AQA GCSE Combined Science - Trilogy | 8464

SPECIFICATION POINT 4.7.3.3

Land use

Past-paper questions

Tier	**Foundation**
Question groups	**21**
Available paper years	**2018–2025**

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.

4.7.3.3 Land use

Question 01

June 2018 | 8464/B/1F | Original Q2

0 2 This question is about photosynthesis.

0 2 . 1 What are the **two** products of photosynthesis?

[2 marks]

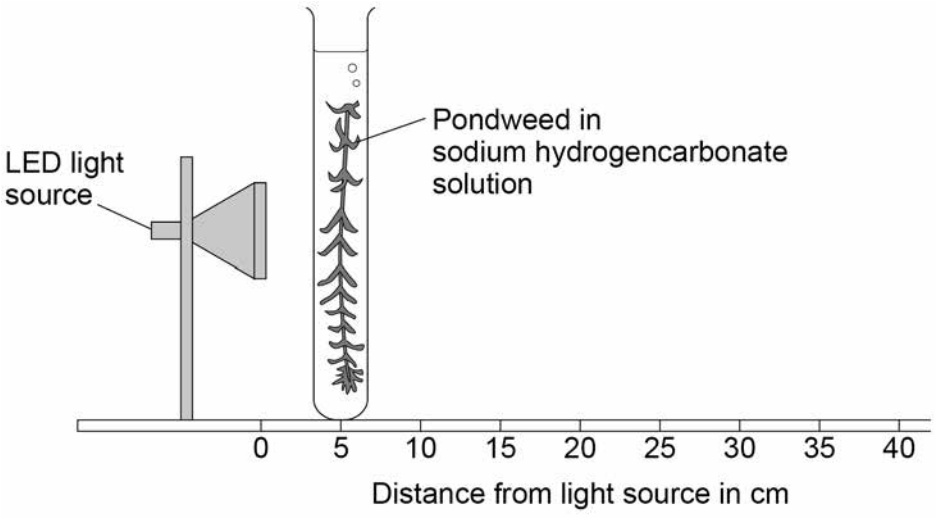
Tick **two** boxes.

- Carbon dioxide ☐
- Chlorophyll ☐
- Glucose ☐
- Oxygen ☐
- Water ☐

A student investigated the effect of light intensity on the rate of photosynthesis.

Figure 4 shows the apparatus.

Figure 4



This is the method used.

1. Place the pondweed at 5 cm from the light source.
2. Measure the rate of photosynthesis by counting the number of bubbles produced in 30 seconds.
3. Repeat the investigation with the pondweed at different distances from the light source.

Question 01 · continued

0 2 . 2 How could the student measure the rate of photosynthesis more accurately?

[2 marks]

Tick **two** boxes.

- Count the number of bubbles produced in 1 minute ☐
- Measure the change in mass of the pondweed in 30 seconds ☐
- Measure the volume of gas produced in 30 seconds ☐
- Place the pondweed further from the light source ☐
- Use water instead of sodium hydrogencarbonate solution ☐

0 2 . 3 The LED light source does **not** get hot.

Why is this important?

[1 mark]

Table 1 shows the student's results.

Table 1

Distance of light source from pondweed in cm	Number of bubbles produced in 30 seconds
5	40
10	13
15	5
20	2
25	1
30	0

4.7.3.3 Land use

Question 01 · continued

0 2 . 4 Calculate the number of bubbles produced in 2 minutes when the light source was 10 cm from the pondweed.

[1 mark]

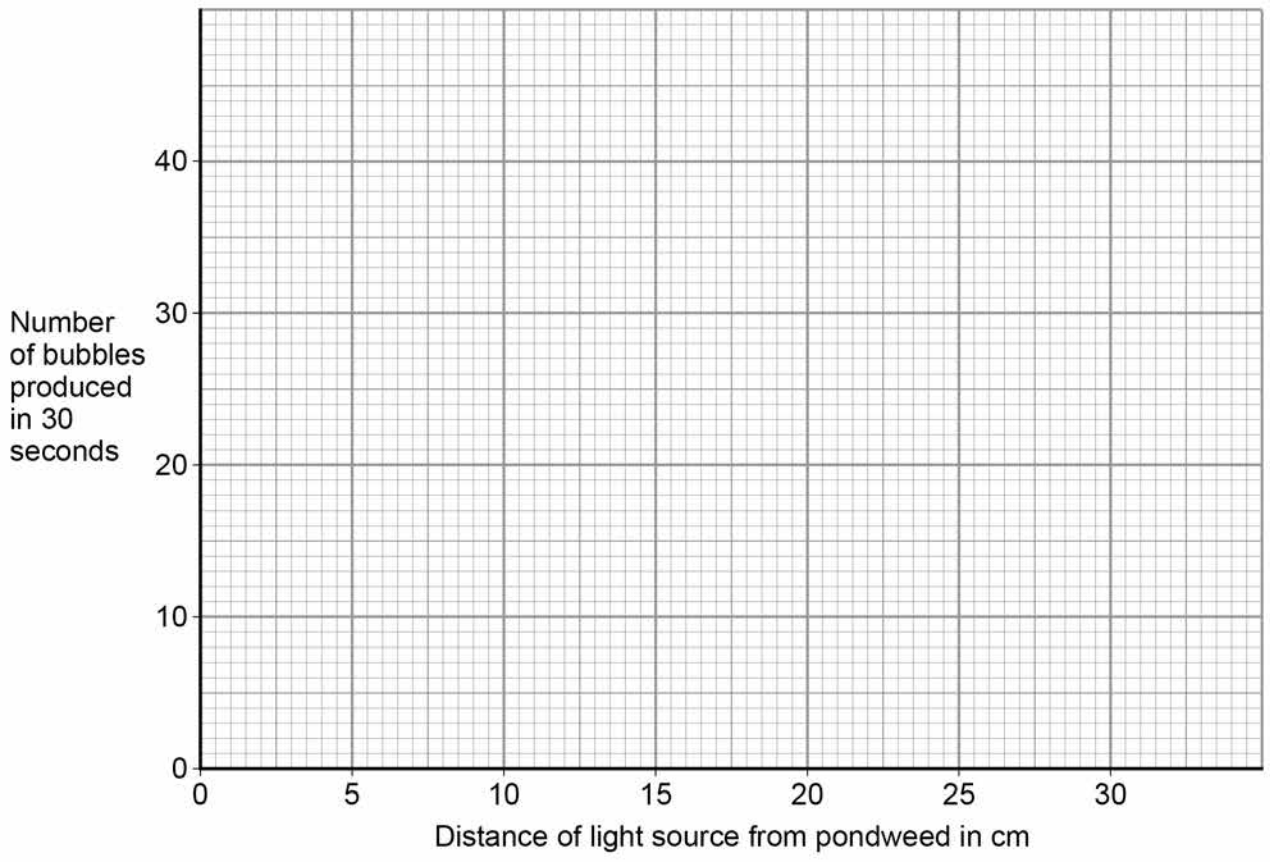
Number of bubbles produced in 2 minutes = _____

0 2 . 5 Plot the data from **Table 1** on **Figure 5**

Draw a line of best fit.

[3 marks]

Figure 5



0 2 . 6 Give **one** conclusion that can be made from these results.

[1 mark]

10

4.7.3.3 Land use

Question 02

0 6 Many biotic and abiotic factors can affect the growth of plants.

0 6 . 1 Are the factors in **Table 6** biotic or abiotic?

[2 marks]

Tick **one** box for each factor.

Table 6

Factor	Biotic	Abiotic
Diseases		
Herbivores		
Temperature		
Water		

Two students investigated the effect of light intensity on the distribution of small plants.

The plants are growing under a tree in a park.

The students made the following hypothesis:

'As you move outwards from a tree there will be more plant growth.'

0 6 . 2 Explain why the students thought their hypothesis would be correct.

[3 marks]

Question 02 · continued

0 6 . 3 The students used two pieces of equipment.

Give the scientific name of each piece of equipment.

[2 marks]

A square frame measuring 0.5 m × 0.5 m _____

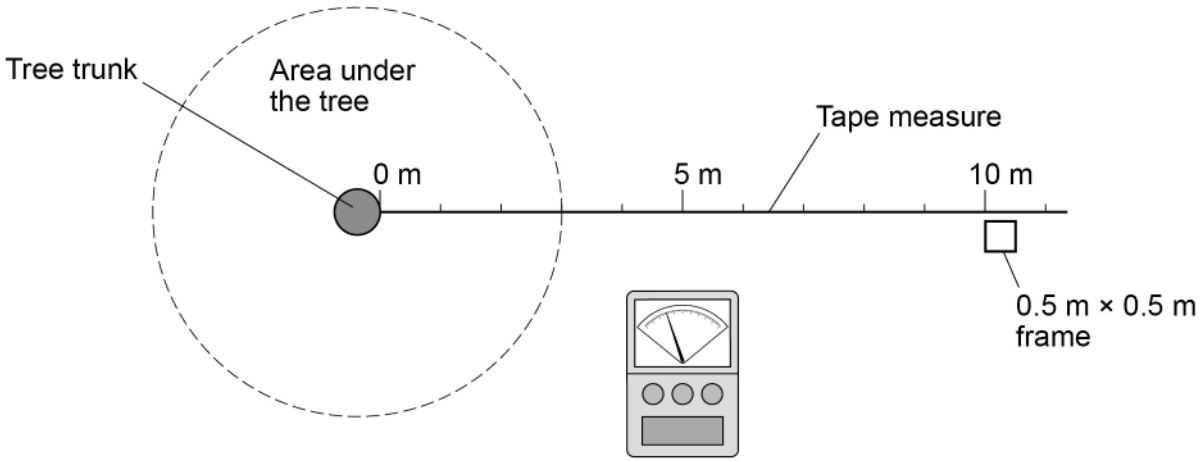
An electronic device to measure light intensity _____

This is the method used.

1. Fix one end of a tape measure at the base of the tree.
2. Fix the other end of the tape measure 11 metres from the tree.
3. At 0 metres put the square frame on the ground.
4. Identify all the plant species growing inside the frame.
5. Estimate and record the percentage cover of each plant species.
6. Measure the light intensity inside the frame.
7. Put the square frame on the ground every 2 metres along the tape to 10 metres.
8. Repeat steps 4 – 6 in every frame.

Figure 9 shows the equipment in this investigation.

Figure 9



0 6 . 4 Calculate the total area sampled.

[1 mark]

_____

_____

Total area sampled = _____ m^2

0 6 . 5 The whole investigation was done as quickly as possible on the same day.

Suggest **one** reason why.

[1 mark]

0 6 . 6 Give **one** way the investigation could be improved.

[1 mark]

Table 7 shows the results.

Table 7

	Distance from tree in metres					
	0	**2**	**4**	**6**	**8**	**10**
Percentage cover of grass	15	50	35	16	15	15
Percentage cover of plantain	0	5	10	40	25	30
Percentage cover of daisy	0	0	0	4	20	10
Percentage cover of clover	1	10	25	40	40	45
Total percentage cover of plants	16	65	70	100	100	100
Light intensity in arbitrary units	37	59	150	175	>200	>200

0 6 . 7 Which plant species in **Table 7** will only grow at high light intensity?

[1 mark]

4.7.3.3 Land use

Question 02 · continued

0 6 . 8 What conclusion can be made about the relationship between light intensity and the total percentage cover of plants?

Use data from **Table 7** in your answer.

[2 marks]

0 6 . 9 Light intensity might **not** be the cause of this pattern of plant distribution.

Suggest **one** different factor that may cause these results.

Give **one** reason for your answer.

[2 marks]

Factor

Reason

15

4.7.3.3 Land use

Question 03

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.

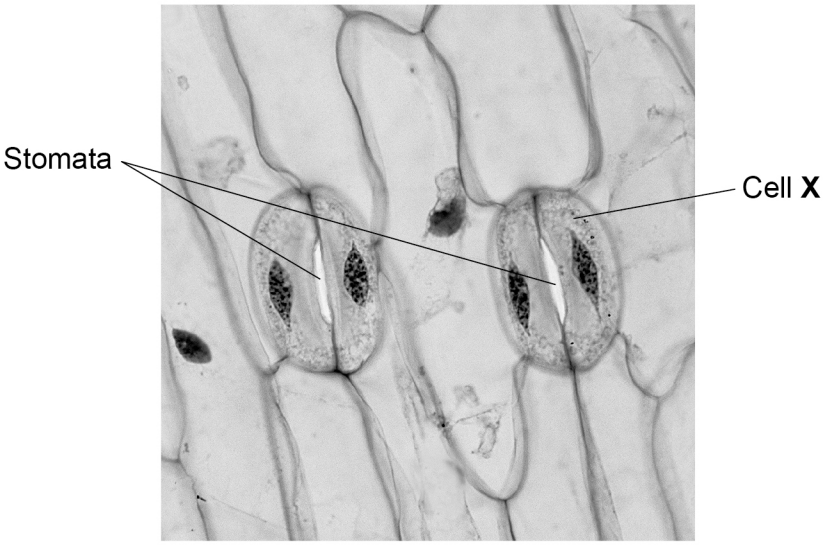
Osmosis ☐

Photosynthesis ☐

Transpiration ☐

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

Figure 7



Question 03 · 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

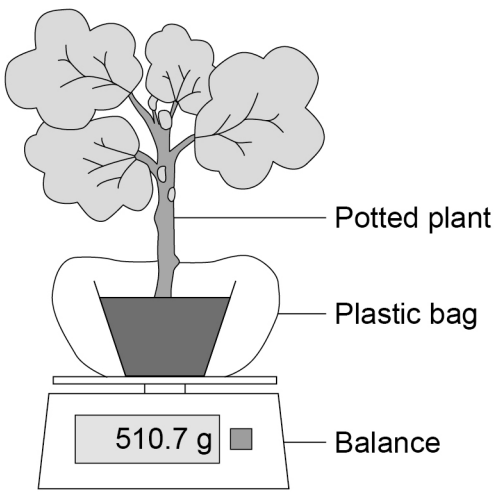
Question 4 continues on the next page

Question 03 · continued

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 ☐

4.7.3.3 Land use

Question 03 · 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 03 · 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

4.7.3.3 Land use

Question 04

June 2019 | 8464/B/2F | Original Q2

0 2 Some students estimated the population of daisy plants in a field.

This is the method used.

1. Place a quadrat randomly on the field.
2. Count and record the number of daisy plants in the quadrat.
3. Repeat steps 1 and 2 another four times.

0 2 . 1 How could the students have made sure the quadrats were placed randomly?

[1 mark]

0 2 . 2 Describe the piece of equipment called a quadrat.

[1 mark]

Table 1 shows the results.

Table 1

Quadrat number	Number of daisy plants
1	8
2	11
3	4
4	6
5	16
Mean	**X**

0 2 . 3 Calculate mean value **X**.

[1 mark]

X = _____ daisy plants

4.7.3.3 Land use

Question 04 · continued

0 2 . 4 The field is a rectangle 100 m wide and 150 m long.

Calculate the area of the field.

[1 mark]

Area = _____ m^2

0 2 . 5 The quadrat used by the students had an area of 1.0 m^2

Estimate the population of daisy plants in the field.

Use your answers to Question **02.3** and Question **02.4**

[2 marks]

Estimated population = _____ daisy plants

0 2 . 6 More daisy plants grew in some parts of the field compared to other areas of the field.

Give **two** biotic factors that may affect where daisy plants grow in the field.

[2 marks]

1 _____

2 _____

0 2 . 7 The students noticed that the daisy plants growing near a building were smaller.

Explain why smaller daisy plants grew near the building.

[2 marks]

10

4.7.3.3 Land use

Question 05

June 2019 | 8464/B/2F | Original Q6

0 6 Some students investigated the effect of drinking caffeine on reaction time.

They used a drink containing 32.25 mg of caffeine per 100 cm^3

This is the method used.

1. Divide the students into four groups, **A**, **B**, **C** and **D**.
2. Measure and record the reaction time of each student using the ruler-drop test.
3. Students in:
   - group **A** drink 200 cm^3 of water
   - group **B** drink 200 cm^3 of the caffeine drink
   - group **C** drink 400 cm^3 of the caffeine drink
   - group **D** drink 600 cm^3 of the caffeine drink.
4. Repeat step 2 after 15 minutes.

0 6 . 1 Describe how to do the ruler-drop test.

[3 marks]

Question 6 continues on the next page

Question 05 · continued

0 6 . 2 **Table 3** shows the mass of caffeine taken in by each student.

Table 3

Group	Mass of caffeine in mg
A	0
B	64.5
C	129.0
D	**X**

Calculate value **X**.

[1 mark]

X = _____ mg

0 6 . 3 Why did group **A** drink water instead of the caffeine drink?

[1 mark]

Question 05 · continued

Table 4 was used to convert the results of the ruler-drop test into reaction times.

Table 4

Distance in cm	Reaction time in s	Distance in cm	Reaction time in s
2	0.064	28	0.239
4	0.090	30	0.247
6	0.111	32	0.256
8	0.128	34	0.263
10	0.143	36	0.271
12	0.156	38	0.278
14	0.169	40	0.286
16	0.181	42	0.293
18	0.192	44	0.300
20	0.202	46	0.306
22	0.212	48	0.313
24	0.221	50	0.319
26	0.230	52	0.326

0 6 . 4 Estimate the reaction time for a student who recorded a distance of 23 cm

[1 mark]

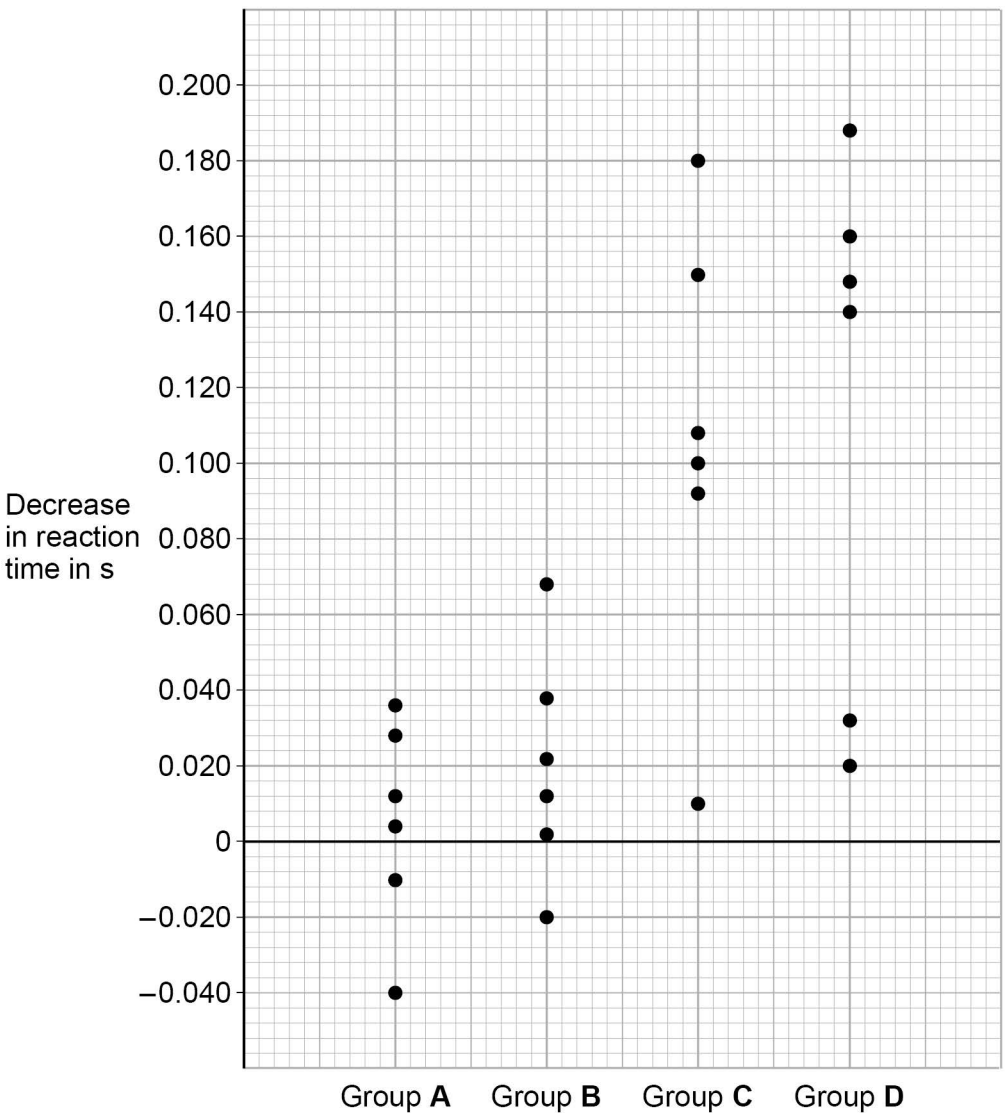
Reaction time = _____ s

Question 6 continues on the next page

Students calculated the decrease in their reaction time after the drink compared with before the drink.

Figure 6 shows the results for each student.

Figure 6



0 6 . 5 Describe the effect of the mass of caffeine taken in on the decrease in reaction time.

[1 mark]

4.7.3.3 Land use

Question 05 · continued

0 6 . 6 For three students the decrease in reaction time was negative.

Give the reason why the value was negative.

[1 mark]

0 6 . 7 What is the range of results for group **C**?

[1 mark]

0 6 . 8 Suggest **two** variables that should have been controlled in this investigation.

[2 marks]

1

2

0 6 . 9 Explain why the ruler-drop test does **not** involve a reflex action.

[2 marks]

13

4.7.3.3 Land use

Question 06

November 2020 | 8464/B/1F | Original Q5

0 5 A student investigated the effect of different concentrations of sugar solution on pieces of potato.

This is the method used.

1. Cut five pieces of potato.

2. Record the starting mass of each piece of potato.

3. Place each piece of potato in a different concentration of sugar solution.

4. After 24 hours remove the pieces of potato from the solutions.

5. Record the final mass of each piece of potato.

6. Calculate the change in mass for each piece of potato.

0 5 . 1 What is the independent variable?

[1 mark]

Tick (✓) **one** box.

- Change in mass of the pieces of potato ☐
- Concentration of the sugar solution ☐
- Length of time the pieces of potato are in the solution ☐
- Starting mass of the pieces of potato ☐

Question 5 continues on the next page

Table 3 shows the results.

Table 3

Concentration of sugar solution in mol/dm^3	Mass of potato at start in grams	Mass of potato after 24 hours in grams	Change in mass in grams
0.0	7.94	10.14	2.20
0.1	7.95	9.10	1.15
0.2	7.96	8.21	0.25
0.3	7.93	7.53	–0.40
0.4	7.93	7.18	–0.75
0.5	7.95	7.00	–0.95

0 5 . 2 Explain why the potato in 0.0 mol/dm^3 sugar solution increased in mass.

[2 marks]

Question 06 · continued

0 5 . 3 Complete **Figure 5**.

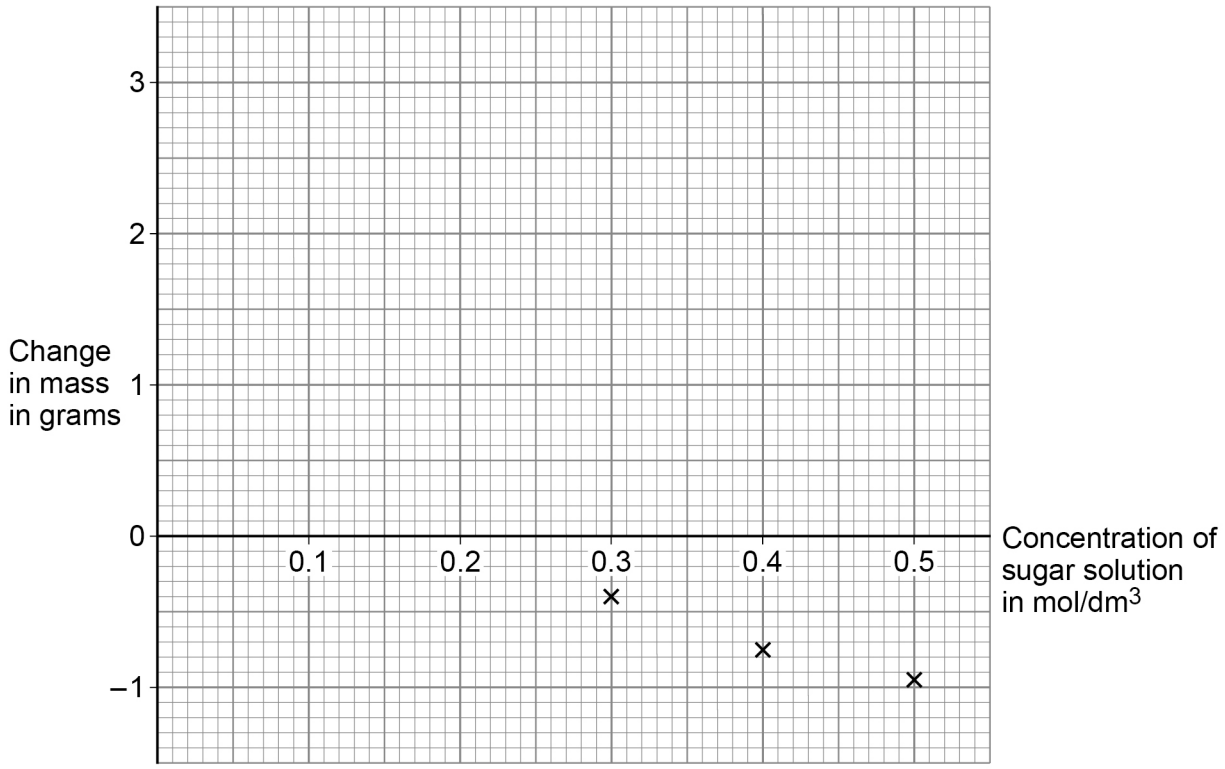
Some of the results have been plotted for you.

You should:

- plot the data from **Table 3**
- draw a line of best fit through all the points.

[2 marks]

Figure 5



0 5 . 4 The mass of a piece of potato does **not** change when:

concentration of solution inside cells = concentration of solution outside cells

Determine the concentration of sugar solution inside the potato cells.

Use **Figure 5**.

[1 mark]

Concentration = _____ mol/dm^3

Question 06 · continued

Table 3 is repeated below.

Table 3

Concentration of sugar solution in mol/dm^3	Mass of potato at start in grams	Mass of potato after 24 hours in grams	Change in mass in grams
0.0	7.94	10.14	2.20
0.1	7.95	9.10	1.15
0.2	7.96	8.21	0.25
0.3	7.93	7.53	–0.40
0.4	7.93	7.18	–0.75
0.5	7.95	7.00	–0.95

0 5 . 5 Calculate the percentage change in mass for the potato in 0.2 mol/dm^3 sugar solution.

Use **Table 3**.

Use the equation:

$$\text{percentage change in mass} = \frac{\text{change in mass}}{\text{mass of potato at start}} \times 100$$

Give your answer to 3 significant figures.

[3 marks]

Percentage change in mass (3 significant figures) = _____ %

9

4.7.3.3 Land use

Question 07

November 2020 | 8464/B/1F | Original Q6

0 6 Starch is digested to form sugar molecules in the digestive system.

0 6 . 1 What is the name of the enzyme that digests starch?

[1 mark]

0 6 . 2 Where are most food molecules absorbed?

[1 mark]

Tick (✓) **one** box.

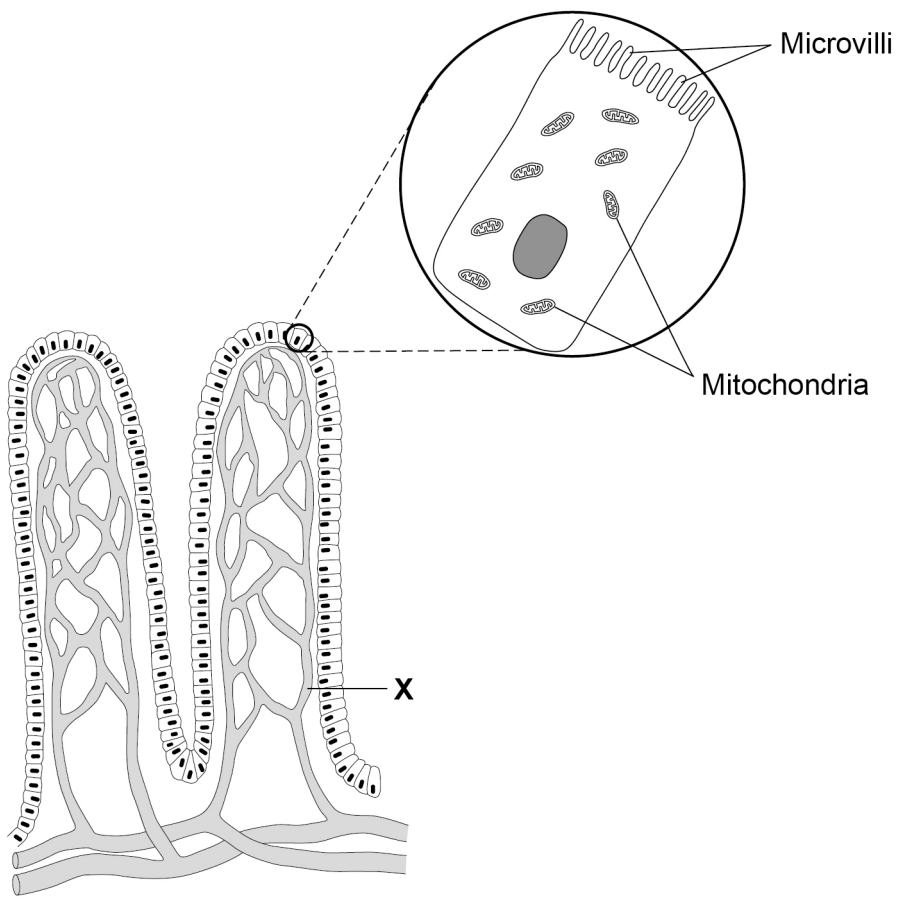
- Large intestine ☐
- Liver ☐
- Small intestine ☐
- Stomach ☐

Question 6 continues on the next page

Figure 6 shows two villi.

Figure 6 also shows one cell on the surface of a villus as seen using an electron microscope.

Figure 6



0 6 . 3 Give **one** advantage of using an electron microscope compared with using a light microscope.

[1 mark]

4.7.3.3 Land use

Question 07 · continued

0 6 . 4 What type of blood vessel is labelled **X**?

[1 mark]

Tick (✓) **one** box.

Artery ☐

Capillary ☐

Vein ☐

0 6 . 5 The real length of one villus is 0.8 mm

Calculate the image length if the villus is viewed at a magnification of ×20

Use the equation:

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

[3 marks]

Image length = _____ mm

Question 6 continues on the next page

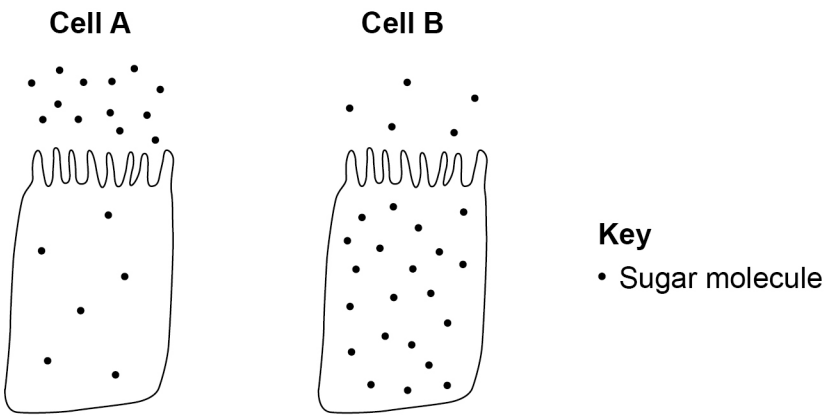
4.7.3.3 Land use

Question 07 · continued

Figure 7 shows two cells from the surface of a villus.

There are sugar molecules inside and next to each cell.

Figure 7



0 6 . 6 Name the process by which sugar moves into cell **A**.

[1 mark]

0 6 . 7 Name the process by which sugar moves into cell **B**.

[1 mark]

0 6 . 8 Give **one** use of sugar in the body.

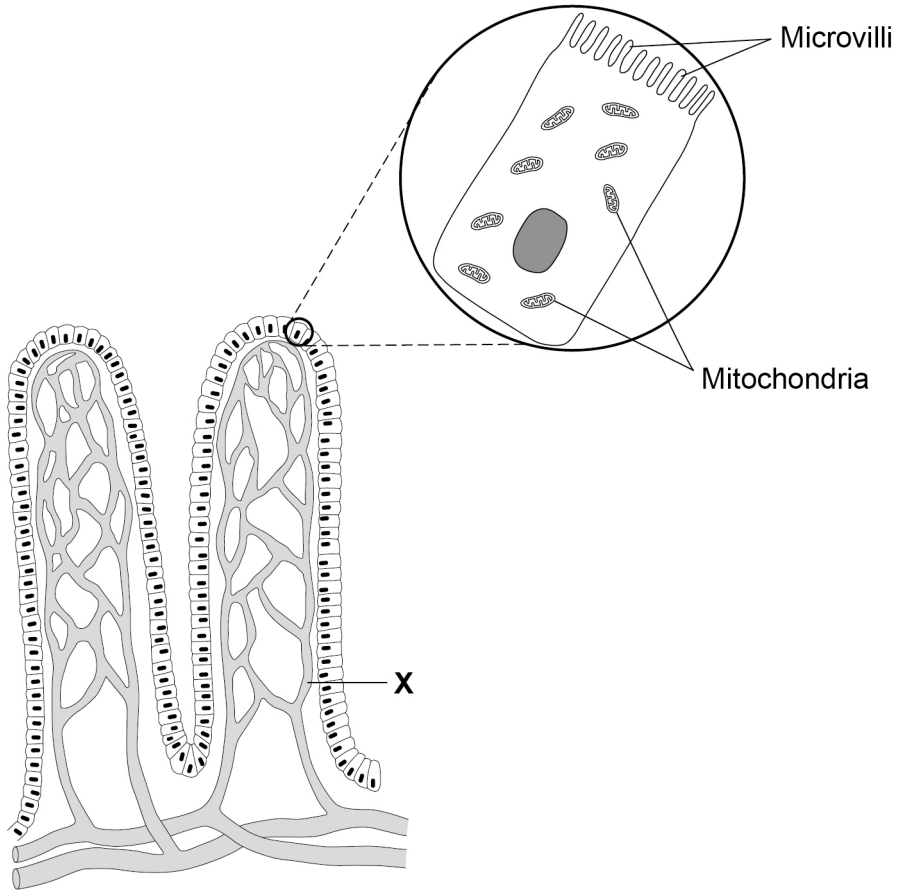
[1 mark]

4.7.3.3 Land use

Question 07 · continued

0 6 . 9 **Figure 6** is repeated below.

Figure 6



Explain how villi are adapted for efficient absorption of sugar molecules.

[4 marks]

14

4.7.3.3 Land use

Question 08

November 2020 | 8464/B/2F | Original Q5

0 5 This question is about biodiversity.

A farmer:

- grows only wheat crops
- has used all his small fields to make a few large fields
- cuts down trees in his woodlands to burn as fuel.

0 5 . 1 What are **two** ways the farmer could increase biodiversity on his farm?

[2 marks]

Tick (✓) **two** boxes.

- Cut down trees to grow wheat ☐
- Plant hedgerows around his fields ☐
- Plant many different crops in his fields ☐
- Put fences around his fields ☐
- Put fertiliser on his wheat crop ☐

Question 08 · continued

Students investigated the effect of cutting down trees in the woodland.

This is the method used.

1. Mark out a 10 m by 10 m area where trees have been removed.
2. Place a 1 m × 1 m quadrat at six random positions in the area.
3. Record the number of plant species present.
4. Record the number of invertebrate species seen among dead leaves on the ground.
5. Repeat steps 1 to 4 in an area where there are trees.

0 5 . 2 Suggest **one** improvement the students could make to their method.

[1 mark]

0 5 . 3 The students made this prediction:

'There will be more invertebrate species living in the area where there are trees.'

Explain why the students' prediction may be correct.

[2 marks]

Question 5 continues on the next page

Question 08 · continued

Table 1 shows the students' results.

Table 1

Quadrat	Number of plant species		Number of invertebrate species	
	Area with no trees	Area with trees	Area with no trees	Area with trees
1	8	2	4	10
2	6	2	3	6
3	7	0	4	8
4	6	3	5	14
5	20	4	2	9
6	8	1	6	13
Mean	7	2	4	10

0 5 . 4 The students decided that one result was anomalous.

Draw a ring around the anomalous result in **Table 1**.

[1 mark]

0 5 . 5 How does removing trees affect the number of invertebrate species living among the dead leaves on the ground?

Use **Table 1**.

[1 mark]

4.7.3.3 Land use

Question 08 · continued

0 5 . 6 There were more plant species growing in the area where there were no trees.

Explain why.

[3 marks]

10

Turn over for the next question

4.7.3.3 Land use

Question 09

November 2021 | 8464/B/1F | Original Q2

0 2 Antibiotics are used to treat bacterial infections.

0 2 . 1 Which substance is used as an antibiotic?

[1 mark]

Tick (✓) **one** box.

Aspirin ☐

Digitalis ☐

Penicillin ☐

Gonorrhoea and chlamydia are two sexually transmitted infections.

Gonorrhoea and chlamydia infections can be treated with antibiotics.

0 2 . 2 Give **one** symptom of gonorrhoea.

[1 mark]

4.7.3.3 Land use

Question 09 · continued

A scientist investigated which antibiotics were most effective at treating gonorrhoea and chlamydia.

This is the method used.

1. Grow gonorrhoea bacteria in a Petri dish.
2. Prepare four different antibiotic solutions, **A**, **B**, **C** and **D**, of the same concentration.
3. Cut four filter paper discs to the same size.
4. Soak each paper disc in a different antibiotic solution.
5. Put the four paper discs into the Petri dish.
6. Repeat steps 3 to 5 using a Petri dish with chlamydia bacteria growing in it.
7. Keep both Petri dishes at 25 °C for 3 days.

0 2 . 3 Give **two** control variables used in this investigation.

[2 marks]

1 _____

_____

2 _____

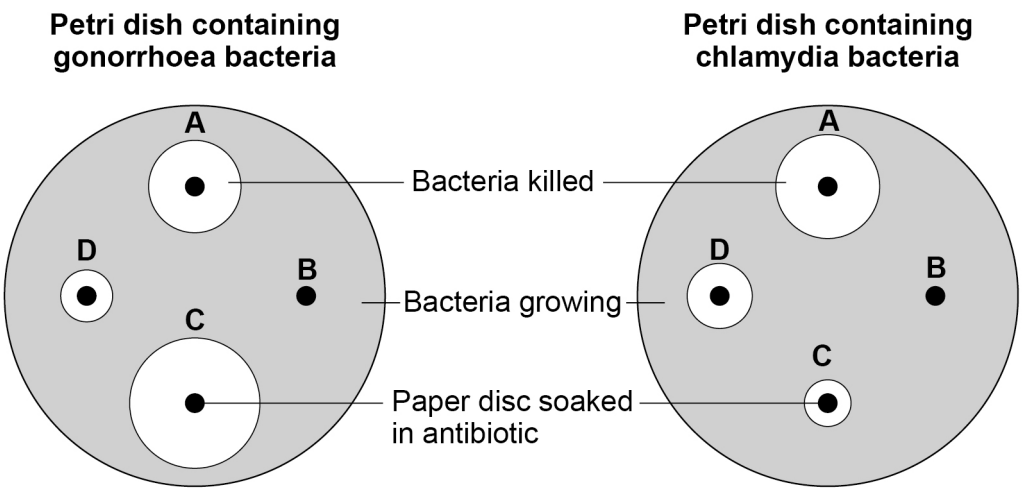
_____

Question 2 continues on the next page

Figure 2 shows the results.

A clear area around a paper disc is where the antibiotic has killed the bacteria.

Figure 2



0 2 . 4 Which antibiotic did **not** kill either type of bacterium?

[1 mark]

Tick (✓) **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐

0 2 . 5 Which antibiotic would be the most effective to treat a person with a **gonorrhoea** infection?

[1 mark]

Tick (✓) **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐

4.7.3.3 Land use

Question 09 · continued

0 2 . 6 Which antibiotic would be the most effective to treat a person who had both gonorrhoea **and** chlamydia infections?

[1 mark]

Tick (✓) **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐

0 2 . 7 Antibiotics **cannot** be used to treat HIV infections.

Suggest **one** reason why.

[1 mark]

Fungi can cause an infection of the fingernails and toenails.

Fungal nail infections can spread from one person to another person.

0 2 . 8 Some people go to nail salons to have their nails shaped and painted.

Suggest **one** way workers in nail salons can reduce the risk of infections being spread.

[1 mark]

0 2 . 9 Suggest **one** reason why fungal infection of toenails is more common than fungal infection of fingernails.

[1 mark]

10

4.7.3.3 Land use

Question 10

November 2021 | 8464/B/1F | Original Q3

0 3 Anaerobic respiration in yeast is called fermentation.

The equation for fermentation is:

glucose → ethanol + carbon dioxide

0 3 . 1 How does the equation show that fermentation is an **anaerobic** reaction?

[1 mark]

Fermentation in yeast is used in the manufacture of beer, wine and bread.

0 3 . 2 Why is fermentation used when making beer and wine?

[1 mark]

0 3 . 3 Explain why fermentation is used when making bread.

[2 marks]

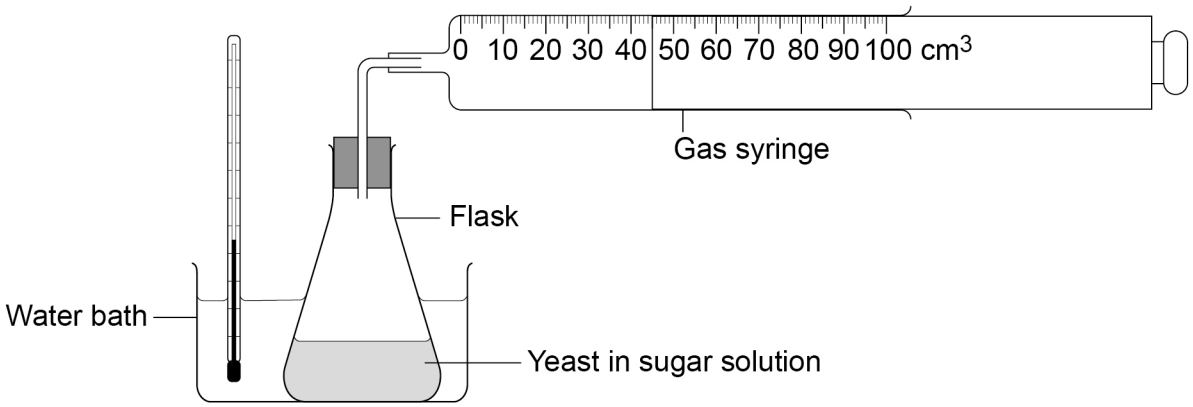
4.7.3.3 Land use

Question 10 · continued

A student investigated fermentation in yeast.

Figure 3 shows the apparatus.

Figure 3



This is the method used.

1. Mix yeast with sugar solution in a flask.
2. Put the flask in a water bath at 35 °C.
3. After 10 minutes attach a gas syringe to the flask.
4. Record the volume of carbon dioxide collected every 5 minutes for 1 hour.

0 3 . 4 What volume of carbon dioxide has been collected in the gas syringe in **Figure 3**?

[1 mark]

Volume of carbon dioxide = _____ cm^3

0 3 . 5 Why did the student wait 10 minutes before attaching the gas syringe?

[1 mark]

Tick (✓) **one** box.

To allow time for the mixture to reach 35 °C ☐

To allow time for the sugar to dissolve ☐

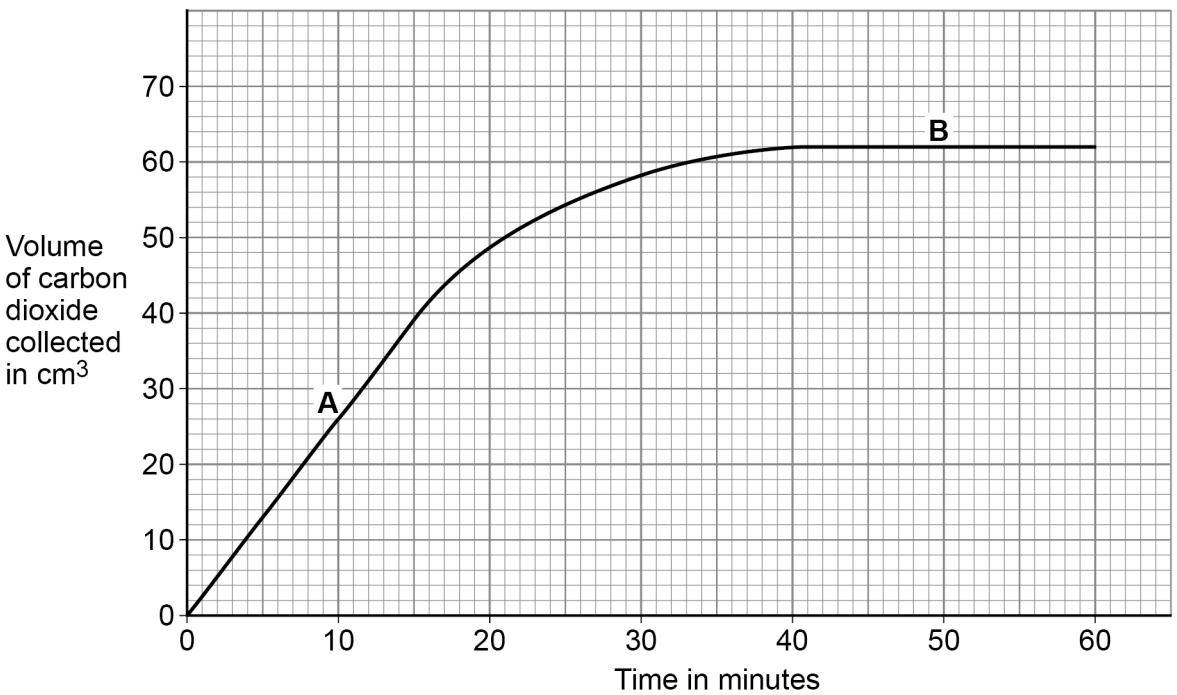
To allow time to draw a results table ☐

4.7.3.3 Land use

Question 10 · continued

Figure 4 shows the results.

Figure 4



4.7.3.3 Land use

Question 10 · continued

0 3 . 6 **A** and **B** are different parts of the graph in **Figure 4**.

Draw **one** line from each part of the graph to the description of the reaction.

[2 marks]

Part of the graph	Description of the reaction
	Carbon dioxide is **not** being produced
A	
	Carbon dioxide production is **fastest**
B	
	Carbon dioxide production is **slowing down**

Question 3 continues on the next page

Question 10 · continued

The equation for fermentation is repeated here.

glucose → ethanol + carbon dioxide

0 3 . 7 Suggest **one** reason why fermentation in the flask stopped.

[1 mark]

0 3 . 8 Fermentation is controlled by enzymes.

The investigation was repeated at 2 °C and at 75 °C.

No carbon dioxide was produced at either of these temperatures.

Suggest why **no** carbon dioxide was produced at 2 °C or at 75 °C.

[2 marks]

Reason at 2 °C

Reason at 75 °C

0 3 . 9 Anaerobic respiration also happens in animal cells.

Complete the equation for anaerobic respiration in animal cells.

Choose answers from the box.

[2 marks]

carbon dioxide	**ethanol**	**glucose**	**lactic acid**	**water**

_____ → _____

13

4.7.3.3 Land use

Question 11

November 2021 | 8464/B/1F | Original Q5

0 5 Plants absorb light for photosynthesis.

0 5 . 1 Which is the equation for photosynthesis?

[1 mark]

Tick (✓) **one** box.

$C_6H_{12}O_6 + 6\,O_2 \rightarrow 6\,CO_2 + 6\,H_2O$ ☐

$6\,CO_2 + 6\,H_2O \rightarrow C_6H_{12}O_6 + 6\,O_2$ ☐

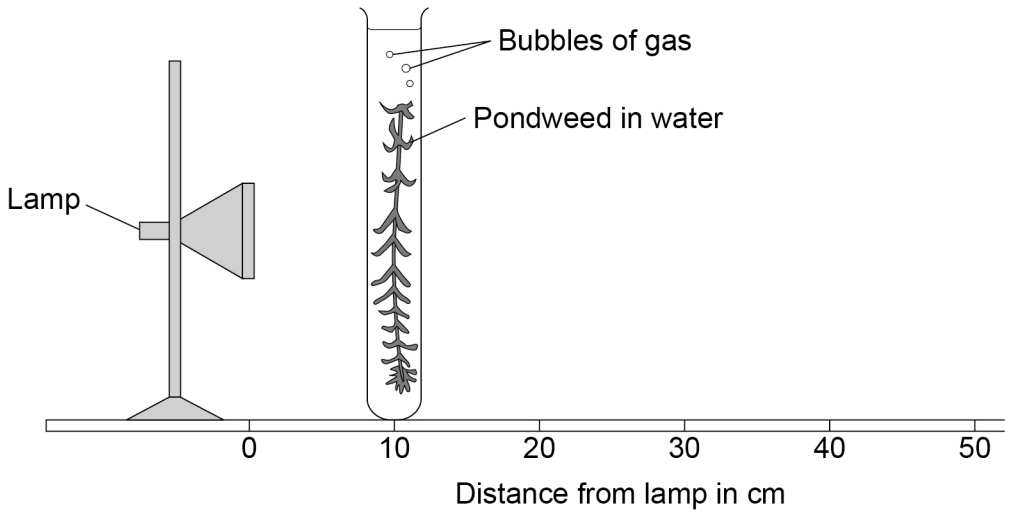
$6\,H_2O + 6\,O_2 \rightarrow C_6H_{12}O_6 + 6\,CO_2$ ☐

$6\,O_2 + 6\,CO_2 \rightarrow C_6H_{12}O_6 + 6\,H_2O$ ☐

A student investigated the effect of light intensity on the rate of photosynthesis.

Figure 6 shows the apparatus.

Figure 6



4.7.3.3 Land use

Question 11 · continued

This is the method used.

1. Set up the apparatus as shown in **Figure 6**.
2. Place the pondweed 10 cm away from the lamp.
3. Switch on the lamp.
4. Record the number of bubbles of gas produced in 5 minutes.
5. Repeat steps 2 to 4 with the pondweed at different distances from the lamp.

0 5 . 2 What was the independent variable in this investigation?

[1 mark]

Tick (✓) **one** box.

- Distance of the pondweed from the lamp ☐
- Length of the piece of pondweed ☐
- Number of bubbles of gas produced ☐
- Time taken to collect the gas ☐

Question 5 continues on the next page

4.7.3.3 Land use

Question 11 · continued

The lamp gets warm when it is on. This causes the temperature of the water to increase.

0 5 . 3 Explain how an increase in temperature would affect the results of this investigation.

[2 marks]

0 5 . 4 Suggest **one** way the investigation could be improved so the temperature of the water does **not** increase.

[1 mark]

0 5 . 5 Suggest **two** improvements to the investigation so the results would be more valid.

Do **not** refer to controlling the temperature of the water.

[2 marks]

1

2

Table 2 shows the results.

Table 2

Distance of pondweed from the lamp in cm	Number of bubbles of gas produced in 5 minutes
10	120
20	56
30	31
40	16
50	10

0 5 . 6 Calculate the rate of photosynthesis when the pondweed was 40 cm from the lamp.

Give the rate of photosynthesis as the number of bubbles of gas produced per minute.

[1 mark]

Rate = _____ bubbles of gas produced per minute

0 5 . 7 Give **one** conclusion that can be made from **Table 2**.

[1 mark]

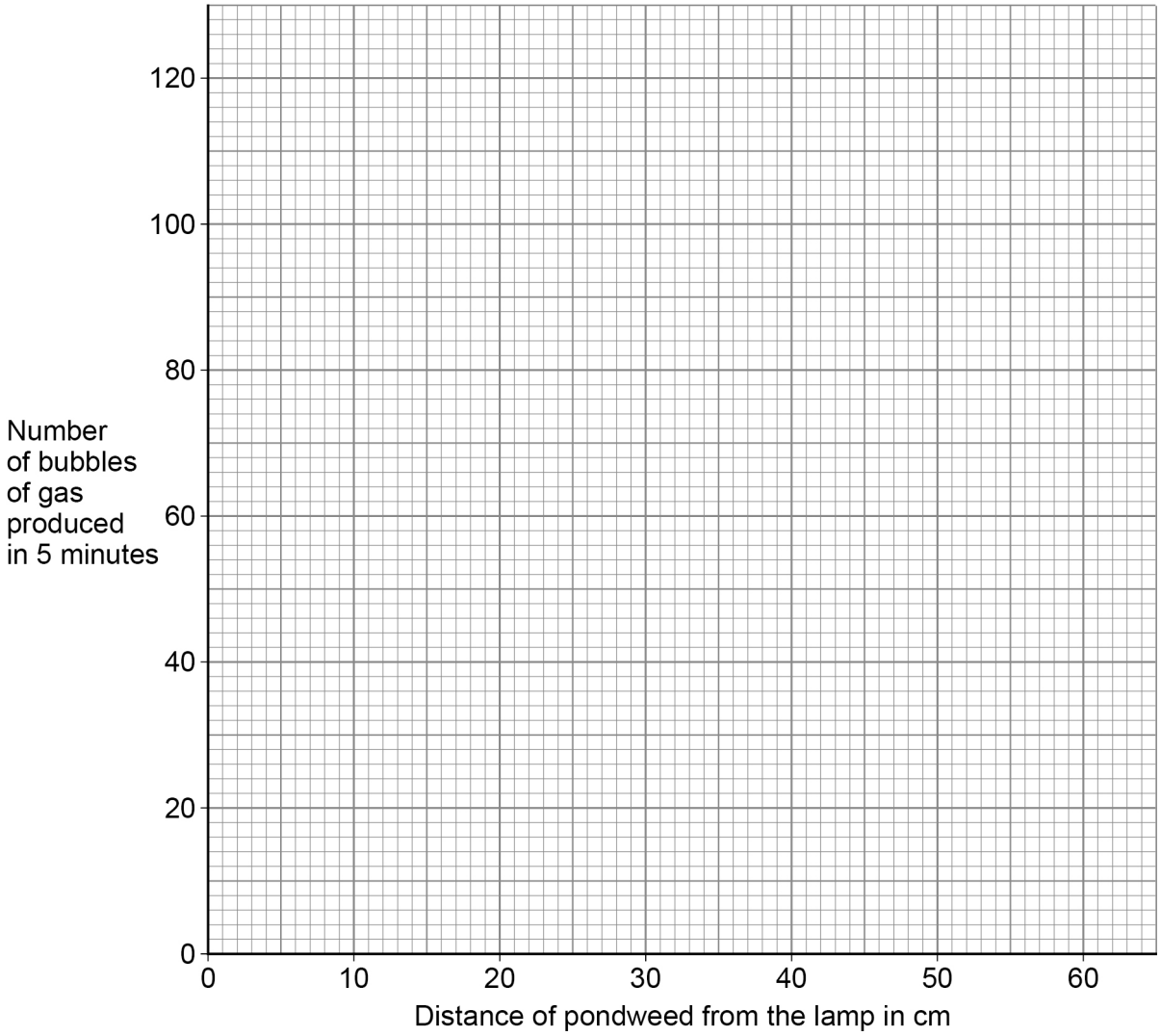
Question 11 · continued

0 5 . 8 Plot the data from **Table 2** on **Figure 7**.

Draw a line of best fit.

[3 marks]

Figure 7



0 5 . 9 Predict the number of bubbles that would be produced in 5 minutes if the pondweed was 60 cm from the lamp.

Use **Figure 7**.

[1 mark]

Number of bubbles produced in 5 minutes = _____

13

4.7.3.3 Land use

Question 12

November 2021 | 8464/B/2F | Original Q2

0 2 Caffeine is a drug that affects reaction time.

Coffee is a drink that contains caffeine.

Five students investigated the effect of drinking coffee on their reaction time.

Each student sat in front of a computer screen showing a reaction timer.

This is the method used.

1. Press any key on the keyboard when the colour of the screen changes to green.
2. Record the reaction time shown on the computer screen.
3. Drink coffee containing caffeine.
4. Wait 15 minutes then repeat steps 1 and 2.

0 2 . 1 What is the dependent variable in the investigation?

[1 mark]

Tick (✓) **one** box.

- The coffee containing caffeine ☐
- The number of students ☐
- The reaction time ☐

0 2 . 2 Give **two** control variables the students should have used.

[2 marks]

1 _____

_____

2 _____

_____

4.7.3.3 Land use

Question 12 · continued

0 2 . 3 Why did the students wait 15 minutes after drinking the coffee before repeating the test?

[1 mark]

0 2 . 4 Responding to the colour change of the screen involves a receptor in the student.

Where is the receptor in the student?

[1 mark]

Tick (✓) **one** box.

Ear ☐

Eye ☐

Skin ☐

0 2 . 5 Responding to the colour change of the screen involves an effector in the student.

What is the effector in the student?

[1 mark]

Tick (✓) **one** box.

Brain ☐

Gland ☐

Muscle ☐

Spinal cord ☐

4.7.3.3 Land use

Question 12 · continued

Table 1 shows the results.

Table 1

Student	Reaction time in milliseconds	
	Before drinking coffee	After drinking coffee
1	385	255
2	420	291
3	285	265
4	871	259
5	463	247

0 2 . 6 What is the effect of drinking coffee on reaction time?

Use **Table 1**.

[1 mark]

4.7.3.3 Land use

Question 12 · continued

0 2 . 7 Which student had the smallest change in reaction time after drinking coffee?

[1 mark]

Tick (✓) **one** box.

Student 1 ☐

Student 2 ☐

Student 3 ☐

Student 4 ☐

Student 5 ☐

0 2 . 8 The students decided that one of the results was anomalous.

What should the students do with the anomalous result when calculating the mean change in reaction time?

[1 mark]

_____

_____

9

4.7.3.3 Land use

Question 13

November 2021 | 8464/B/2F | Original Q5

0 5 Increased carbon dioxide levels in the atmosphere contribute to climate change.

0 5 . 1 Give **one** way deforestation can increase carbon dioxide levels in the atmosphere.

[1 mark]

0 5 . 2 Name **one** other gas that contributes to climate change.

Do **not** refer to carbon dioxide in your answer.

[1 mark]

0 5 . 3 Meat is produced for humans to eat.

Give **two** ways the production of meat releases carbon dioxide.

[2 marks]

1

2

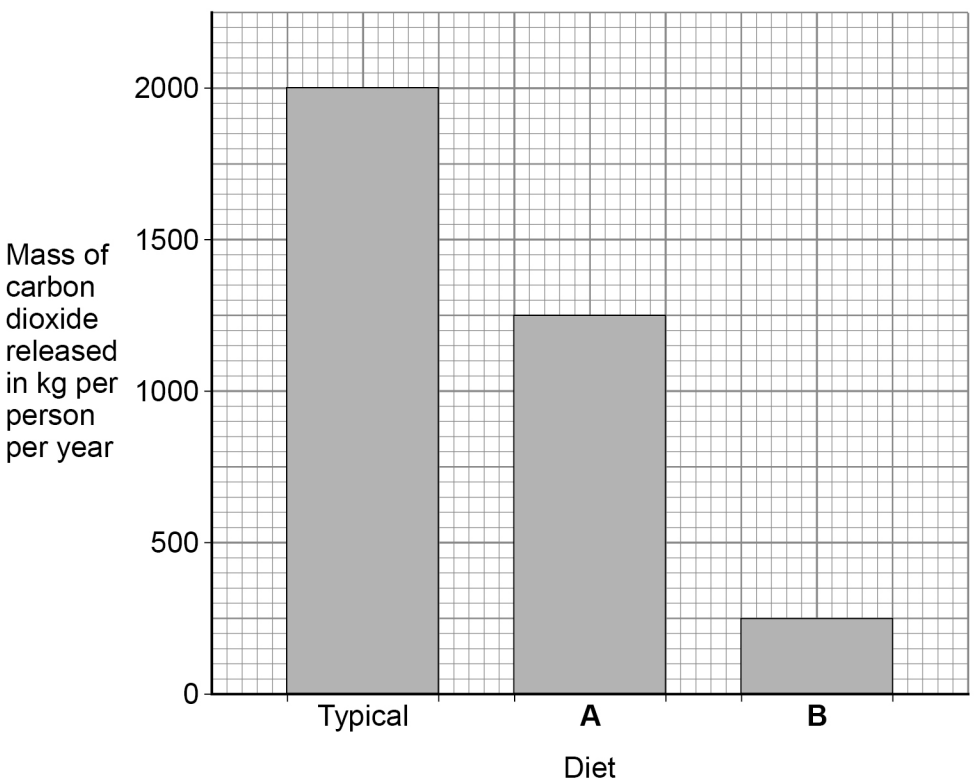
Question 5 continues on the next page

Question 13 · continued

0 5 . 4 The mass of carbon dioxide released during the production of food varies depending on the type of food.

Figure 4 shows the mass of carbon dioxide released as a result of three different diets.

Figure 4



4.7.3.3 Land use

Question 13 · continued

Compare the mass of carbon dioxide released as a result of the three diets shown in **Figure 4**.

Use data from **Figure 4** in your answer.

[4 marks]

8

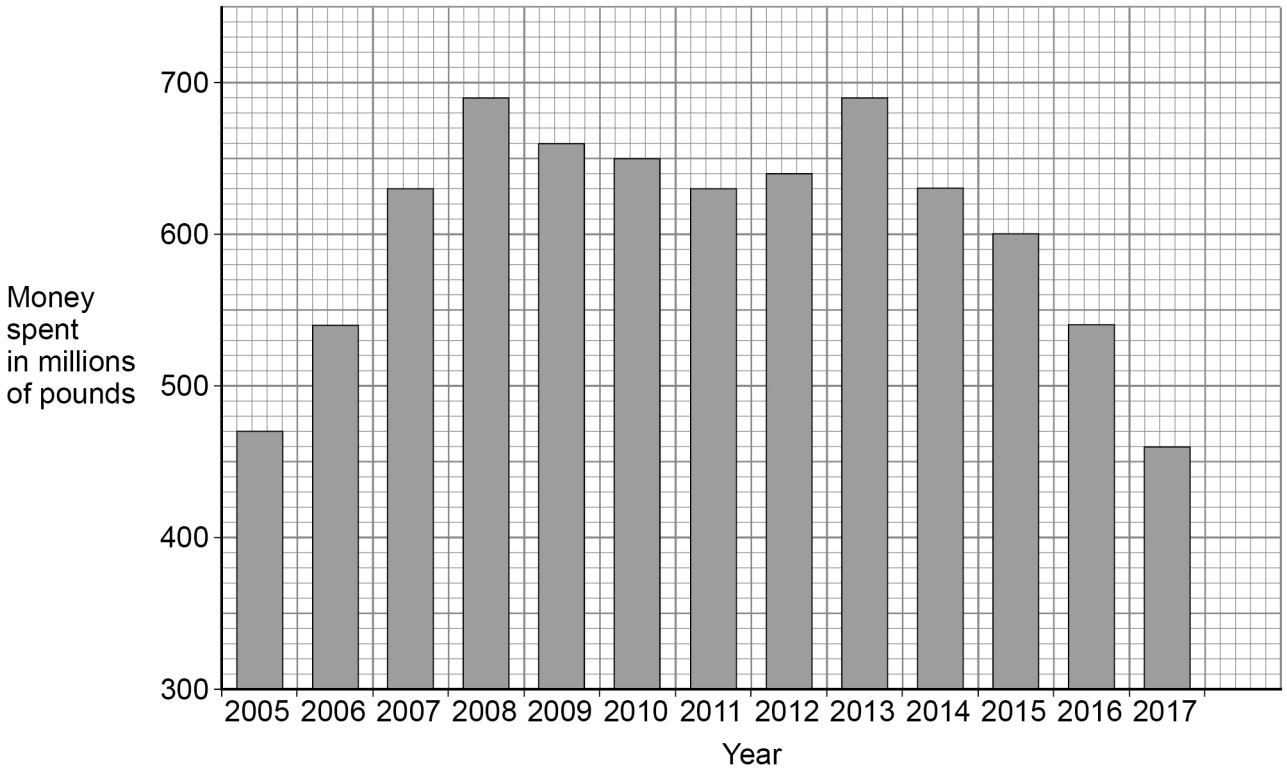
4.7.3.3 Land use

Question 14

November 2021 | 8464/B/2F | Original Q7

0 7 **Figure 6** shows the money spent on conserving biodiversity in the UK by the government.

Figure 6



0 7 . 1 Describe the trends in the money spent on conserving biodiversity from 2005 to 2011.

Use data from **Figure 6** in your answer.

[2 marks]

4.7.3.3 Land use

Question 14 · continued

0 7 . 2 Calculate the percentage decrease in the money spent on conserving biodiversity from 2013 to 2017.

Use the equation:

$$\text{percentage decrease} = \frac{\text{change in money spent from 2013 to 2017}}{\text{money spent in 2013}} \times 100$$

Give your answer to 2 significant figures.

[3 marks]

Percentage decrease (2 significant figures) = _____ %

0 7 . 3 Conservation of peat bogs can help maintain biodiversity.

Give **two** uses of peat taken from peat bogs.

[2 marks]

1 _____

2 _____

Question 7 continues on the next page

4.7.3.3 Land use

Question 14 · continued

November 2021 | 8464/B/2F | Original Q7

0 7 . 4 Describe **two** ways to **increase** biodiversity in the UK.

Do **not** refer to money spent or to peat in your answer.

[2 marks]

1 _____

_____

2 _____

_____

9

4.7.3.3 Land use

Question 15

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 ☐

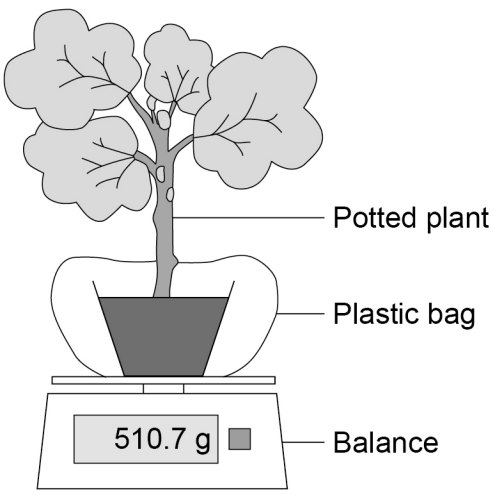
Question 3 continues on the next page

Question 15 · 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.

4.7.3.3 Land use

Question 15 · 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

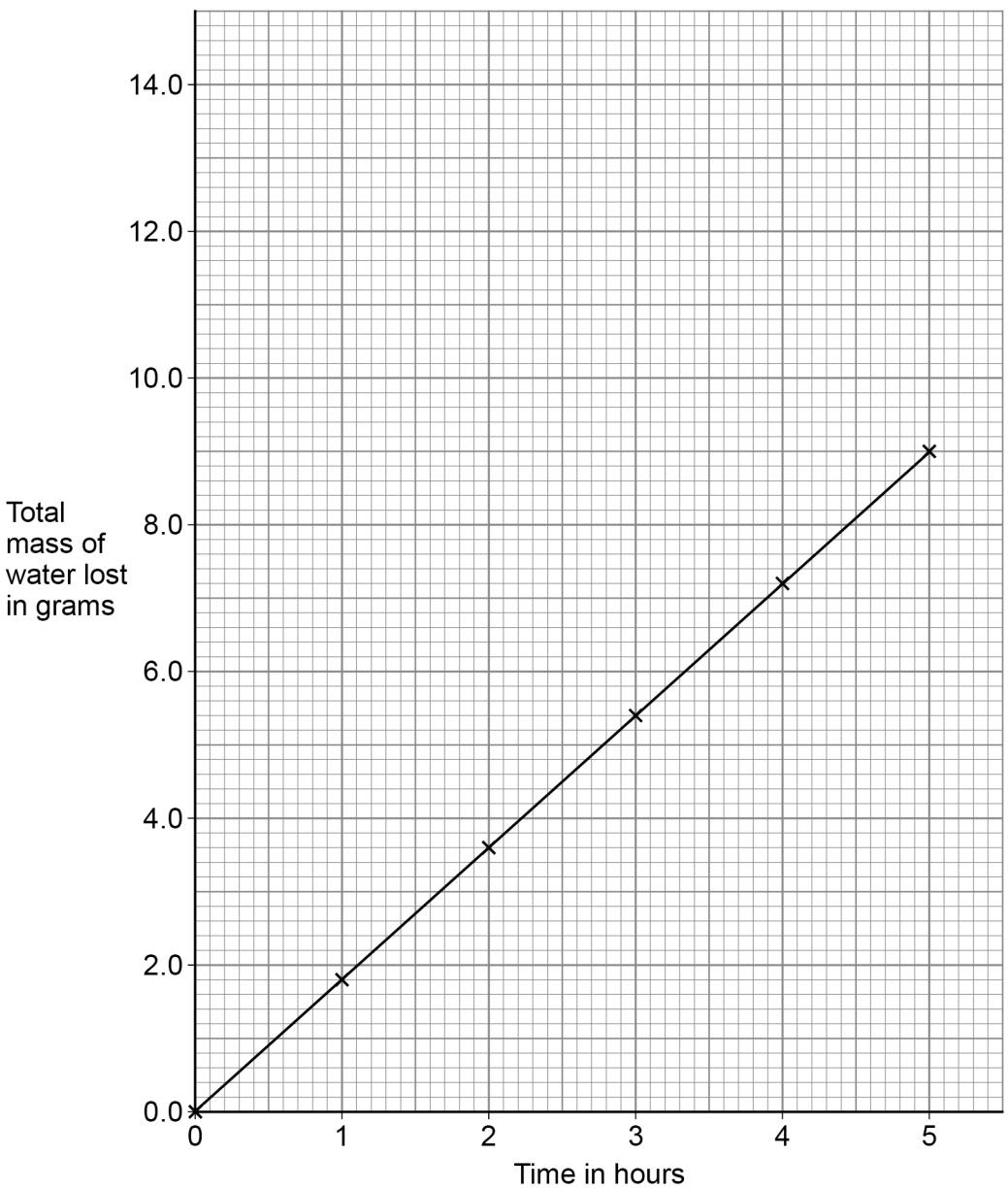
Question 3 continues on the next page

4.7.3.3 Land use

Question 15 · continued

Figure 5 shows the results.

Figure 5



4.7.3.3 Land use

Question 15 · 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]

8

4.7.3.3 Land use

Question 16

June 2023 | 8464/B/2F | Original Q1

0 1 **Figure 1** shows a place where peat is being removed from a peat bog.

Figure 1



0 1 . 1 Why is peat removed from peat bogs?

[1 mark]

Tick (✓) **one** box.

To increase biodiversity ☐

To produce garden compost ☐

To protect rare habitats ☐

Question 16 · continued

0 1 . 2 Peat can decay.

Name **one** type of organism that causes decay.

[1 mark]

_____

0 1 . 3 Complete the sentences.

Choose answers from the box.

[2 marks]

carbon dioxide	**nitrogen**	**oxygen**	**sulfur dioxide**

The organisms that cause decay respire.

The gas used for respiration is _____ .

The gas produced by respiration is _____ .

Question 1 continues on the next page

Question 16 · continued

0 1 . 4 Peat bogs cover a total area of 3 700 000 km^2.

In 2020, 46% of peat bogs were frozen.

How can the area of peat bogs that were frozen be calculated?

[1 mark]

Tick (✓) **one** box.

$3\,700\,000 \times \frac{46}{100}$ ☐

$\frac{46}{3\,700\,000} \times 100$ ☐

$\frac{3\,700\,000}{46} \times 100$ ☐

0 1 . 5 The percentage of peat bogs that are frozen decreases each year.

Suggest why the **percentage** of peat bogs that are frozen is decreasing.

[1 mark]

4.7.3.3 Land use

Question 16 · continued

0 1 . 6 Which **two** human activities **decrease** the area of land available for other animals and plants?

[2 marks]

Tick (✓) **two** boxes.

- Building factories ☐
- Recycling plastics ☐
- Replanting hedgerows ☐
- Reusing glass bottles ☐
- Quarrying rocks ☐

8

Turn over for the next question

4.7.3.3 Land use

Question 17

June 2023 | 8464/B/2F | Original Q2

0 2 A student investigated the effect of either **seeing** a stimulus or **hearing** a stimulus on reaction time.

First, the student measured their reaction time to **seeing** a colour change.

This is the method used.

1. Sit in front of a computer with a reaction timer program open.
2. Press a key on the keyboard as quickly as possible when the computer screen changes colour.
3. Record the reaction time.
4. Repeat steps 1 to 3 four more times and calculate the mean reaction time.

Next, the student measured their reaction time to **hearing** a sound.

This is the method used.

5. Sit in front of a computer with a reaction timer program open.
6. Press a key on the keyboard as quickly as possible when the computer produces a sound.
7. Record the reaction time.
8. Repeat steps 5 to 7 four more times and calculate the mean reaction time.

0 2 . 1 **Table 1** shows some variables in this investigation.

Table 1

Variable	Independent variable	Dependent variable	Control variable
Distractions from background sounds			
Reaction time			
Type of stimulus			

Identify each variable as an independent variable, a dependent variable or a control variable.

Tick (✓) **one** box in each row on **Table 1**.

[3 marks]

0 2 . 2 How could the method be improved?

[1 mark]

Tick (✓) **one** box.

Measure the reaction time with a stopwatch. ☐

Only test reaction time to seeing a colour change. ☐

Repeat both methods 10 times. ☐

Question 2 continues on the next page

4.7.3.3 Land use

Question 17 · continued

0 2 . 3 A shorter reaction time means the student reacted faster.

The student reacted faster as each test was repeated.

Suggest **one** reason why the student's reactions got faster.

[1 mark]

Table 2 shows the results.

Table 2

Method	Mean reaction time in milliseconds
Seeing the stimulus	350
Hearing the stimulus	220

4.7.3.3 Land use

Question 17 · continued

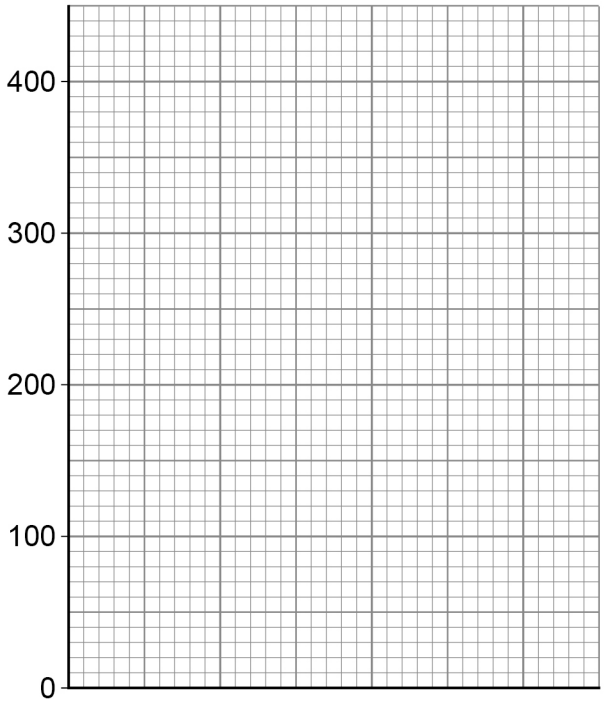
0 2 . 4 Complete **Figure 2**.

You should:

- plot the data from **Table 2** as a bar chart
- label each bar
- label the y-axis.

[2 marks]

Figure 2



Method

0 2 . 5 Compare the reaction time when seeing the stimulus with the reaction time when hearing the stimulus.

[1 mark]

8

4.7.3.3 Land use

Question 18

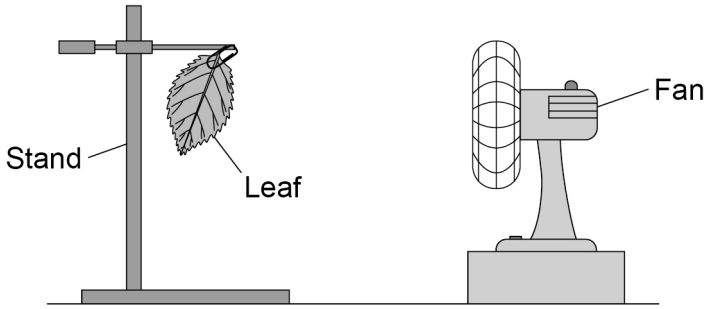
June 2024 | 8464/B/1F | Original Q2

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.

Question 18 · 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 18 · 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. ☐

7

4.7.3.3 Land use

Question 19

June 2024 | 8464/B/2F | Original Q3

0 3 Students used a reaction test card in an investigation.

The reaction test card can be used to test the reactions of car drivers.

Figure 4 shows the reaction test card.

Figure 4

Reaction score	How fast are your reactions?
5	Too slow
4	A bit slow
3	OK
2	Good
1	Super

0 3 . 1 Suggest why fast reactions are important for car drivers.

[1 mark]

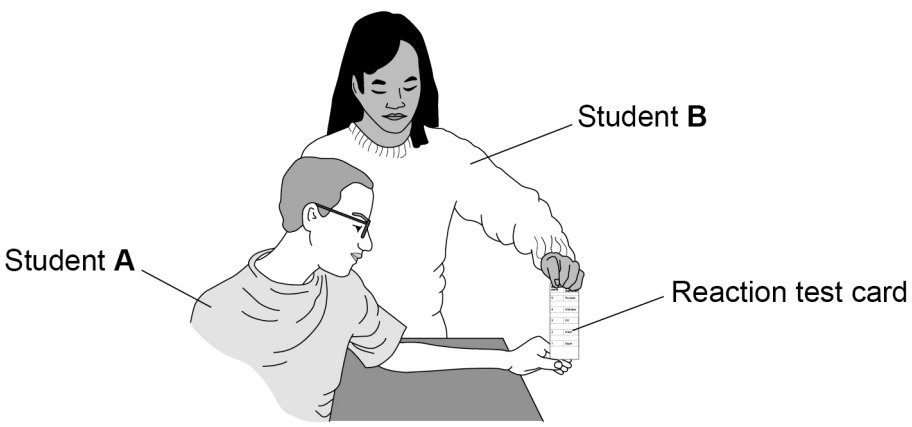
Question 19 · continued

Students investigated the effect of number of hours of sleep on reaction time.

The students used the reaction test card shown in **Figure 4** on page 11.

Figure 5 shows the method used.

Figure 5



This is the method used.

1. Record the number of hours of sleep student **A** had the night before the test.
2. Student **B** holds the lower edge of the card level with the top of student **A**'s thumb.
3. Student **A** holds their thumb and forefinger slightly apart, with space for the card to drop.
4. Student **B** drops the card.
5. Student **A** catches the card as quickly as possible.
6. Record the number shown at the top of student **A**'s thumb.
7. Repeat steps 1 to 6 with seven other students.

4.7.3.3 Land use

Question 19 · continued

0 3 . 2 Draw **one** line from each type of variable to the example of that variable in the investigation.

[3 marks]

Type of variable	Example
Control variable	Number nearest top of thumb when student catches card
Dependent variable	Number of hours of sleep
Independent variable	Number of students tested
	Start with lower edge of card level with top of thumb

Question 3 continues on the next page

4.7.3.3 Land use

Question 19 · continued

Figure 4 is repeated below.

Figure 4

Reaction score	How fast are your reactions?
5	Too slow
4	A bit slow
3	OK
2	Good
1	Super

0 3 . 3 A student said:

'It would be better to use a ruler showing millimetres instead of the card in **Figure 4**.'

Why is the student correct?

[1 mark]

Tick (✓) **one** box.

Students are familiar with a ruler but the card is new. ☐

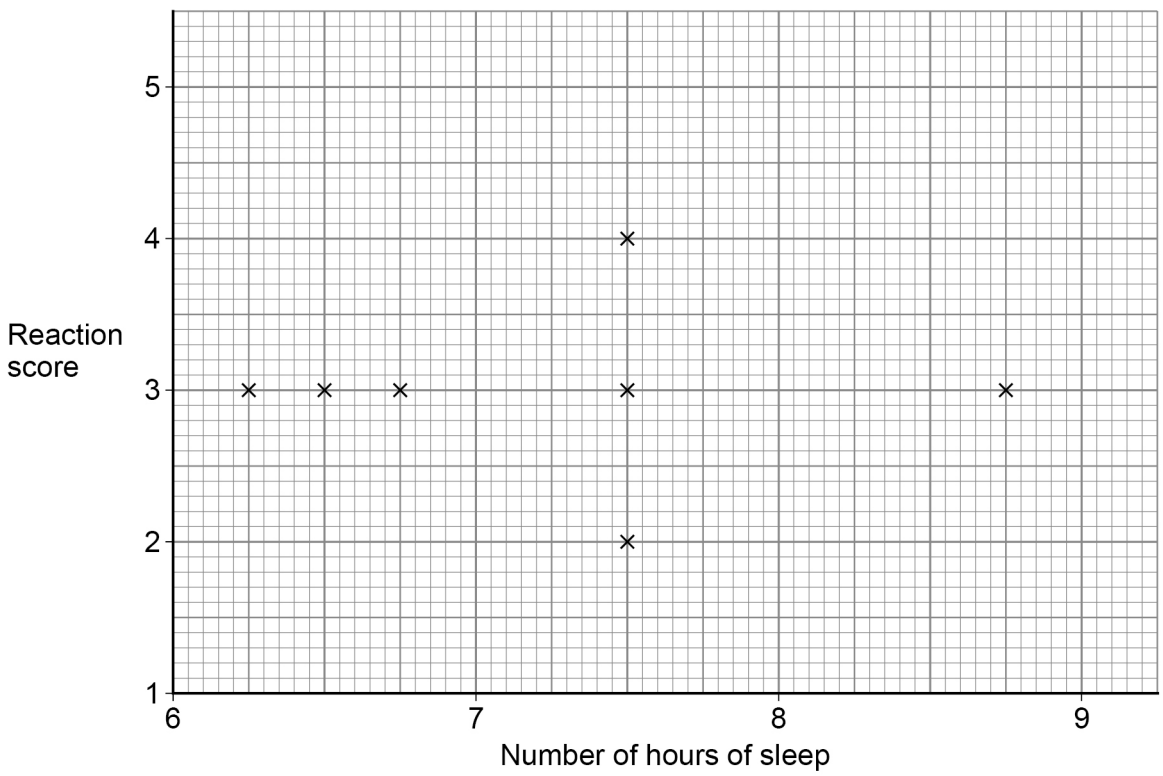
Students have very fast reactions. ☐

Students may catch the card between scores. ☐

Question 19 · continued

Figure 6 shows the results for the seven other students.

Figure 6



0 3 . 4 Student **A** had 8 hours and 30 minutes of sleep and a reaction score of 3

Plot the result for student **A** on **Figure 6**.

[1 mark]

0 3 . 5 The mean number of hours of sleep for all students was 7.4

What was the **mode** for the number of hours of sleep?

[1 mark]

Mode = _____ hours

4.7.3.3 Land use

Question 19 · continued

0 3 . 6 A lower reaction score means a faster reaction.

What was the effect of increasing the number of hours of sleep on reaction time?

Use **Figure 6**.

[1 mark]

Tick (✓) **one** box.

Reaction time decreased ☐

Reaction time stayed the same ☐

Reaction time increased ☐

0 3 . 7 Suggest **two** ways the students could improve the investigation.

Do **not** refer to using a ruler in your answer.

[2 marks]

1 _____

_____

2 _____

_____

Question 3 continues on the next page

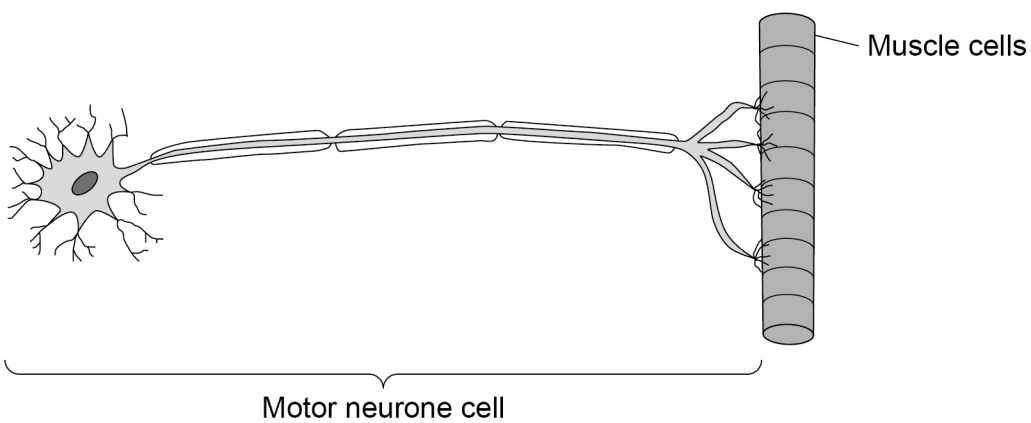
4.7.3.3 Land use

Question 19 · continued

0 3 . 8 Motor neurones are involved in reactions.

Figure 7 shows a motor neurone.

Figure 7



Explain **one** way the motor neurone cell is adapted for its function.

[3 marks]

13

4.7.3.3 Land use

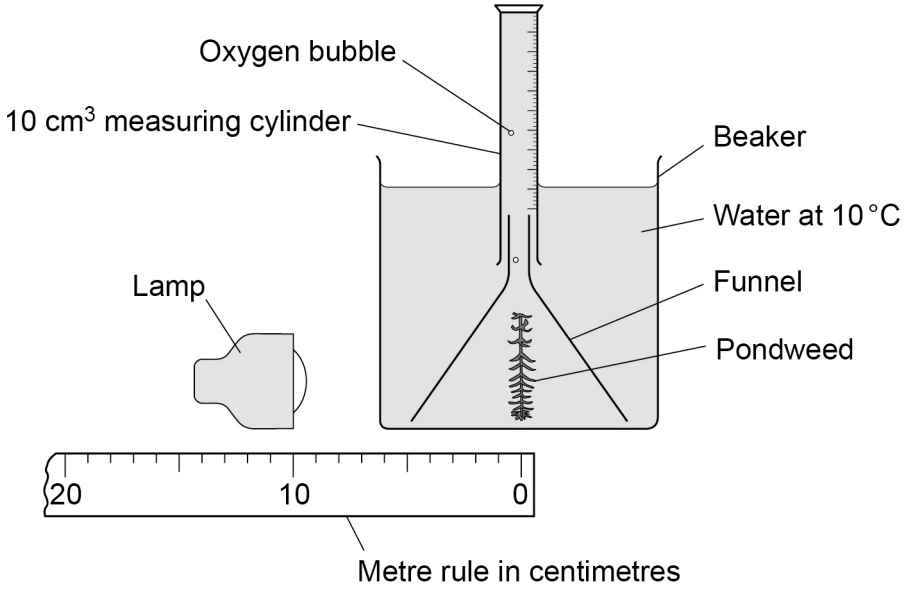
Question 20

0 2 Photosynthesis is important for plant growth.

A student used pondweed to investigate photosynthesis.

Figure 3 shows the apparatus used.

Figure 3



This is the method used.

1. Set up the apparatus as shown in **Figure 3**.
2. Switch on the lamp.
3. After 1 hour, record the volume of oxygen collected in the measuring cylinder.
4. Repeat steps 1 to 3 a further four times, placing the lamp at different distances from the pondweed.

4.7.3.3 Land use

Question 20 · continued

0 2 . 1 What are **two** control variables the student should use in the investigation?

[2 marks]

Tick (✓) **two** boxes.

- The distance of the lamp from the pondweed. ☐
- The length of the pondweed. ☐
- The size of the beaker. ☐
- The temperature of the water. ☐
- The volume of oxygen collected. ☐

Table 2 shows the results.

Table 2

Distance of the lamp from the pondweed in cm	Volume of oxygen in cm^3
10	
20	1.0
30	0.4
40	0.2
50	0.0

0 2 . 2 Describe the trend shown in **Table 2**.

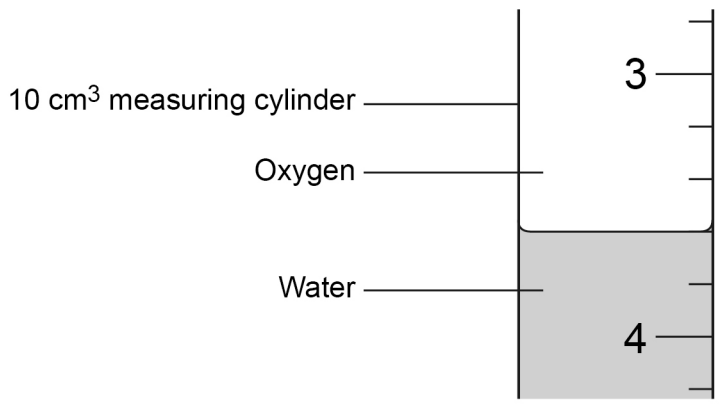
[1 mark]

4.7.3.3 Land use

Question 20 · continued

0 2 . 3 **Figure 4** shows the volume of oxygen when the lamp was 10 cm from the pondweed.

Figure 4



What volume of oxygen is shown in **Figure 4**?

[1 mark]

Volume = _____ cm^3

Question 20 · continued

0 2 . 4 The student repeated the investigation using a measuring cylinder with smaller intervals of 0.1 cm^3.

What did using smaller intervals improve?

[1 mark]

Tick (✓) **one** box.

Accuracy ☐

Repeatability ☐

Reproducibility ☐

0 2 . 5 The student did the investigation at 10 °C.

The student repeated the investigation at 20 °C.

Complete the sentence.

Choose the answer from the box.

[2 marks]

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

Compared to the results at 10 °C, the volumes of oxygen collected

in one hour at 20 °C would be _____.

Give a reason for your answer.

_____

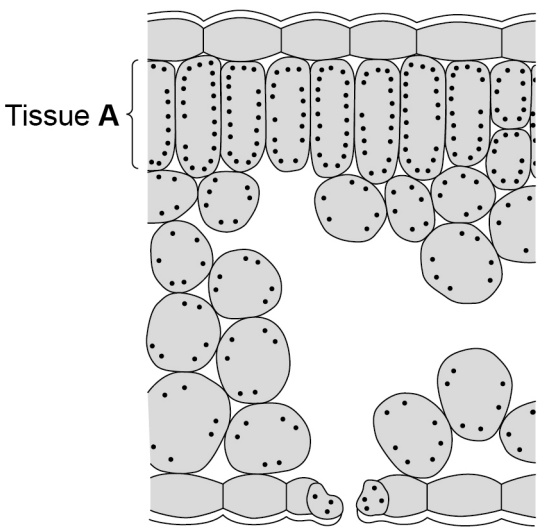
_____

Question 20 · continued

Photosynthesis is important for apple trees.

Figure 5 shows a section through the leaf of an apple tree.

Figure 5



0 2 . 6 What is tissue **A**?

[1 mark]

Tick (✓) **one** box.

Epidermis ☐

Palisade mesophyll ☐

Spongy mesophyll ☐

0 2 . 7 The cells in tissue **A** contain chloroplasts.

What is the name of the green chemical in chloroplasts?

[1 mark]

4.7.3.3 Land use

Question 20 · continued

Apple scab is a disease of apple trees.

Apple scab is caused by a fungus.

Figure 6 shows a leaf from an apple tree infected with apple scab fungus.

Figure 6



0 2 . 8 How could the fungal infection be removed from the tree?

[1 mark]

Tick (✓) **one** box.

Destroy the affected leaves. ☐

Spray the affected leaves with antibiotics. ☐

Use an antitoxin on the affected leaves. ☐

Question 2 continues on the next page

4.7.3.3 Land use

Question 20 · continued

0 2 . 9 Infection with apple scab fungus decreases the number of chloroplasts in the leaves.

Explain why apple trees with apple scab fungus produce smaller apples than apple trees that are **not** infected.

[3 marks]

13

4.7.3.3 Land use

Question 21

June 2025 | 8464/B/2F | Original Q2

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
	Adds mineral ions to the soil
Fertiliser	Decreases carbon dioxide concentration in the soil
	Increases oxygen concentration in the air
Herbicide	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. ☐

4.7.3.3 Land use

Question 21 · continued

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

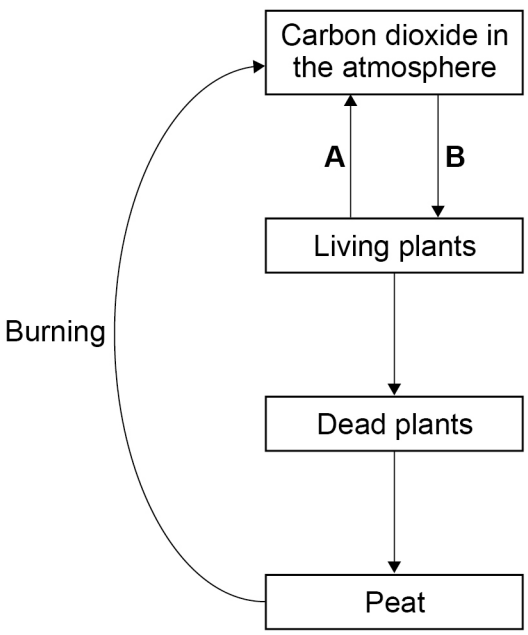
4.7.3.3 Land use

Question 21 · continued

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** _____

4.7.3.3 Land use

Question 21 · 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