



Rewarding Learning

General Certificate of Secondary Education
2021–2022

Centre Number

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Candidate Number

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Double Award Science: Biology

Unit B1

Higher Tier



[GDW12]

GDW12

TUESDAY 17 MAY 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 4.



- 1 Kiwis are flightless birds found only in New Zealand.
The population of kiwis is decreasing each year.

The photograph shows a sign to warn about kiwis crossing the road.



Read the passage below about kiwis and answer the questions that follow.

Kiwis feed on plants and worms.

Rabbits and worms feed on plants.

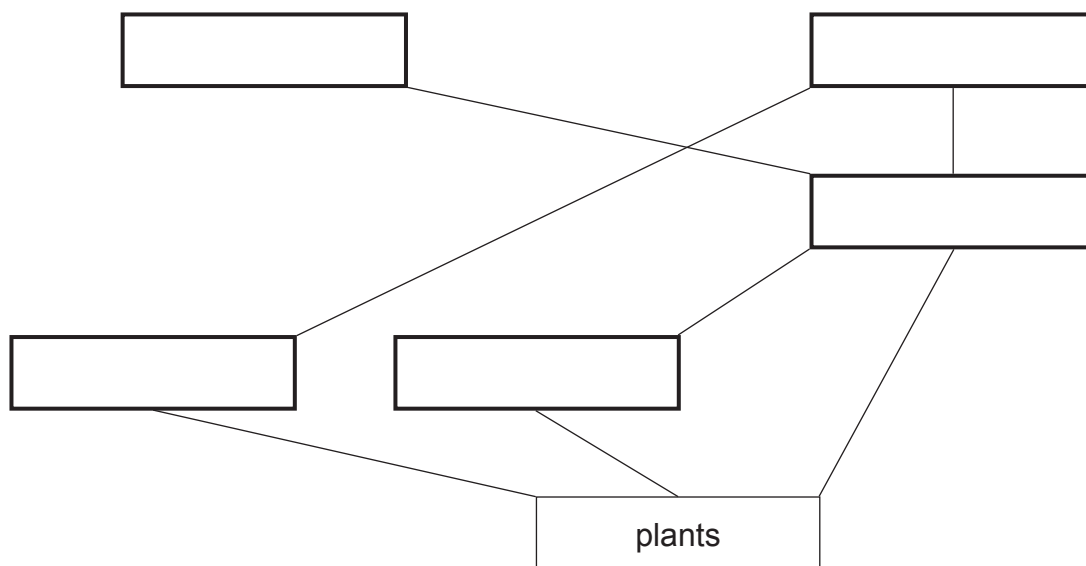
Kiwis had few predators before people introduced animals like dogs and stoats.

Stoats were brought into New Zealand to kill rabbits that had been introduced into the country.



- (a) Use the information in the passage opposite to write the names of the organisms in this food web in the empty boxes.

Complete the food web by adding **arrowheads** to the lines.



[4]

[Turn over



- (b) In 1998 the population of kiwis was 100 000.
In 2008 the population of kiwis was 70 000.

- (i) Calculate the percentage (%) reduction in the kiwi population between 1998 and 2008.

Show your working.

_____ % [3]

Between 2008 and 2018 measures were taken to reduce the decline in the kiwi population.

- (ii) Suggest what **one** of these measures could have been.

_____ [1]

Between 2008 and 2018 the kiwi population declined by only 0.5%.

- (iii) Calculate the size of the kiwi population in 2018.

Show your working.

_____ [3]





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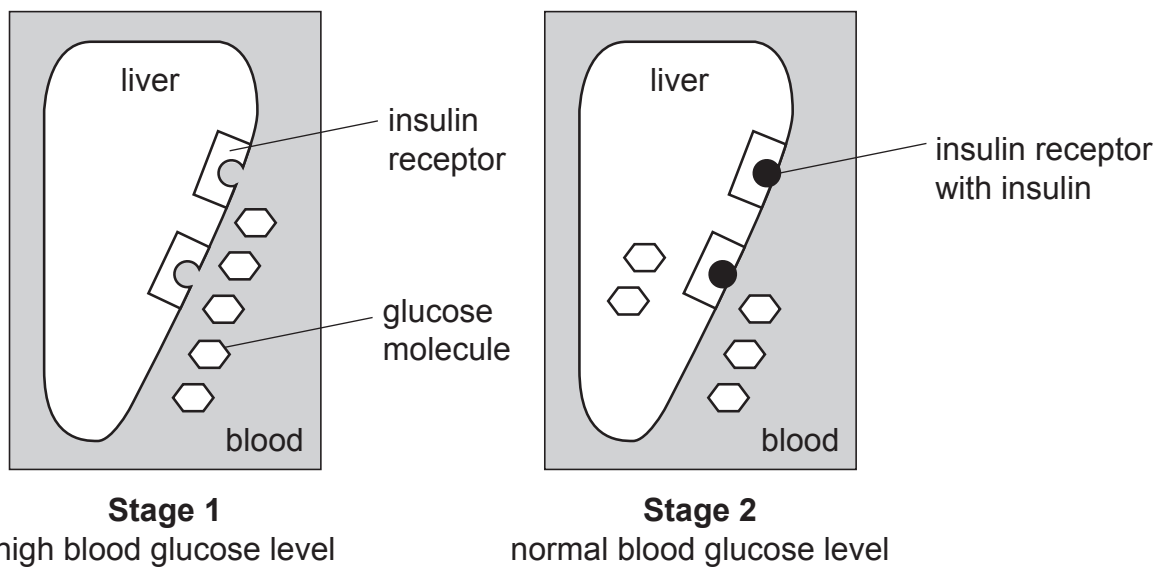
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24GDW1205

- 2 The diagrams below show the liver when blood glucose level is high (stage 1) and when it has been returned to normal (stage 2).



- (a) Use the **diagrams** to describe what happens when insulin travels in the blood to the liver.

[3]



(b) Two further changes occur when insulin travels in the blood to the liver.

Circle the **two** correct descriptions of these changes in the list below.

more glycogen is converted
to glucose

more glucose is converted
to glycogen

more glucose is converted
to glycerol

more respiration

less respiration

same amount of respiration

[2]

[Turn over

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24GDW1207

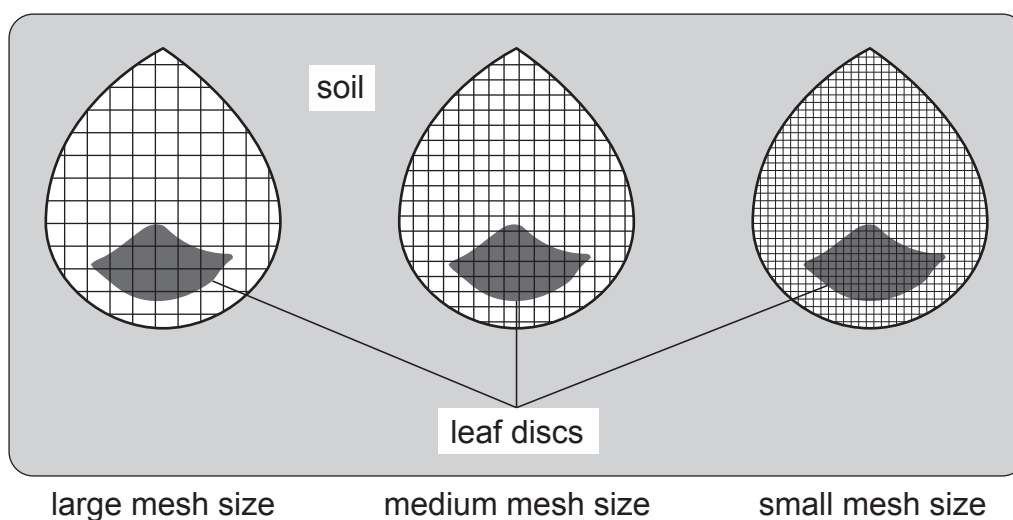
- 3 (a) Students carried out an investigation into the rate of decomposition of leaf discs. The students cut leaf discs of the same size from leaves of the same plant.

They placed equal numbers of leaf discs inside three bags of the same size. The bags had different mesh sizes (large, medium and small).

The students weighed each bag at the start of the investigation. The bags were **different masses** at the start of the investigation.

The students buried the bags in the same depth of soil.

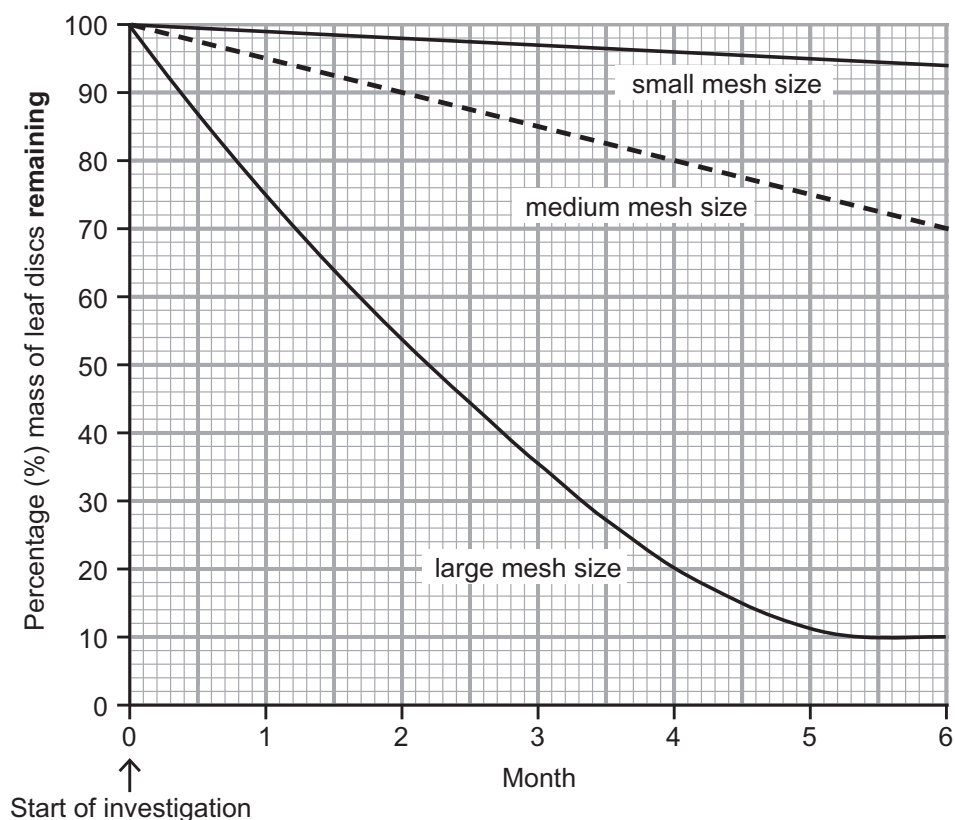
The diagram below shows the set-up of the students' investigation.



Every month for six months the students dug up the bags, weighed them and then buried them again. Every month they calculated the percentage (%) mass of leaf discs **remaining** for each bag.

The graph opposite shows their results.





Use the information and the graph to answer the following questions.

(i) Place a tick (✓) in the box which correctly describes each statement.

Statement	True	False	Can't tell
The mass of the bags was the same at the start of the investigation.	☐	☐	☐
The rate of decomposition of the leaf discs is slowest in the bag with the small mesh size.	☐	☐	☐
The rate of decomposition of the leaf discs in the bag with the medium mesh size is faster in the first two months than in the next four months.	☐	☐	☐
Leaf discs of the same mass from a different plant would decompose faster.	☐	☐	☐

[4]

[Turn over



- (ii) Suggest an explanation for the different rate of decomposition in the bag with the large mesh compared to the bag with the small mesh.

_____ [1]

- (b) (i) Name the **two** types of microorganism that carry out decomposition.

_____ and _____ [2]

- (ii) Name the type of digestion carried out by the microorganisms in (i)

_____ [1]



- 4** Give six statements that describe how the structure of a plant cell is different from the structure of a **bacterial** cell.

Your statements may include structures that are present **or** absent in plant cells. Each statement should begin with 'A plant cell'.

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

A plant cell _____

[illegible]

[6]

[Turn over

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- 5 (a) Dust acts as an irritant when it enters a person's nose. This irritant causes the reflex action of sneezing.

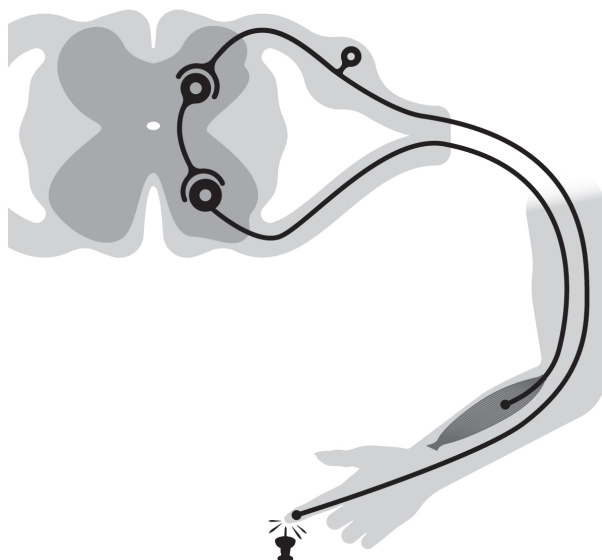
(i) What is the stimulus for this reflex action?

_____ [1]

(ii) What detects this stimulus?

_____ [1]

- (b) The diagram shows the pathway of a spinal reflex arc.



the first neurone in this reflex arc. _____

the final neurone in this reflex arc. _____ [2]

- (ii) Muscles are one type of effector. Name the other type of effector.

_____ [1]



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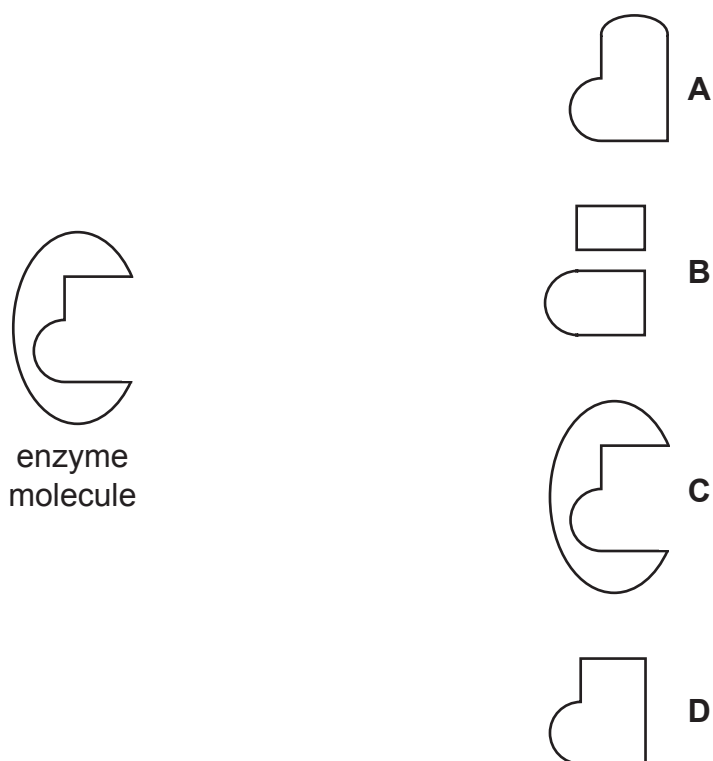
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24GDW1213

- 6 (a) Enzymes are biological catalysts that speed up the rate of reactions. The diagram shows some molecules involved in enzyme-controlled reactions in the digestive system.



- (i) Give the **letter** of the molecule that reacts with this **digestive** enzyme.

Molecule _____ [1]

- (ii) Give the **letters** of the molecules present at the end of this reaction.

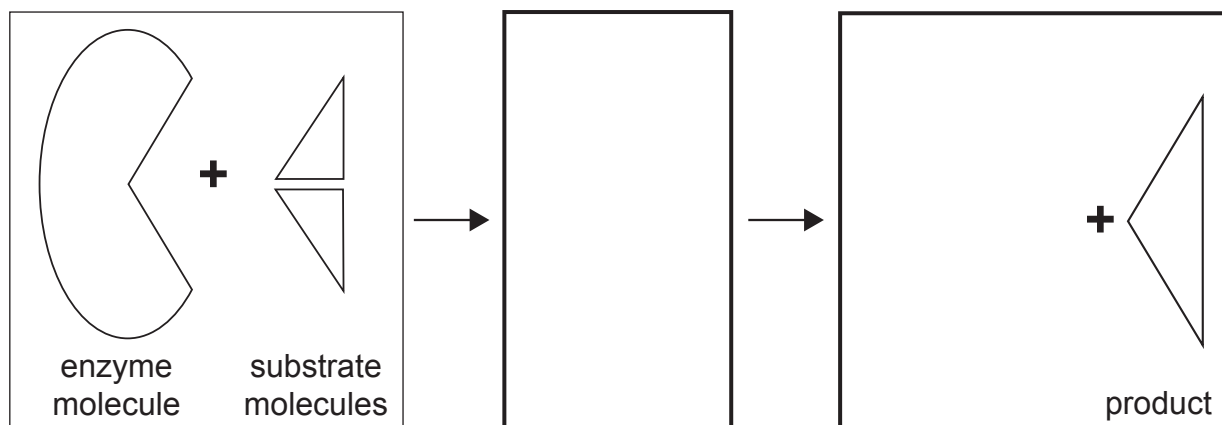
Molecules _____ and _____ [2]

- (iii) Name the digestive enzyme in this reaction.

_____ [1]



(b) The diagram shows some steps in a **different** enzyme-controlled reaction.



(i) Draw the **shapes** of the missing molecules in this reaction, in the boxes above. [2]

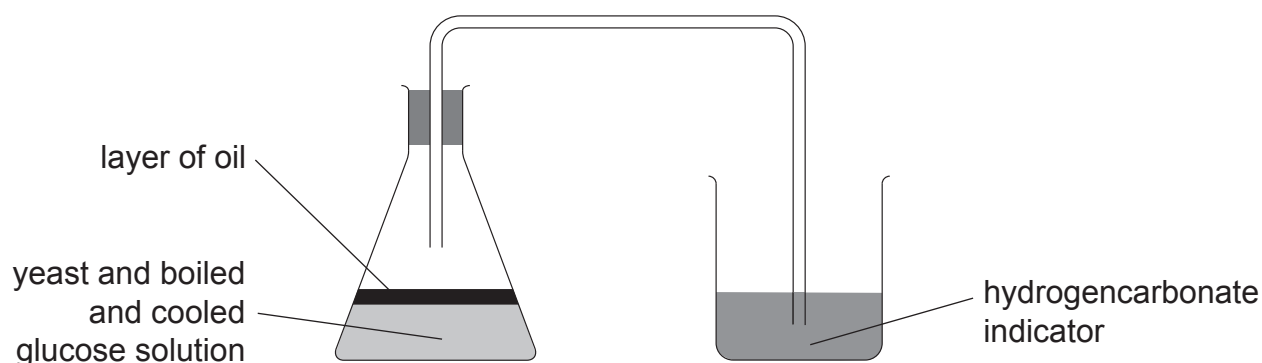
(ii) Describe what has happened to the substrate molecules in this reaction.

[1]



- 7 Students carried out an experiment on respiration. The diagram shows the set-up of their experiment.

The students left the experiment for four hours.



- (a) Complete **Table 1** about the solution in the conical flask at the **start** of the experiment:

- write a tick (✓) if a substance or organism is **present**
- write a cross (X) if a substance or organism is **not present**

Table 1

Substance or organism	Present (✓) or not present (X)
yeast	
glucose	✓
oxygen	
carbon dioxide	
alcohol	

[3]



(b) (i) Complete **Table 2** about the solution in the conical flask after **four hours**.

Use only a tick (✓) to indicate whether each substance decreases, stays the same or increases.

Table 2

Substance or organism	After four hours		
	Decreases	Stays the same	Increases
yeast			
glucose	✓		
oxygen			
carbon dioxide			
alcohol			

[4]

(ii) Explain the result for glucose in **Table 2**.

[2]

(c) Give the colour of the hydrogencarbonate indicator at the end of four hours.

[1]

[Turn over



- 8 (a) The table shows some processes that add or remove nitrogen from the soil in a field that has crops growing in it.

Processes that add nitrogen	Processes that remove nitrogen
A	C
B	D
Nitrogen fixation	Nitrates in run-off from the soil
Application of fertiliser	

- (i) Name process **A** that produces ammonia from dead material.

[1]

- (ii) Name the nitrogen bacteria that use ammonia to carry out process **B**.

[1]

- (b) (i) Name process **C** where plants take up nitrates from the soil.

[1]

- (ii) Name the plant cells that carry out process **C**.

[1]

- (c) Name the nitrogen bacteria that carry out process **D**.

[1]



- (d) In Ireland, an average of 41 tonnes of fertiliser run-off from fields occurs each year.

The ratio of fertiliser applied to fertiliser run-off is 9146 : 1.

- (i) Calculate the amount of fertiliser applied to soils in Ireland each year.

_____ tonnes [1]

- (ii) Name the process that happens in rivers when fertiliser run-off from fields occurs.

_____ [1]

- (iii) Suggest **one** way that the amount of fertiliser run-off from fields could be reduced.

_____ [1]

[Turn over

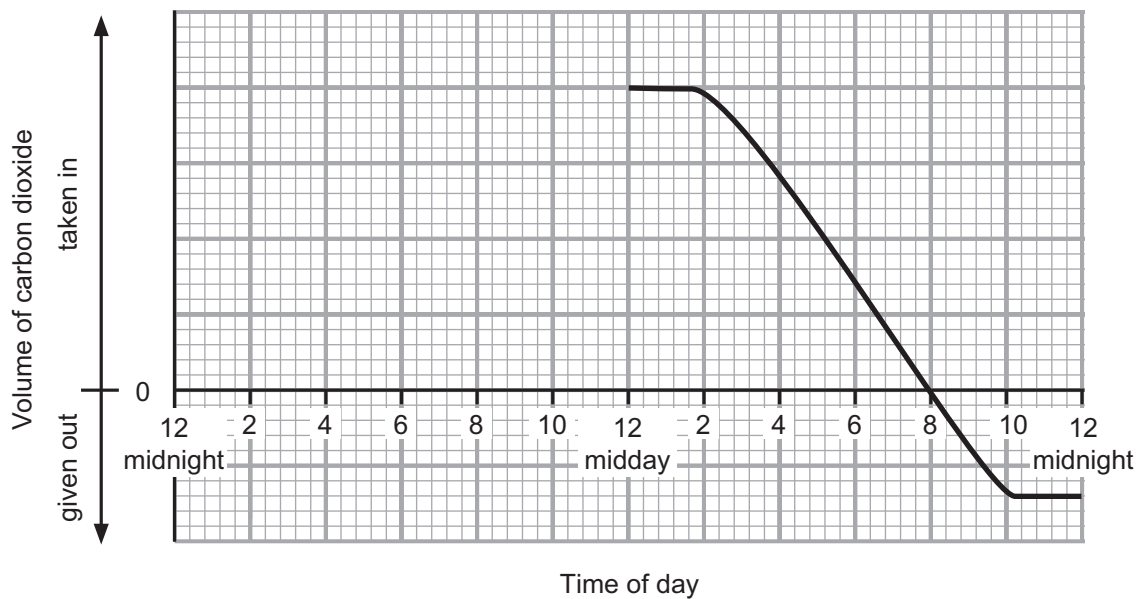
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9 Photosynthesis and respiration occur in plants.

The graph shows some data for the volume of carbon dioxide taken in and given out by a plant over a 24 hour period in summer.



(a) On this day the sun rose at 4 am.

The first compensation point occurred at 6 am.

(i) Draw a line on the graph to show the volume of carbon dioxide given out or taken in between 12 midnight and 12 midday. [3]

(ii) Describe and explain what is happening at 6 am.

[2]



- (b) Use the graph to describe and explain what is happening between 9pm and 10pm.

[3]

- (c) The same graph, drawn for a 24 hour period in winter, would have a much shorter time between compensation points.

Suggest the effect this would have on the growth of a plant.
Explain your answer in terms of photosynthesis **and** respiration.

[2]

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Question 2(a): Chief Examiner

Question 3(a): Chief Examiner

Question 5(b): © CCEA

Question 6(a): Principal Examiner

Question 6(b): Principal Examiner

Question 7: Principal Examiner

Question 9: Graph – Principal Examiner

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