AQA GCSE Combined Science - Trilogy | 8464

SPECIFICATION POINT 4.2.3.2

Plant organ system

Past-paper questions

Tier	**Foundation**
Question groups	**7**
Available paper years	**2019–2025**

Using this booklet

1. Answer the questions in order and show your working.
2. Original question numbers and marks are retained.
3. Print at actual size (100%) for measuring questions.
4. Use the companion answer booklet to check your work.

Name: _____ **Date:** _____

Whole questions are retained for context, so some parts assess other specification points. Current and legacy sources are labelled. Continue on extra paper if needed.

4.2.3.2 Plant organ system

Question 01

June 2019 | 8464/B/1F | Original Q4

0 4 Water is lost from the leaves of a plant through stomata.

0 4 . 1 What is the process by which water is lost from the leaves of a plant?

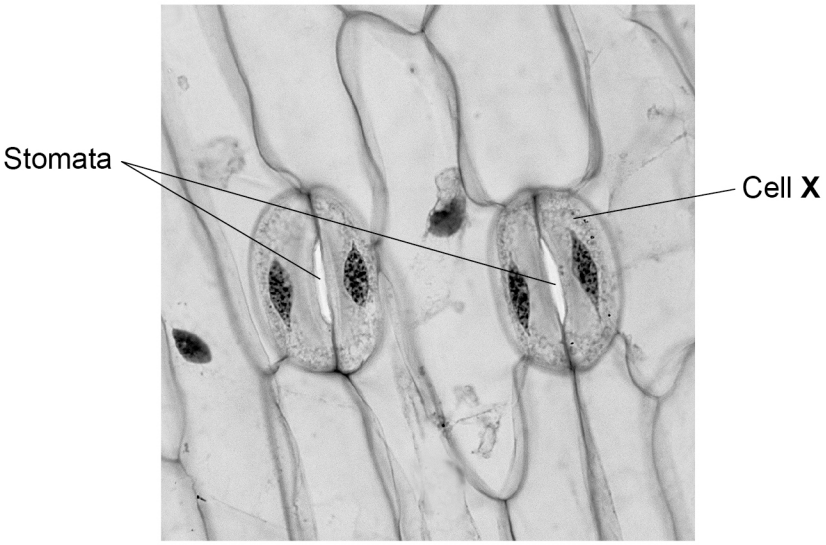
[1 mark]

Tick (✓) **one** box.

- Osmosis ☐
- Photosynthesis ☐
- Transpiration ☐

Figure 7 shows stomata on the lower surface of a leaf.

Figure 7



4.2.3.2 Plant organ system

Question 01 · continued

0 4 . 2 What is the name of cell **X**?

[1 mark]

Tick (✓) **one** box.

- Epidermal cell ☐
- Guard cell ☐
- Palisade cell ☐
- Xylem cell ☐

0 4 . 3 The length of cell **X** is 25 mm when viewed at a magnification of ×800

Calculate the real length of cell **X**.

Give your answer in micrometres (μm).

1 mm = 1000 μm

Use the equation:

$$\text{real length of cell} = \frac{\text{size of image}}{\text{magnification}}$$

[3 marks]

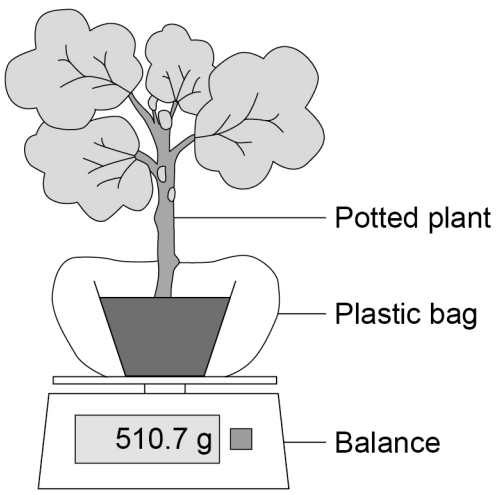
Real length of cell **X** = _____ μm

Question 4 continues on the next page

A student measured the mass of water lost from some similar plants.
The plants were at different temperatures.

Figure 8 shows the apparatus used.

Figure 8



This is the method used.

1. Seal a plastic bag around the pot of a potted plant.
2. Place the potted plant with the bag on a balance in a room at 20 °C
3. Record the mass.
4. After 3 hours record the mass again.
5. Calculate the mass of water lost from the plant.
6. Repeat steps 1–5 at 25 °C and at 30 °C with other similar plants.

0 4 . 4 What was the independent variable in this investigation?

[1 mark]

Tick (✓) **one** box.

Initial mass of the plant ☐

Length of time the plant was left ☐

Mass of water lost ☐

Temperature of the room ☐

4.2.3.2 Plant organ system

Question 01 · continued

0 4 . 5 Suggest why the student sealed a plastic bag around the pot.

[1 mark]

Question 4 continues on the next page

Question 01 · continued

Table 1 shows the student's results.

Table 1

Temperature in °C	Mass at the start in g	Mass after 3 hours in g	Mass of water lost in 3 hours in g
20	510.7	508.6	2.1
25	510.4	507.1	3.3
30	**X**	506.3	4.9

0 4 . 6 What is the resolution of the balance used in this investigation?

[1 mark]

Tick **one** box.

0.1 g ☐ 1.0 g ☐ 100 g ☐ 500 g ☐

0 4 . 7 Calculate value **X** in **Table 1**.

[1 mark]

X = _____ g

0 4 . 8 Give **one** conclusion that can be made from the results in **Table 1**.

[1 mark]

0 4 . 9 Give **two** factors that might affect the rate of water loss from the leaves.

Do **not** refer to temperature in your answer.

[2 marks]

1 _____

2 _____

12

4.2.3.2 Plant organ system

Question 02

November 2020 | 8464/B/1F | Original Q3

0 3 Water is lost from the leaves of plants through pores called stomata.

0 3 . 1 What is the loss of water from a leaf called?

[1 mark]

Tick (✓) **one** box.

- Osmosis ☐
- Respiration ☐
- Transpiration ☐

0 3 . 2 Which cells control the size of stomata?

[1 mark]

Tick (✓) **one** box.

- Guard cells ☐
- Phloem cells ☐
- Xylem cells ☐

Question 3 continues on the next page

4.2.3.2 Plant organ system

Question 02 · continued

A student investigated the water loss when different surfaces of leaves were covered in grease.

The grease blocks the stomata.

This is the method used.

1. Remove four similar leaves from one plant.
2. Put grease on different surfaces of the leaves as shown in **Figure 4**.
3. Record the mass of each leaf and attach the four leaves to a string.
4. After 24 hours record the mass of each leaf again.

Figure 4

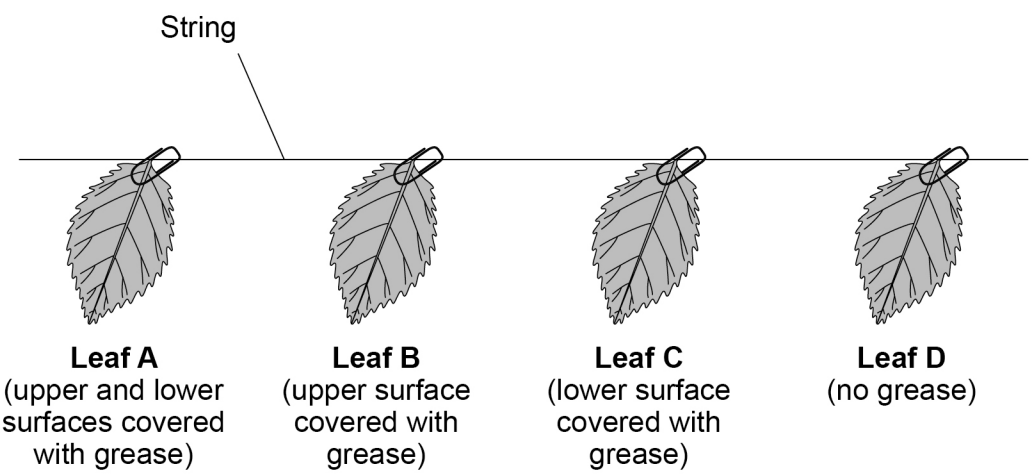


Table 2 shows the results.

Table 2

Leaf	Surfaces covered with grease	Mass of leaf at start in grams	Mass of leaf after 24 hours in grams	Loss in mass after 24 hours in grams
A	Upper and lower	2.01	1.97	**X**
B	Only upper	2.00	1.87	0.13
C	Only lower	2.01	1.96	0.05
D	None	1.98	1.83	0.15

4.2.3.2 Plant organ system

Question 02 · continued

0 3 . 3 Calculate value **X** in **Table 2**.

[1 mark]

Value **X** = _____ g

0 3 . 4 The loss in mass of water was measured after 24 hours.

Calculate the mass of water lost in grams per hour for leaf **D**.

[2 marks]

Mass of water lost per hour = _____ g

The student concluded:

'More water is lost from the lower surface of a leaf than from the upper surface.'

0 3 . 5 What evidence is there in **Table 2** to support the student's conclusion?

[1 mark]

0 3 . 6 What do the results in **Table 2** show about the number of stomata on the surfaces of a leaf?

[1 mark]

Tick (✓) **one** box.

There are more stomata on the lower surface. ☐

There are more stomata on the upper surface. ☐

There are the same number of stomata on both surfaces. ☐

4.2.3.2 Plant organ system

Question 02 · continued

0 3 . 7 The investigation was done at 20 °C

How would the mass of water lost be different if the investigation was done at 25 °C?

Give a reason for your answer.

[2 marks]

Difference _____

_____

Reason _____

_____

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4.2.3.2 Plant organ system

Question 03

November 2021 | 8464/B/1F | Original Q4

0 4 This question is about plant transport systems.

0 4 . 1 Which **organ** in a plant absorbs water from the soil?

[1 mark]

_____

0 4 . 2 The concentration of nitrate ions in the soil is lower than the concentration of nitrate ions inside a plant.

How would the nitrate ions move from the soil into the cells of this plant?

[1 mark]

Tick (✓) **one** box.

By active transport ☐

By diffusion ☐

By osmosis ☐

4.2.3.2 Plant organ system

Question 03 · continued

Dissolved sugars are transported in the phloem.

0 4 . 3 What is the name of the process that moves dissolved sugars through the phloem?

[1 mark]

Tick (✓) **one** box.

Evaporation ☐

Osmosis ☐

Translocation ☐

0 4 . 4 Give **one** use of sugars in a plant.

[1 mark]

_____

_____

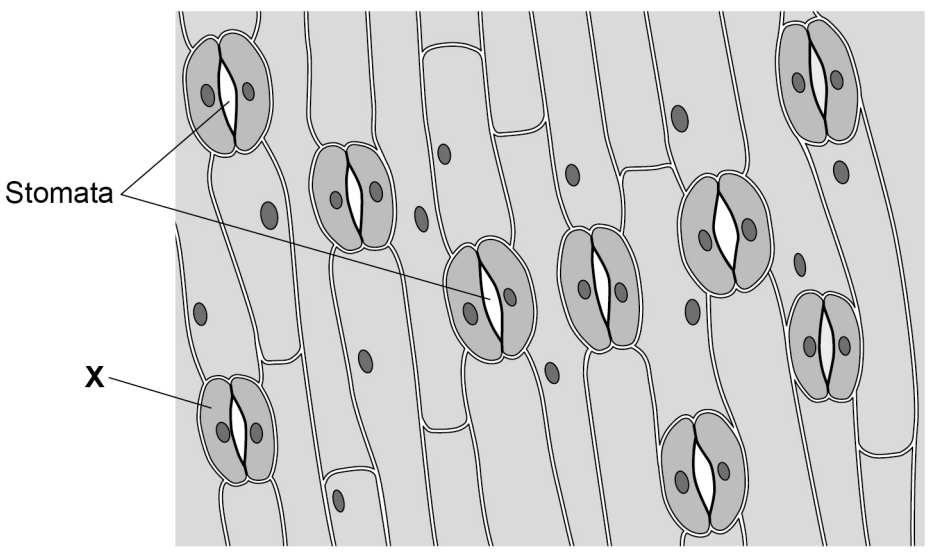
Question 4 continues on the next page

Stomata are openings on the surface of a leaf.

Stomata allow gases to move into and out of a leaf.

Figure 5 shows the surface of a leaf.

Figure 5



0 4 . 5 What is cell **X**?

[1 mark]

Tick (✓) **one** box.

Guard cell ☐

Meristem cell ☐

Palisade cell ☐

4.2.3.2 Plant organ system

Question 03 · continued

0 4 . 6 Why do the stomata open during the day?

[1 mark]

Tick (✓) **one** box.

To allow carbon dioxide in ☐

To allow nitrogen in ☐

To allow oxygen in ☐

0 4 . 7 The area of the leaf shown in **Figure 5** is 0.25 mm^2.

Calculate the number of stomata per mm^2 for the leaf in **Figure 5**.

Use the equation:

$$\text{number of stomata per mm}^2 = \frac{\text{number of stomata}}{\text{area in mm}^2}$$

[2 marks]

Number of stomata per mm^2 = _____

Question 4 continues on the next page

Question 03 · continued

A student investigated the number of stomata per mm^2 on the upper and lower surfaces of leaves.

The leaves were taken from the same plant.

Table 1 shows the results.

Table 1

Leaf	Number of stomata per mm^2	
	Upper surface	Lower surface
1	0	37
2	1	36
3	2	30
4	1	32
5	1	35
Mean	1	**X**

0 4 . 8 Calculate mean value **X** in **Table 1**.

[2 marks]

X = _____

4.2.3.2 Plant organ system

Question 03 · continued

0 4 . 9 Water vapour is lost through stomata.

Explain the difference in the number of stomata on the upper and lower surfaces of the leaves.

Use **Table 1**.

[3 marks]

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Turn over for the next question

4.2.3.2 Plant organ system

Question 04

June 2023 | 8464/B/1F | Original Q3

0 3 Plants need water for photosynthesis.

0 3 . 1 Where do plants obtain water for photosynthesis from?

[1 mark]

Plants lose water from their leaves through small pores called stomata.

0 3 . 2 What is the evaporation of water from leaves called?

[1 mark]

Tick (✓) **one** box.

- Active transport ☐
- Respiration ☐
- Transpiration ☐

Question 3 continues on the next page

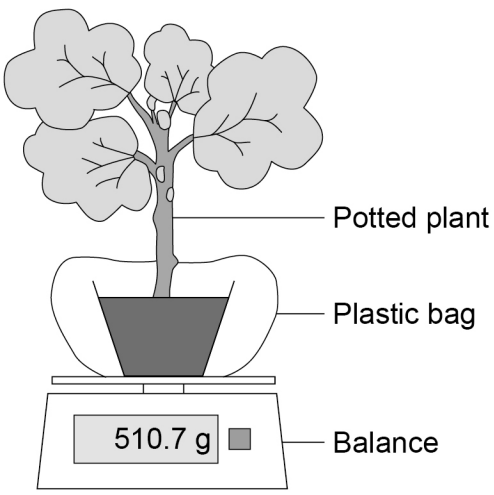
4.2.3.2 Plant organ system

Question 04 · continued

A student investigated the mass of water lost from a plant.

Figure 4 shows the apparatus.

Figure 4



This is the method used.

1. Seal a plastic bag around the pot of a potted plant.
2. Place the plant on a balance in a room at 20 °C.
3. Record the mass.
4. Record the mass every hour for 5 hours.
5. Calculate the total mass of water lost from the plant after each hour.

4.2.3.2 Plant organ system

Question 04 · continued

Table 1 shows the results.

Table 1

Time in hours	Mass in grams	Total mass of water lost in grams
0	510.7	0.0
1	508.9	1.8
2	507.1	3.6
3	505.3	5.4
4	503.5	7.2
5	**X**	9.0

0 3 . 3 Calculate mass **X** in **Table 1**.

[2 marks]

Mass **X** = _____ grams

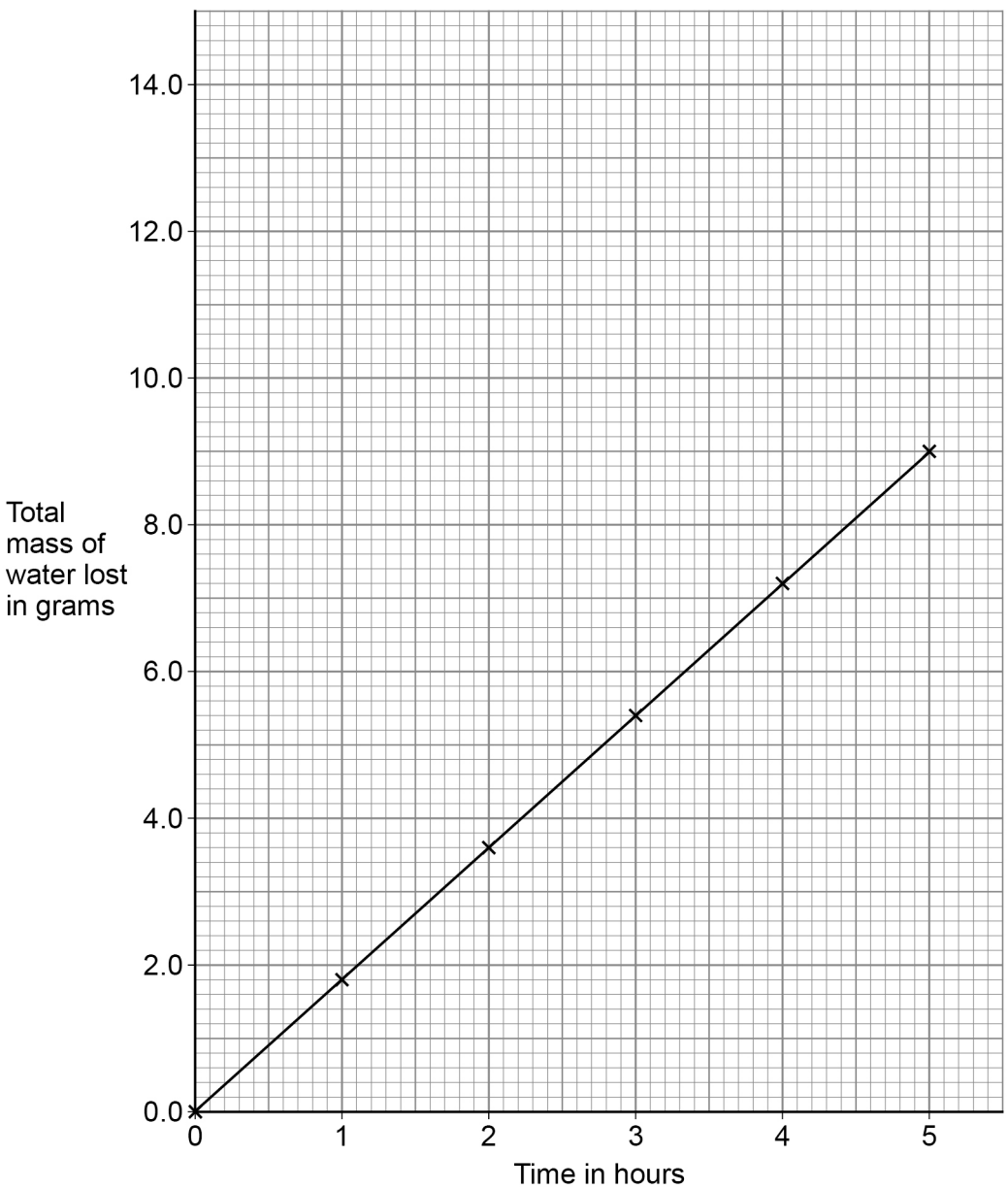
Question 3 continues on the next page

4.2.3.2 Plant organ system

Question 04 · continued

Figure 5 shows the results.

Figure 5



4.2.3.2 Plant organ system

Question 04 · continued

0 3 . 4 What was the rate of water loss from the plant?

[1 mark]

Tick (✓) **one** box.

0.9 grams/hour ☐

1.8 grams/hour ☐

9.0 grams/hour ☐

0 3 . 5 The investigation was repeated at a **lower** temperature.

Draw **one** line on **Figure 5** to show how the results would be different at a **lower** temperature.

[2 marks]

0 3 . 6 Suggest **one** change to the investigation that would **increase** the rate of water loss from the plant.

Do **not** refer to temperature in your answer.

[1 mark]

_____

_____

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4.2.3.2 Plant organ system

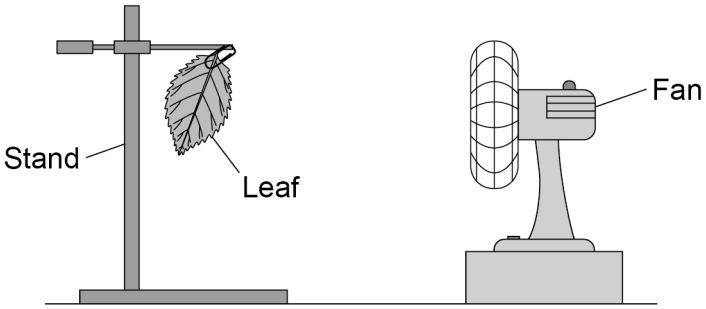
Question 05

0 2 A student investigated the loss of mass from leaves that were placed in winds of different speed.

The student used an electric fan to create different wind speeds.

Figure 4 shows the apparatus.

Figure 4



This is the method used.

1. Record the mass of one leaf taken from a plant.

2. Attach the leaf to a stand.

3. Leave for 1 hour with the fan off.

4. Record the final mass of the leaf.

5. Repeat steps 1 to 4 with the fan set at different speeds. Use leaves of a similar size each time.

6. Calculate the loss of mass for each leaf.

4.2.3.2 Plant organ system

Question 05 · continued

Table 1 shows the results.

Table 1

Fan setting	Loss of mass in grams
Off	0.06
Low speed	0.15
Medium speed	0.23
High speed	0.31

0 2 . 1 Why did the student do one experiment with the fan off?

[1 mark]

0 2 . 2 How does **increasing** fan speed affect the loss of mass from the leaves?

Use **Table 1**.

[1 mark]

0 2 . 3 Explain why the mass of the leaves decreased at all fan speeds.

[3 marks]

Question 05 · continued

0 2 . 4 The student repeated the investigation in a room at a higher temperature.

Complete the sentence.

Choose the answer from the box.

[1 mark]

smaller	**the same**	**greater**

At a higher temperature the loss of mass from the leaves

would be _____.

0 2 . 5 How could the student check the repeatability of the results?

[1 mark]

Tick (✓) **one** box.

Do the investigation again using a different method. ☐

Do the investigation again using a different type of plant. ☐

Do the investigation again using the same method. ☐

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4.2.3.2 Plant organ system

Question 06

June 2025 | 8464/B/1F | Original Q3

0 3 A student investigated the effect of concentration of salt solution on the mass of potato cubes.

This is the method used.

1. Cut a piece of potato into four cubes.
2. Record the mass of each cube.
3. Put each cube into a different beaker.
4. Pour a different concentration of salt solution into each beaker.
5. After 1 hour, remove each cube.
6. Record the mass of each cube.

0 3 . 1 Suggest **two** improvements to the investigation.

[2 marks]

1 _____

_____

2 _____

_____

Question 3 continues on the next page

The student improved the investigation.

Table 3 shows the results.

Table 3

Concentration of salt solution in mol/dm^3	Mass of potato cube at the start in grams	Mass of potato cube after one hour in grams	Change in mass in grams
0.0	30.6	30.7	+0.1
0.5	30.8	30.8	0.0
1.0	30.8	30.7	–0.1
2.0	30.5	30.3	–0.2

0 3 . 2 What was the concentration of the solution inside the potato cells?

[1 mark]

Tick (✓) **one** box.

- 0.0 mol/dm^3 ☐
- 0.5 mol/dm^3 ☐
- 1.0 mol/dm^3 ☐
- 2.0 mol/dm^3 ☐

4.2.3.2 Plant organ system

Question 06 · continued

0 3 . 3 Changes in mass of the potato cubes are due to water moving into and out of the cells.

What is the name of the process that allows water to move into and out of cells?

[1 mark]

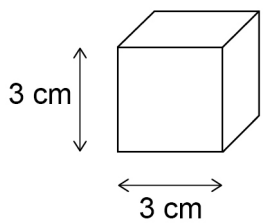
Tick (✓) **one** box.

- Active transport ☐
- Osmosis ☐
- Respiration ☐

Question 3 continues on the next page

0 3 . 4 **Figure 7** shows one of the potato cubes.

Figure 7



Calculate the surface area of the potato cube.

Give the unit.

[3 marks]

Surface area = _____ Unit _____

0 3 . 5 The student then investigated the effect of **surface area** on the change in mass of a piece of potato.

Describe how the student could increase the surface area of the piece of potato shown in **Figure 7**.

[1 mark]

Potatoes contain varying amounts of carbohydrates and proteins.

Starch and sugar are different types of carbohydrate.

0 3 . 6 Draw **one** line from each carbohydrate to the chemical used to test for the carbohydrate.

[2 marks]

Carbohydrate	Chemical used for test
Starch	Benedict's reagent
Sugar	Biuret reagent
	Ethanol
	Iodine solution

0 3 . 7 A potato was tested for protein, sugar and starch.

Table 4 shows the results.

Table 4

	Test for protein	Test for sugar	Test for starch
Result	Blue	Red	Blue-black

Which substances were found in the potato?

[1 mark]

Tick (✓) **one** box.

- Protein and starch ☐
- Protein and sugar ☐
- Sugar and starch ☐

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4.2.3.2 Plant organ system

Question 07

0 2 Farmers can increase crop yield by controlling the conditions that plants grow in.

0 2 . 1 Draw **one** line from each substance to how the substance increases crop yield.

[2 marks]

Substance	How the substance increases crop yield
Fertiliser	Adds mineral ions to the soil
Herbicide	Decreases carbon dioxide concentration in the soil
	Increases oxygen concentration in the air
	Kills weeds that compete with crops

0 2 . 2 **Figure 1** shows a food chain for a farmer's field.

Figure 1

Seeds → Mice → Owls

Which is the secondary consumer in the food chain?

[1 mark]

Tick (✓) **one** box.

- Seeds ☐
- Mice ☐
- Owls ☐

0 2 . 3 Bees are insects that live in hives.

The bees fly in and out of the hives.

Figure 2 shows a crop growing in a field.

The farmer has added bee hives to increase the number of bees in the field.

Figure 2



Increasing the number of bees and other insects increases crop yield.

Which are **two** ways that increasing the number of insects in an area will increase crop yield?

[2 marks]

Tick (✓) **two** boxes.

- Insects change the soil pH around the crop. ☐
- Insects eat leaves from the crop. ☐
- Insects eat pests on the crop. ☐
- Insects pollinate the crop. ☐
- Insects shelter in the crop. ☐

0 2 . 4 Some farmers increase the size of hedgerows between fields where crops grow.

Suggest **one** reason why.

[1 mark]

Peat comes from peat bogs.

0 2 . 5 Peat can be used to produce garden compost.

Table 1 compares peat compost with a sample of soil.

Table 1

	Mineral ion concentration	Speed at which water drains through
Peat compost	Low	Slow
Soil	High	Fast

Young plants have short roots.

Explain **one** advantage of growing young plants in peat compost instead of in soil.

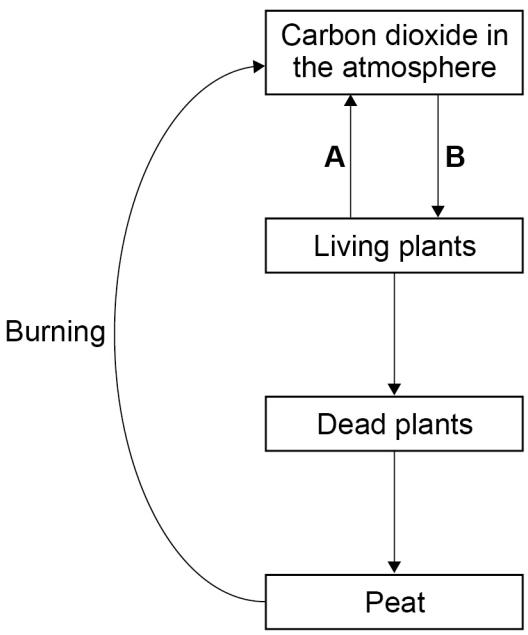
[2 marks]

Question 2 continues on the next page

Peat can also be burnt as fuel.

Figure 3 shows part of the carbon cycle.

Figure 3



0 2 . 6 Name process **A** and process **B**.

Choose answers from the box.

[2 marks]

condensation	**photosynthesis**	**respiration**	**transpiration**

Process **A** _____

Process **B** _____

4.2.3.2 Plant organ system

Question 07 · continued

0 2 . 7 Peat contains carbon compounds.

Explain why burning peat contributes to climate change.

[2 marks]

0 2 . 8 Decay is an important process in the carbon cycle.

Which **two** types of organism cause decay?

[2 marks]

Tick (✓) **two** boxes.

- Algae ☐
- Animals ☐
- Bacteria ☐
- Fungi ☐
- Plants ☐

0 2 . 9 Deforestation affects the carbon cycle.

Give **one** use of the land after the land has been cleared by deforestation.

[1 mark]

15