



General Certificate of Secondary Education
2019–2020

Centre Number

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Candidate Number

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Double Award Science: Biology

Unit B1

Higher Tier



[GDW12]

GDW12

WEDNESDAY 26 FEBRUARY 2020, 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.

12765



24GDW1201

- 1 (a) The photograph below shows a white rhino with a crow on its back.

Read the passage below and answer the questions that follow.

White rhinos live in the grasslands of Africa.
Grass is the main food for a white rhino.
The crow on the rhino's back is feeding on ticks.
Ticks are tiny animals that feed on the rhino's blood and irritate its skin.

crow



Crow © Colin Vamdell / Science Photo Library
Rhino © Tony Camocho / Science Photo Library

Use the information and photograph above to help answer the following questions.

- (i) Give the habitat of the white rhino.

_____ [1]

- (ii) Draw a food chain containing the four organisms given in the passage.

[3]



(iii) What benefit do crows give the white rhino?

[1]

(iv) What benefit does the white rhino give the crow?

[1]

(b) In 2014 the number of white rhinos in the wild was 20 000.
During this year, 6% of the white rhino population was killed by illegal hunting.

(i) Use the information given above to calculate the number of white rhinos which were killed by illegal hunting in 2014.

Show your working.

[2]

(ii) Give **one biotic** factor, that could affect the white rhino population in the wild, apart from illegal hunting.

[1]

[Turn over



- 2 (a) Commercially prepared baby food often contains enzymes. These enzymes start to digest the baby food before it goes into a baby's stomach. This helps a baby to completely digest its food.

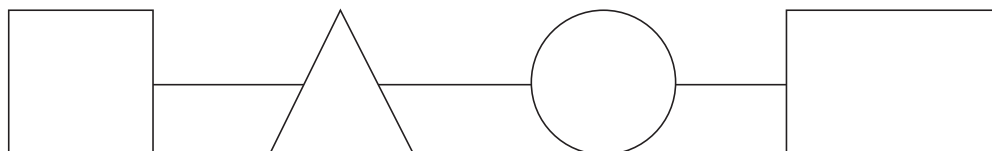
- (i) Name the enzyme that would be added to commercially prepared baby food to help digest protein.

[1]

- (ii) Use your knowledge of enzymes to explain why a different enzyme would **not** digest protein.

[2]

- (b) The diagram below represents part of a protein molecule.



- (i) Name the type of biological molecule, represented by the different shapes in the diagram, that make up a protein molecule.

[1]



(ii) In the space below, draw the products formed when this part of a protein molecule is completely digested.

[2]

[Turn over

12765



24GDW1205

3 Describe how microorganisms carry out decomposition.

Include the following in your answer:

- the **two** types of microorganism that carry out decomposition.
- the process of decomposition.

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

[illegible]

[6]





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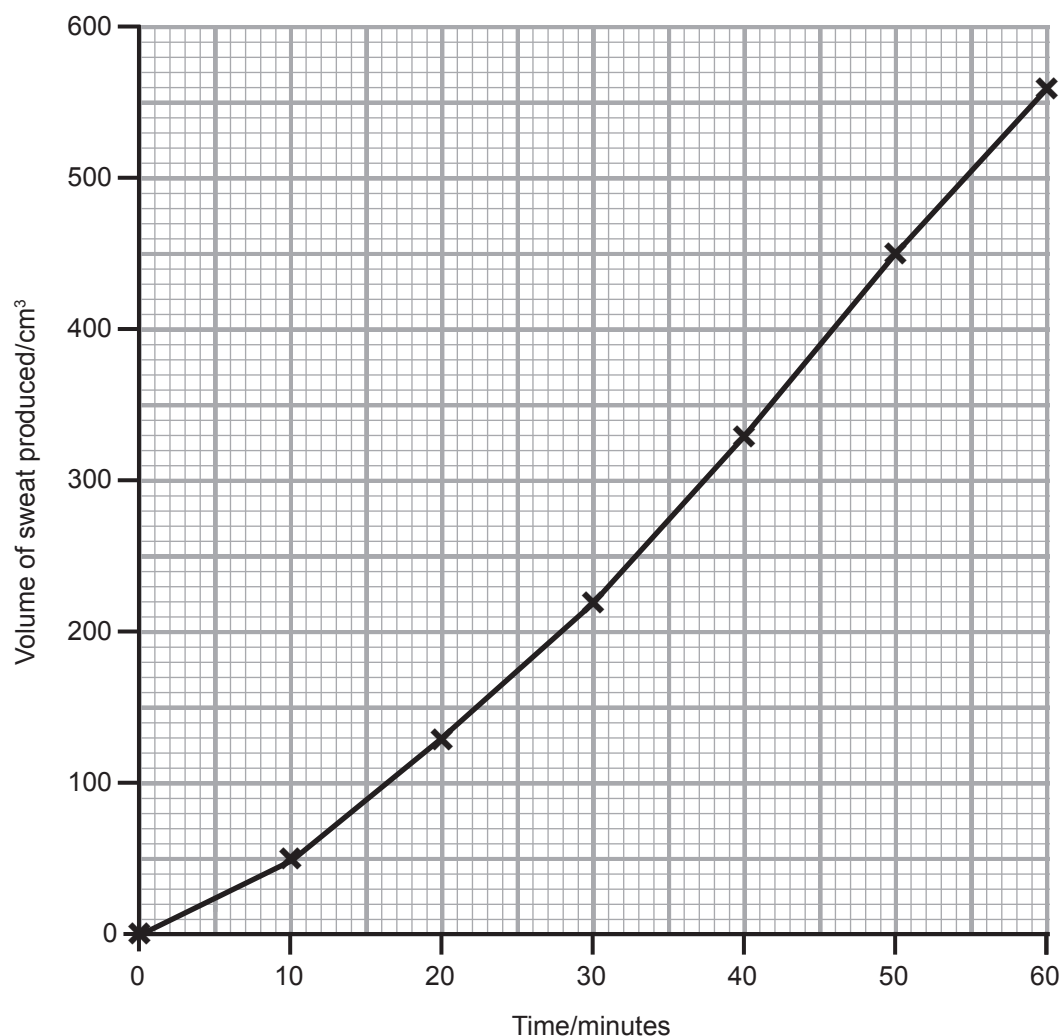
[Turn over



24GDW1207

- 4 (a) Scientists carried out an investigation into the amount of sweat lost by an athlete during 60 minutes of exercise. They recorded the volume of sweat he produced every 10 minutes during the exercise.

The graph below shows the results.



Use the graph to answer the following questions.

- (i) Give the volume of sweat produced by the athlete over the first 30 minutes.

_____ cm³ [1]



- (ii) Calculate the volume of sweat produced by the athlete over the second 30 minutes.

Show your working.

_____ cm³ [2]

- (iii) Using your answers to (i) and (ii), calculate the **difference** in the volume of sweat produced by the athlete over the second 30 minutes compared to the volume of sweat he produced over the first 30 minutes.

_____ cm³ [1]

- (iv) The volume of sweat produced by the athlete over the second 30 minutes is more than he produced over the first 30 minutes.
Suggest why.

_____ [1]

- (b) Describe the effect of the athlete's exercise on the volume and concentration of **urine** produced after exercise.

Volume _____

Concentration _____ [2]

- (c) (i) Name the organ in the body that carries out osmoregulation.

_____ [1]

- (ii) Draw a circle around the phrase below that describes what would happen to the **blood** of this athlete if this organ did **not** carry out osmoregulation during exercise.

Blood would become
less concentrated

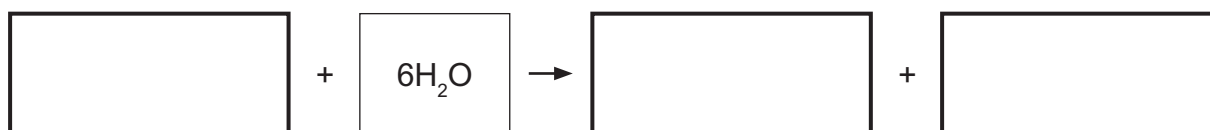
Blood would stay the
same concentration

Blood would become
more concentrated [1]

[Turn over]



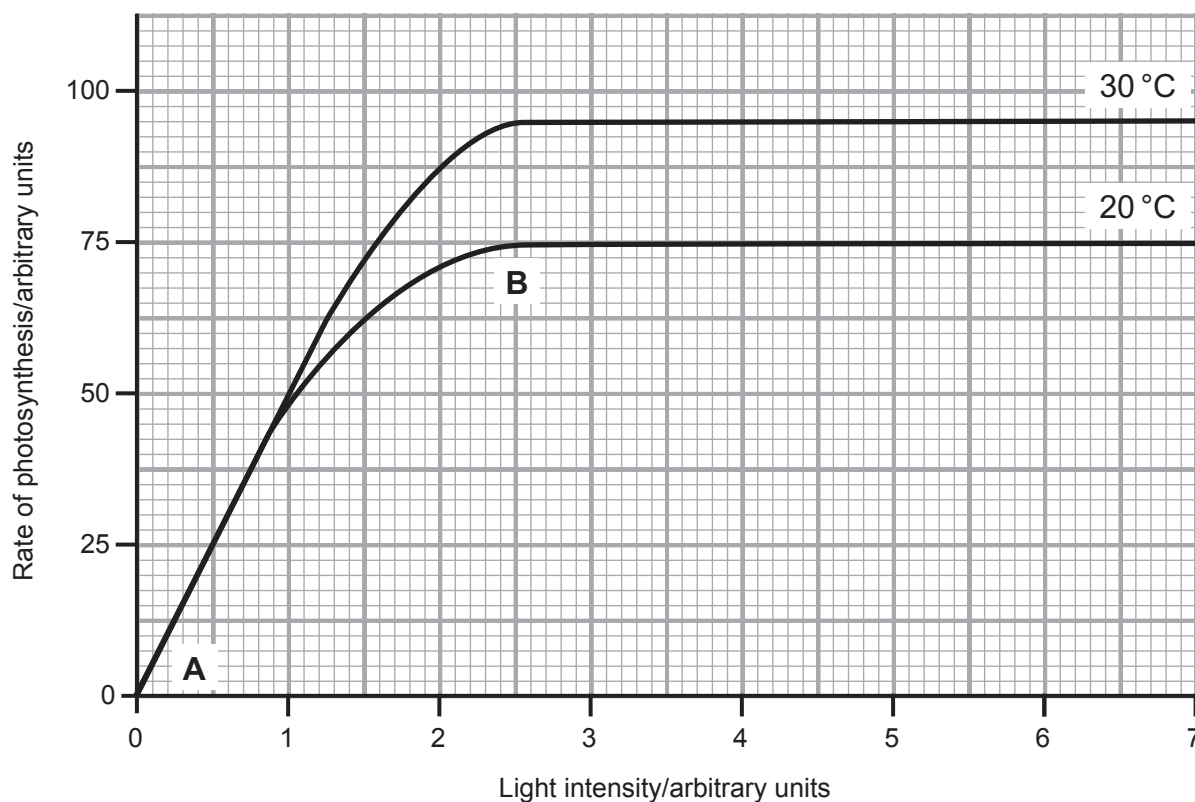
- 5 (a) Complete the balanced chemical equation for photosynthesis by writing in the empty boxes.



[3]

- (b) The rate of photosynthesis in a plant can be limited by environmental factors.

The graph below shows the effect of increasing light intensity on the rate of photosynthesis in a plant when placed in 0.03% carbon dioxide at 20 °C and 30 °C.



- (i) Name the environmental factor that is limiting the rate of photosynthesis between points **A** and **B**.
Explain your answer.

[2]

- (ii) Use your knowledge of **enzyme activity** to explain the difference in the rate of photosynthesis when the temperature increased from 20 °C to 30 °C.

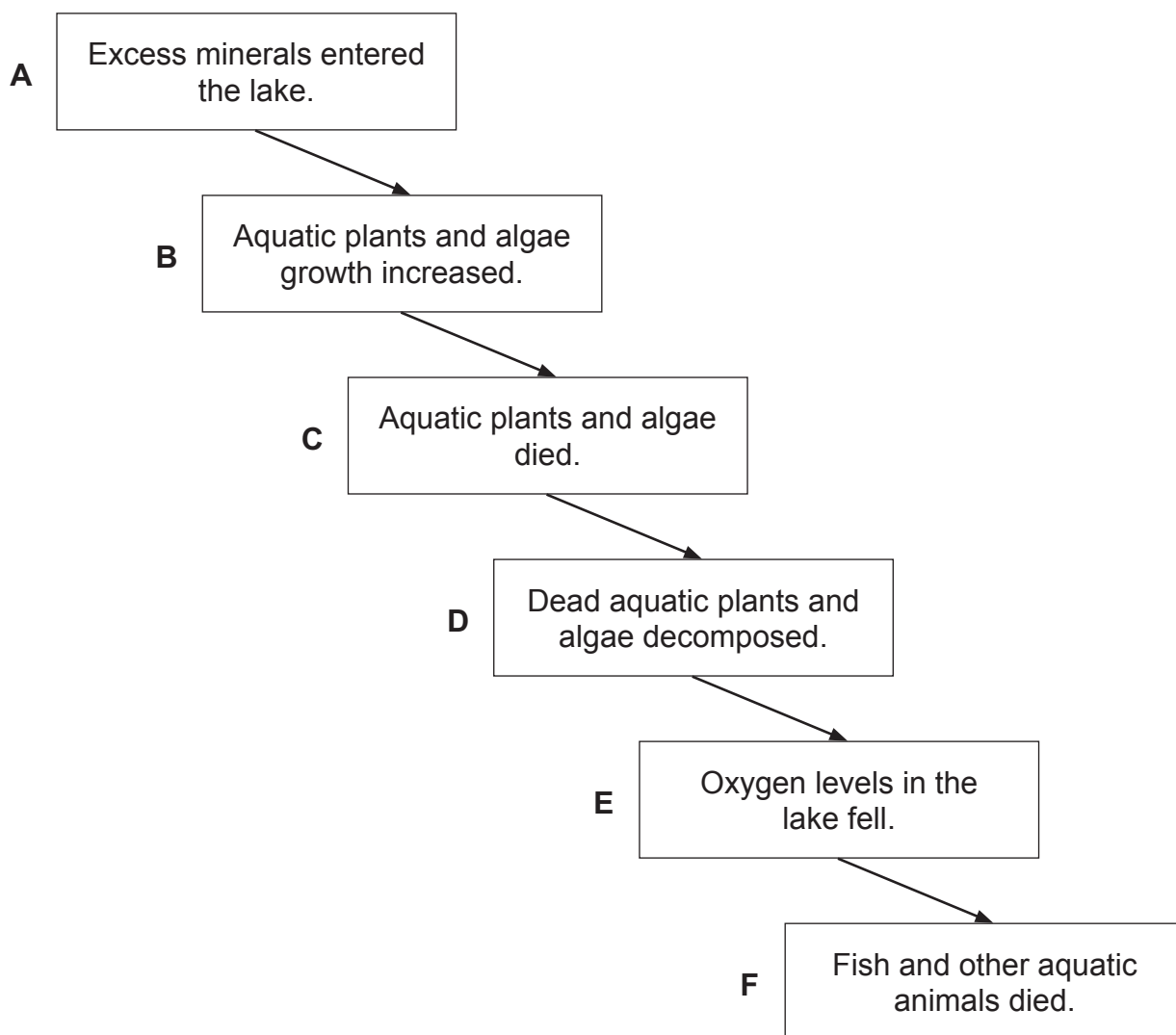
[2]

[Turn over



- 6 The diagram below shows a series of stages that occurred in a previously unpolluted lake.

The lake contained a wide variety of aquatic organisms.



Use the information in the diagram above and your knowledge to answer the following questions.

- (a) Suggest **two** sources of the excess minerals in stage **A**.

1. _____

2. _____

[2]



(b) Give **two** reasons why the aquatic plants and algae died in stage **C**.

1. _____

2. _____

_____ [2]

(c) Explain how the decomposition of dead aquatic plants and algae (stage **D**) caused stage **E**.

_____ [3]

(d) Complete the table below to show the level of biodiversity in this lake **before** stage **A** and **at** stage **F**.

Choose from **low**, **high** or **no change**.

Write your answers in the empty boxes.

Stage	Level of biodiversity
Before A	
At F	

[2]

[Turn over



7 (a) Nitrates must be present in soil for crop growth.

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

[1]

(ii) Describe and explain how these plant cells are adapted for their role in absorbing nitrates from the soil.

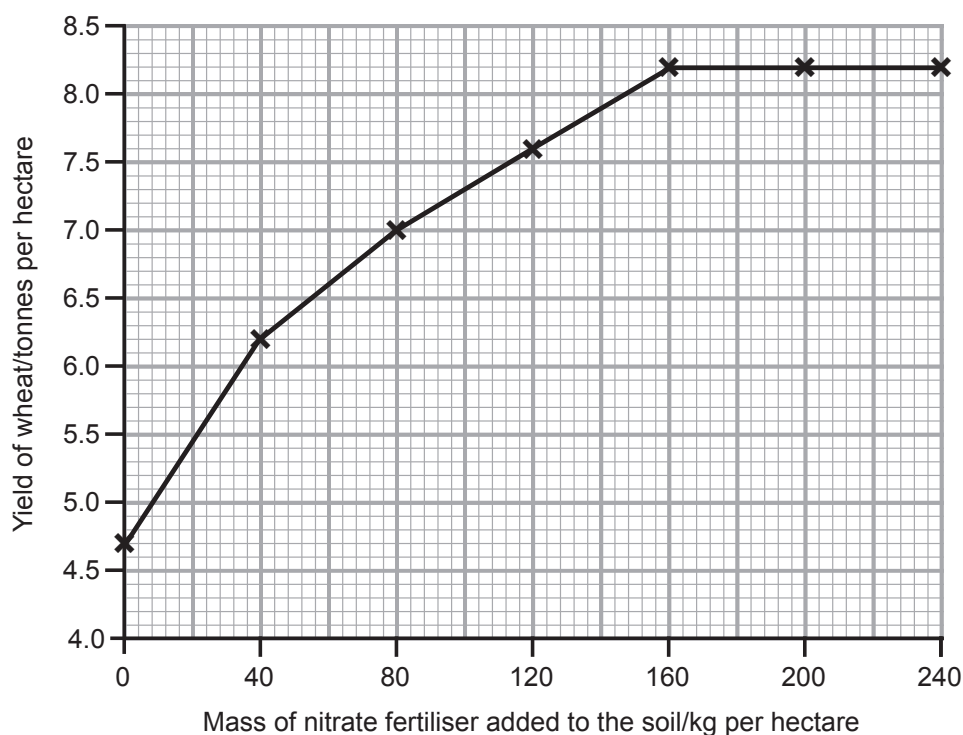
[2]

(iii) Name a substance, other than nitrates, that these plant cells absorb from the soil.

[1]



- (b) The graph below shows the effect of the mass of nitrate fertiliser on the yield of wheat in an area of land (hectare).



- (i) Wheat plants use nitrates from soil to produce a substance which increases their yield.
Name this substance.

[1]

- (ii) Use the graph to give the least mass of nitrate fertiliser that should be added to the soil to give the maximum yield of wheat.

_____ kg per hectare [1]

- (iii) Suggest why the yield of wheat levels off.

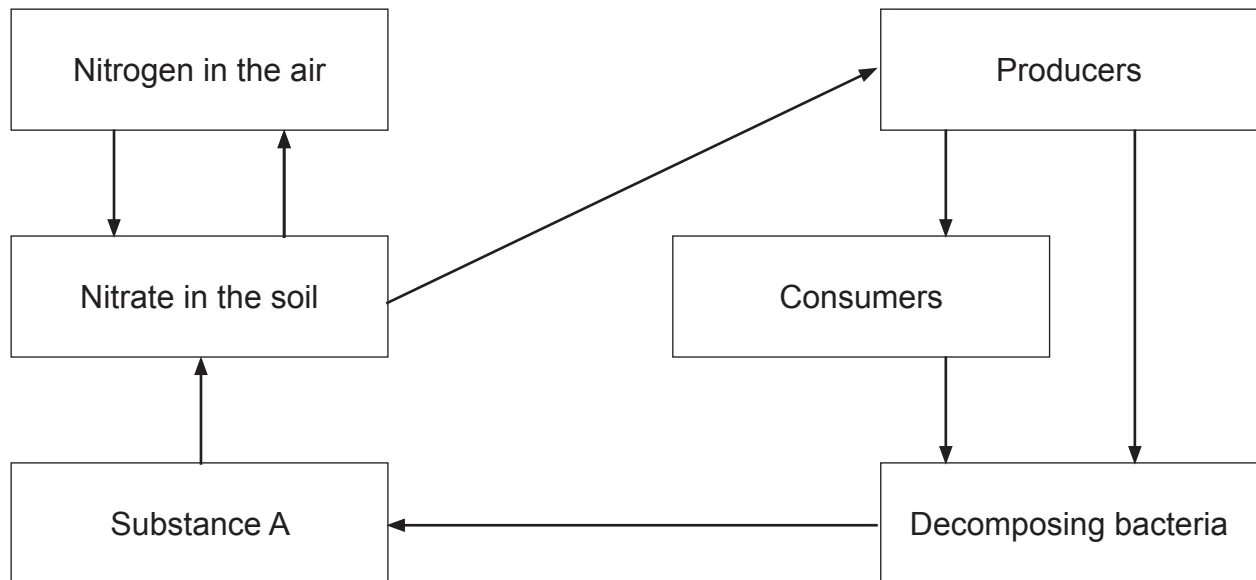
[2]

[Turn over]



(c) The diagram below shows a nitrogen cycle.

Each arrow represents a **process** in the nitrogen cycle.



Source: Principal Examiner

(i) Name substance A.

[1]

One type of nitrogen bacteria will increase in numbers in waterlogged soil.

(ii) Name this type of nitrogen bacteria.

[1]

(iii) On the diagram, write an X on **one** of the arrows to show the process the bacteria in (ii) carry out in the nitrogen cycle.

[1]





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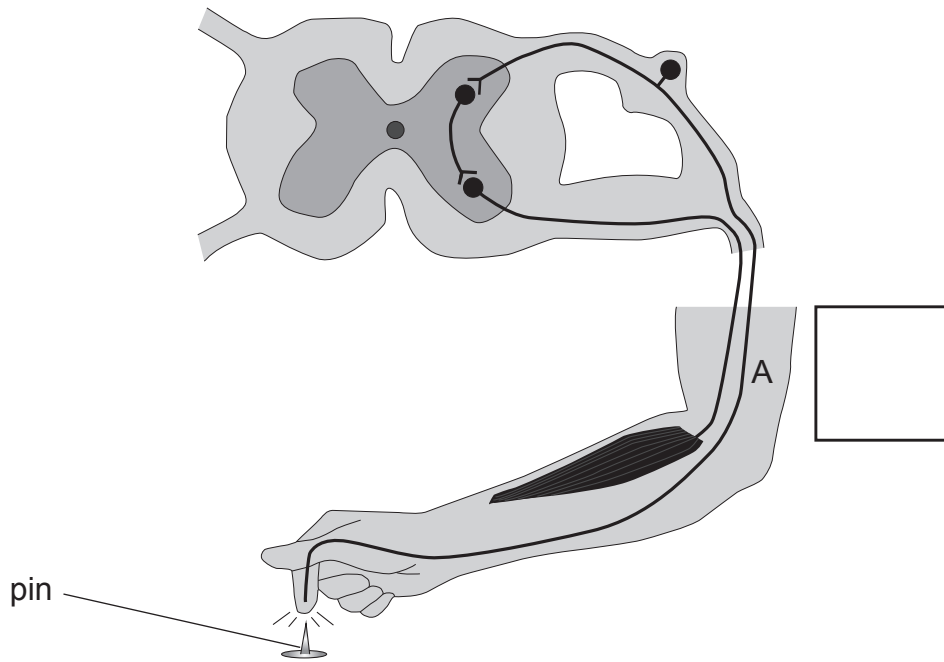
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[Turn over



24GDW1217

8 (a) The diagram below shows a reflex arc.



© Barking Dog Art

- (i) Draw an arrow in the box on the diagram, to give the direction of a nerve impulse along neurone A. [1]
- (ii) On the diagram, label the motor neurone using a line marked B. [1]
- (iii) How many synapses are there in this reflex arc?

[1]



A reflex arc results in a reflex action.
Reflex actions are faster than voluntary actions.

(b) Give **one** property of reflex arcs which results in this faster speed of reaction.

[1]

The reflex arc on the page opposite shows a finger being pricked with a pin.
This results in a reflex action.

(c) Suggest **one** advantage to a person, other than speed of reaction, of this reflex action.

[1]

[Turn over



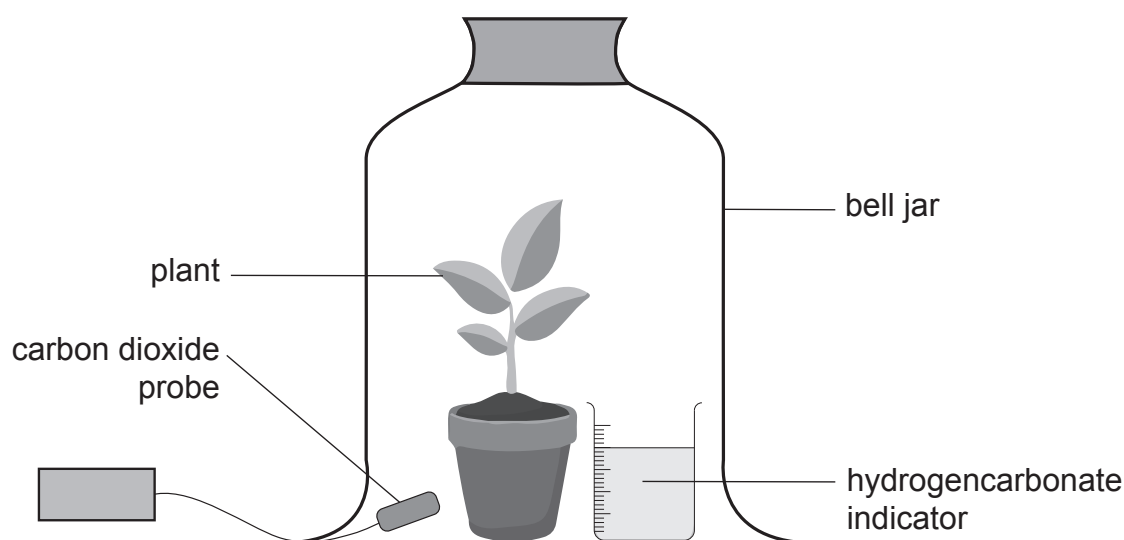
- 9 A student investigated photosynthesis and respiration in two different plants, A and B. The plants were the same size.

The student used a carbon dioxide probe to measure the carbon dioxide concentration in a bell jar with no plant present.

The carbon dioxide concentration in the bell jar with **no plant present** was **four** arbitrary units.

The student then used the probe to measure the carbon dioxide concentration in the bell jar **with a plant**, after two hours at different light intensities.

The diagram below shows the set up of her experiment for each plant.



© Getty Images

The table below shows the results of her experiment for plant A and plant B.

Light intensity/ arbitrary units	Carbon dioxide concentration in the bell jar/arbitrary units	
	Plant A	Plant B
0	22	23
4	12	9
8	8	4
12	6	3
16	4	1



- (a) Describe and explain the trend in carbon dioxide concentration in the bell jar with **plant A** when the light intensity increased from **0 to 12** arbitrary units. Use data to support your answer.

[4]

- (b) Give the light intensity at which **plant B** is at its compensation point.

_____ arbitrary units [1]

- (c) Describe and explain the colour of the hydrogencarbonate indicator in the bell jar with **plant B** at a light intensity of **16** arbitrary units.

[3]

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For Examiner's
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Question Number	Marks
1	
2	
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8	
9	

Total Marks	
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Examiner Number

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