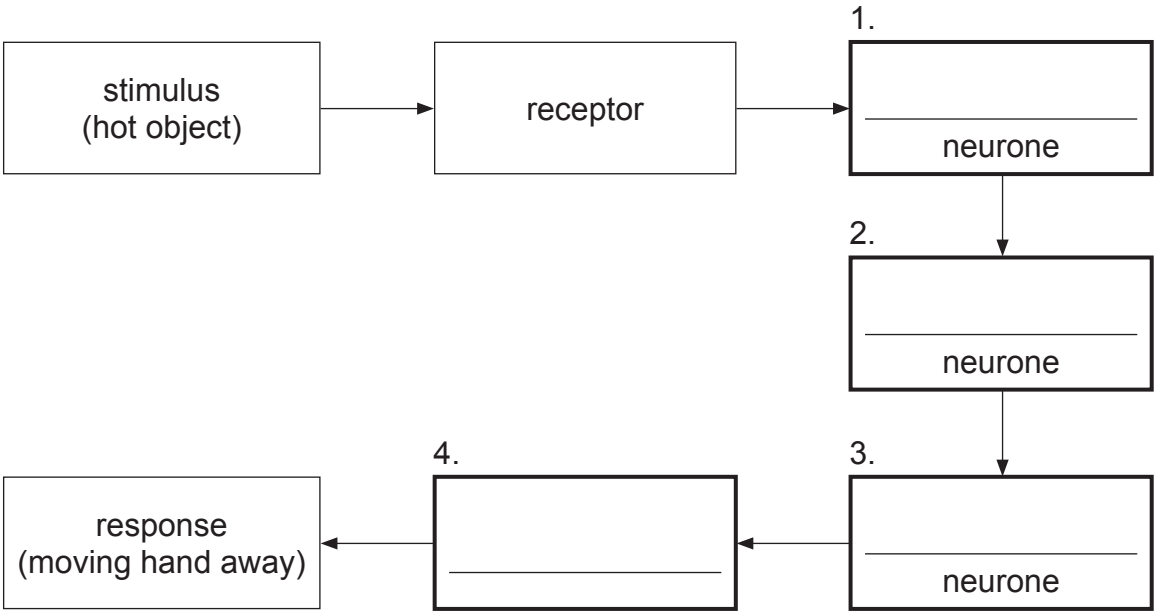
(Questions continue overleaf)

5 The central nervous system (CNS) produces reflex actions to protect the body. Moving your hand away from something hot is an example of a reflex action.

(a) Complete the diagram showing this reflex action by writing on the lines in boxes 1–4.



[4]

(b) Between one neurone and the next there is a gap.

(i) Give the name of this gap.

_____ [1]

(ii) How many of these gaps occur in this reflex action?

_____ [1]

The central nervous system also produces voluntary actions.

(c) Give **one** example of a voluntary action and describe **two** ways that it differs from a reflex action.

Example of voluntary action _____

_____

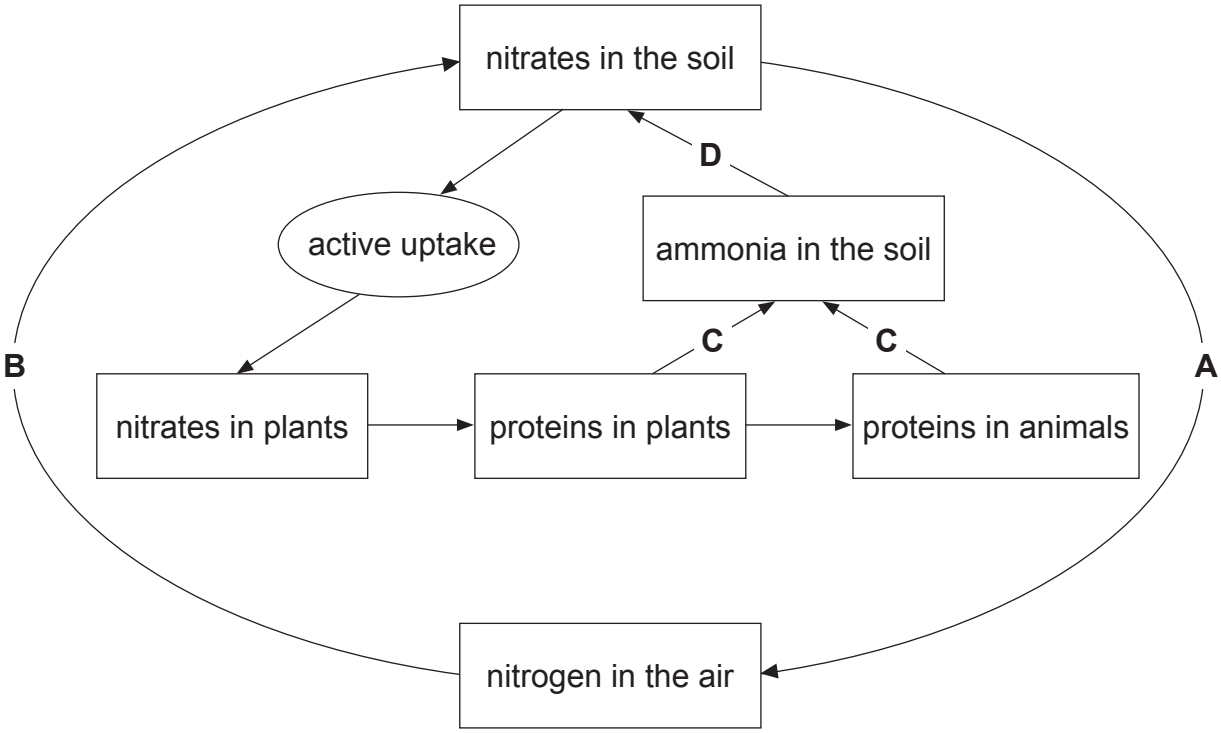
Difference 1 _____

_____

Difference 2 _____

_____ [3]

6 The diagram shows part of a nitrogen cycle.



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

A _____

B _____

C _____ [3]

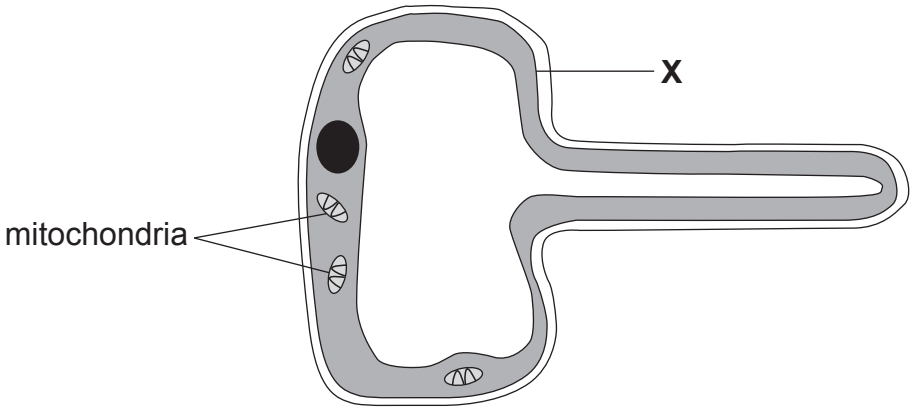
(b) Write an **X** on one of the lines in the diagram to show the process that will increase in waterlogged soils. [1]

(c) Nitrates are absorbed from the soil by plant cells to make proteins for growth.

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

_____ [1]

The diagram shows the specialised plant cell that absorbs nitrates from the soil.



(ii) Name structure **X**.

_____ [1]

(iii) Give the function of mitochondria.

_____ [1]

Plants absorb nitrates from the soil by active uptake.

(d) Choose the numbers of the **three** correct statements about active uptake from the table.

Write your answers on the lines below the table.

1	active uptake moves nitrates down a concentration gradient
2	active uptake moves nitrates against a concentration gradient
3	active uptake moves nitrates between two places with the same concentration
4	active uptake uses energy
5	active uptake releases energy
6	respiration is not needed for active uptake
7	aerobic respiration produces the greatest rate of active uptake
8	anaerobic respiration produces the greatest rate of active uptake

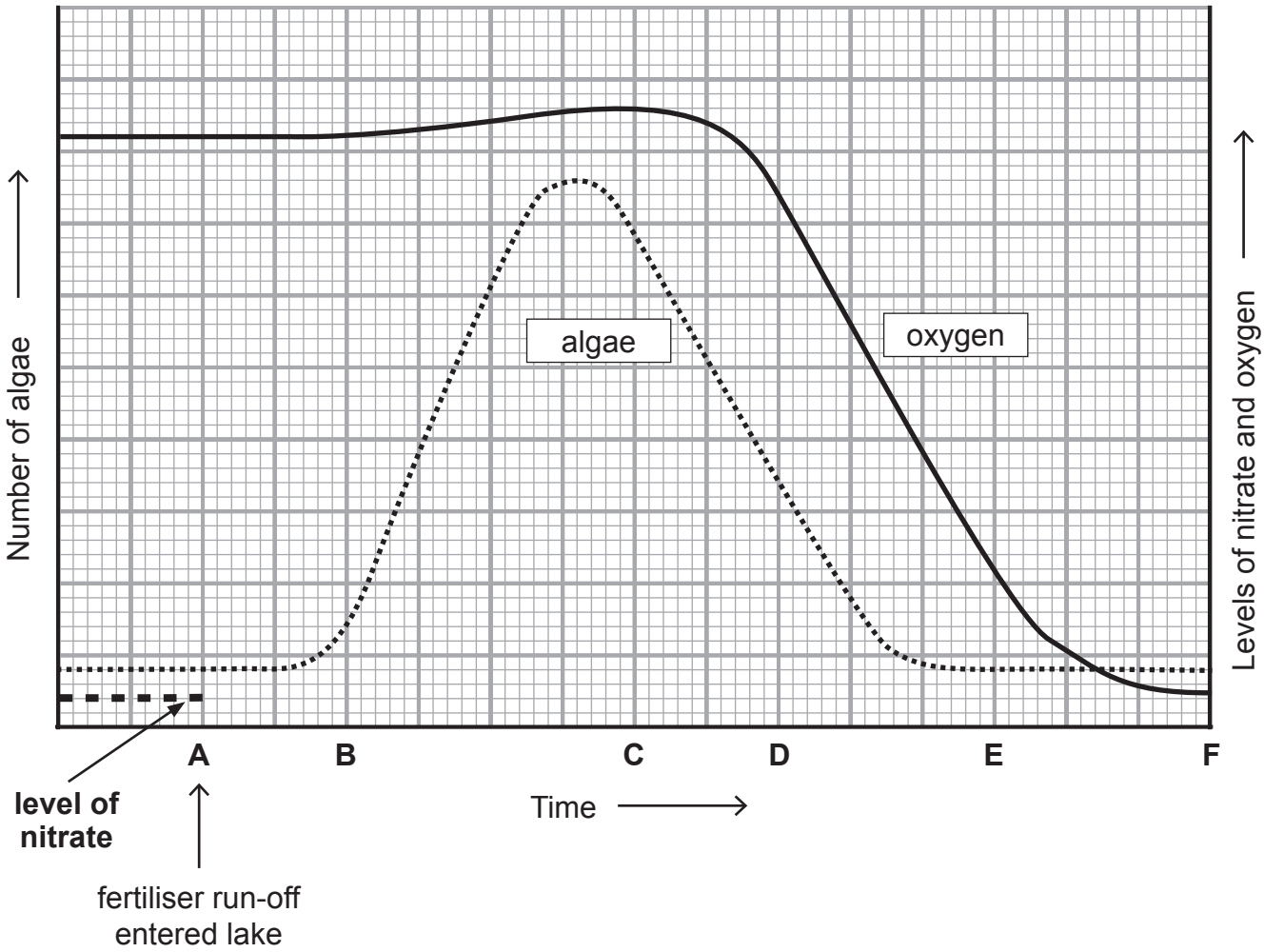
_____ and _____ and _____ [3]

[Turn over

7 Fertiliser run-off entered a lake causing eutrophication.

The graph shows the:
- number of algae
- levels of oxygen
- initial level of nitrate

in the lake over time.



(a) Continue the line for the **level of nitrate** on the graph from **A** to **F** to show how it would change over time. [3]

(b) **(i)** Give **two** reasons for the decrease in the number of algae in the lake between times **C** and **D**.

1. _____

_____

2. _____

_____

_____ [2]

(ii) Name the type of microorganism that caused a reduction in oxygen levels in the lake between times **D** and **F**.

_____ [1]

(c) There were fish in this lake before the fertiliser run-off entered.

Circle **one** answer in the list that describes what you would expect to happen to the number of fish in the lake between times **D** and **F**.

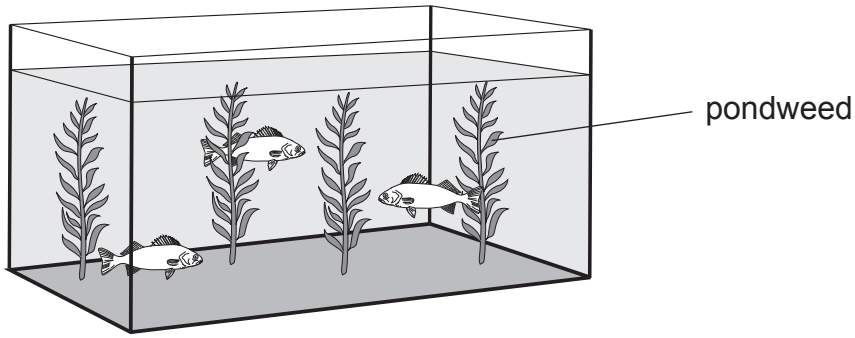
remains the same	decrease	increase

[1]

[Turn over

8 A student investigated **photosynthesis** and **respiration** using water samples taken from a fish tank at different times of the day and night.

The diagram shows the fish tank.



The water samples were tested using **hydrogencarbonate indicator**.

(a) Complete the table to give the colour of the hydrogencarbonate indicator for each level of carbon dioxide.

Time	Colour of hydrogencarbonate indicator	Level of carbon dioxide in the fish tank
2 am (night)		high
10 am		normal
2 pm (afternoon)		low

[2]

(b) (i) Describe and explain the contribution of the **fish** to the level of carbon dioxide in the fish tank.

_____

_____

_____

_____ [2]

(ii) After the night, the overall level of carbon dioxide changed so that by 10 am it was normal.

Explain fully the contribution that the **pondweed** made to produce this change in the level of carbon dioxide in the fish tank.

_____

_____

_____

_____

_____

_____ [2]

(c) Over the next few weeks, the student made changes to the fish tank.

Complete the table by writing the words **increase**, **decrease** or **no change** in the empty boxes to describe the effect each change would have on the **amounts** of photosynthesis and respiration in the fish tank at 2 pm and 2 am.

Change	**2 pm (afternoon) effect on the amount of**		**2 am (night) effect on the amount of**	
	photosynthesis	**respiration**	**photosynthesis**	**respiration**
Adding two more fish		increase		
Adding four more pieces of pondweed	increase			

[3]

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Question 6(c)(ii) . Principal Examiner
Question 8(a) . . . Principal Examiner

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Question Number	Marks
1	
2	
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Total Marks	

Examiner Number

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