AQA GCSE Combined Science - Trilogy | 8464

SPECIFICATION POINT 4.2.3.2

Plant organ system

Mark schemes and examiner comments

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

Using this booklet

1. Booklet answer numbers match the question booklet.
2. Use the original question number within marking tables.
3. Examiner comments are included where available.

Name: _____ **Date:** _____

Where a precise marking extract is unavailable, the full source document is included in an appendix. Any missing mark scheme is explicitly identified.

4.2.3.2 Plant organ system

Answer 01 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.1	transpiration		1	AO1 4.2.3.2
04.2	guard cell		1	AO1 4.2.3.1 4.2.3.2
04.3	(real length of cell =) $\frac{25}{800}$ 0.03125 31.25 (µm)	an answer of 31.25 (µm) scores 3 marks allow 2 marks for $\frac{25\ 000}{800}$ allow 31 or 31.3 allow correct unit conversion of incorrect answer	1 1 1	AO2 4.1.1.5
04.4	temperature of the room		1	AO2 4.2.3.2
04.5	any water / mass lost was from the leaves / plant	allow so no water was lost (directly) from the soil	1	AO3 4.2.3.2
04.6	0.1 g		1	AO2 4.2.3.2
04.7 View with Table 1	511.2 (g)	answer line takes precedence	1	AO2 4.2.3.2
04.8	the higher the temperature the more water lost	cause and effect must be the correct way round	1	AO3 4.2.3.2

4.2.3.2 Plant organ system

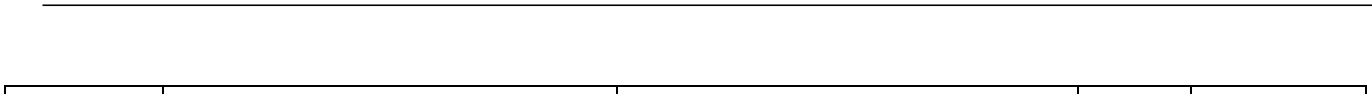
Answer 01 · Mark scheme

04.9	any **two** from: • humidity • air movement • light (intensity) • water availability • rate of photosynthesis	 allow wind allow time of day allow number / size of leaves / allow number of stomata on plant ignore type of plant ignore time plant left for	2	AO1 4.2.3.2
Total			**12**	

4.2.3.2 Plant organ system

Answer 01 · Mark scheme

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



4.2.3.2 Plant organ system

Answer 02 · Mark scheme November 2020 | 8464/B/1F | Original Q3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.1	transpiration		1	AO1 4.2.3.2
03.2	guard cells		1	AO1 4.2.3.1 4.2.3.2
03.3	0.04 (g)		1	AO2 4.2.3.1 4.2.3.2
03.4	$\frac{0.15}{24}$ = 0.0062(5) (g) **or** = 6.2(5) × 10^{-3} (g)	allow $\frac{1}{160}$ allow 0.006 / 0.0063 / 6 × 10^{-3} / 6.3 × 10^{-3} (g)	1 1	AO2 4.2.3.1 4.2.3.2

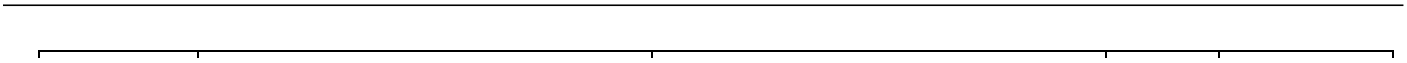
4.2.3.2 Plant organ system

03.5	any **one** from: • leaf B lost more mass / water than leaf C **or** leaf C lost less mass / water than leaf B • when lower surface covered less mass / water was lost (than when upper surface covered) • when upper surface covered more mass / water was lost (than when lower surface covered)	allow B lost 013 g of mass / water **and** C lost 0.05 g of mass / water allow lower surface lost 0.13 g of mass / water **and** upper surface lost 0.05 g of mass / water	1	AO3 4.2.3.1 4.2.3.2
03.6	there are more stomata on the lower surface		1	AO3 4.2.3.1 4.2.3.2
03.7	more (mass / water) lost (because) evaporation / transpiration would be faster	‘it’ refers to the mass of water lost	1 1	AO3 4.2.3.2 AO2 4.2.3.2
Total			**9**	

4.2.3.2 Plant organ system

Answer 02 · Mark scheme

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



4.2.3.2 Plant organ system

Answer 03 · Mark scheme

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

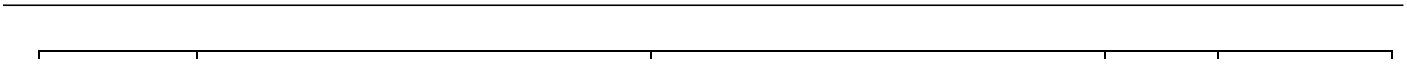
Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.1	root	do **not** accept root hair (cells)	1	AO1 4.2.1 4.2.3.2
04.2	by active transport		1	AO2 4.1.3.3
04.3	translocation		1	AO1 4.2.3.2
04.4	any **one** from: • respiration • (used) to produce starch • (used) to produce fat / oil • (used) to produce cellulose • (used) to produce amino acids / protein	allow to release energy do **not** accept to produce / make / create energy allow for growth	1	AO1 4.2.3.2 4.4.1.3
04.5	guard cell		1	AO1 4.2.3.1 4.2.3.2

04.6	to allow carbon dioxide in		1	AO2 4.2.3.1 4.2.3.2
04.7	$\frac{9}{0.25}$ 36	 do **not** accept if a unit is given allow correct calculation using $\frac{9}{25}$	1 1	AO2 4.2.3.2
04.8	$\frac{37 + 36 + 30 + 32 + 35}{5}$ 34	allow $\frac{170}{5}$	1 1	AO2 4.2.3.2
04.9	there are fewer stomata on the upper surface of the leaves (conditions on upper surface will:) any **one** from: • be warmer • be drier • be more exposed to wind • have more light (so) less water will be lost	allow converse statements a comparative term is required	1 1 1	AO3 AO2 AO2 4.2.3.2
Total			**13**	

4.2.3.2 Plant organ system

Answer 03 · Mark scheme

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



4.2.3.2 Plant organ system

Answer 04 · Mark scheme

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

Question 3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.1	soil	allow ground ignore air ignore rain ignore roots	1	AO1 4.4.1.1 4.2.3.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.2	transpiration		1	AO1 4.2.3.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.3	510.7 – 9(.0) **or** 503.5 – 1.8 501.7 (grams)		1 1	AO2 4.2.3.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.4	1.8 grams/hour		1	AO2 4.2.3.2

4.2.3.2 Plant organ system

Answer 04 · Mark scheme

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

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.5	straight line drawn from 0,0 to 5 hours at a less steep gradient below the line on **Figure 5**	ignore any extrapolations	1 1	AO2 AO3 4.2.3.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.6	any **one** from: • increase air movement • increase light intensity • decrease humidity	ignore references to temperature ignore references to the bag allow descriptions of how changes could be achieved experimentally eg use a fan	1	AO3 4.2.3.2

Total Question 3	8

4.2.3.2 Plant organ system

Answer 05 · Mark scheme

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

Question 2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.1	(as a) control **or** (to) compare (the other results to)	allow to show the effect of fan / wind do **not** accept control variable	1	AO3 4.2.3.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.2	(loss of mass / water) increases	allow mass of leaves decreases more allow more (mass / water) is lost	1	AO2 4.2.3.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.3	loss of water		1	AO2 4.2.3.2
	(because water) evaporated	allow by transpiration allow diffusion	1	
	from stomata / stoma	ignore from guard cells	1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.4	greater		1	AO2 4.2.3.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.5	do the investigation again using the same method		1	AO3 4.2.3.2

Total Question 2	7

4.2.3.2 Plant organ system

Answer 06 · Mark scheme

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

Question 3

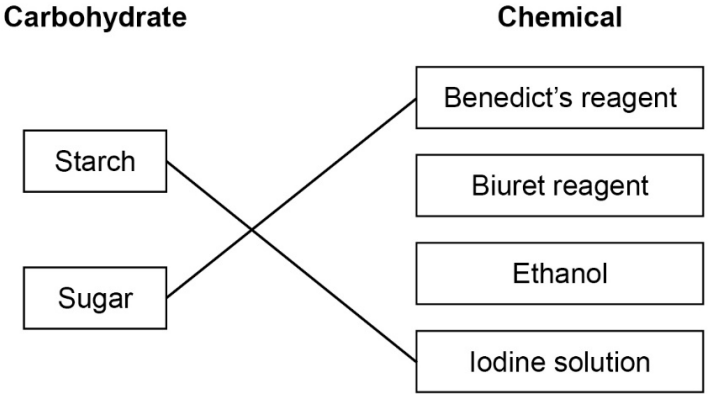
Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.1	any **two** from: • repeat (at each concentration) • use the same size cubes / potato • dry the cubes / potato (before weighing) • increase the number of concentrations • use the same volume of solutions • calculate a (percentage) change in mass • use more precise balance • control the temperature of the solutions	 allow use the same mass of cubes / potato allow blot the cubes / potato dry with paper towel (before taking the mass) allow repeat at 1.5 mol/dm^3 allow ensure the cubes / potato are (fully) submerged allow use weighing scales / balance to 2 decimal places	2	AO3 4.1.3.2 RPA2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.2	0.5 mol/dm^3		1	AO3 4.1.3.2 RPA2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.3	osmosis		1	AO1 4.1.3.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.4	*calculation of area of one face* (3 × 3) = 9 *calculation of total surface area* (9 × 6) = 54 *unit* cm^2	 allow incorrectly calculated area of one face × 6 allow correct unit regardless of working or answer	1 1 1	AO2 4.1.3.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.5	cut the potato (into smaller pieces)		1	AO3 4.1.3.2

Question	Answers	Mark	AO / Spec. Ref.
03.6	 do **not** accept more than one line from a box on the left	1 1	AO1 4.2.2.1 RPA3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
3.7	sugar and starch		1	AO3 4.2.2.1 RPA3

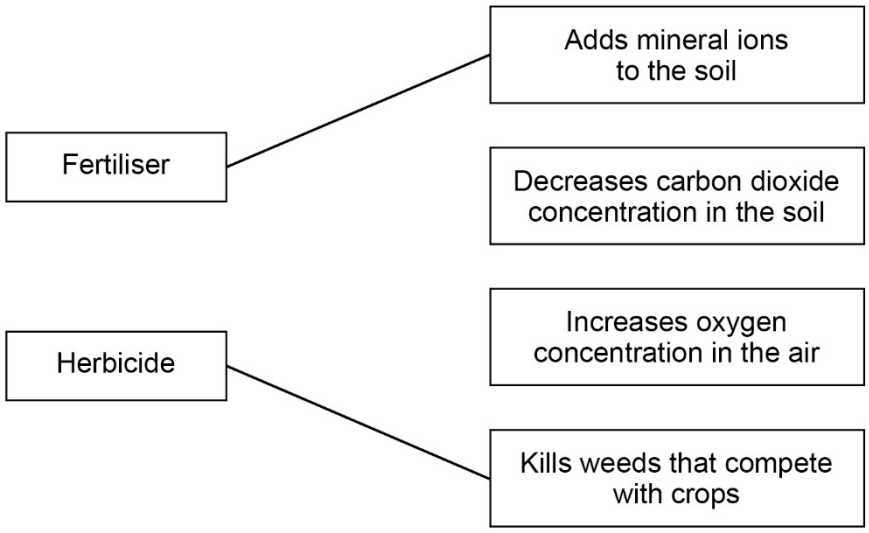
Total Question 3	**11**

4.2.3.2 Plant organ system

Answer 07 · Mark scheme

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

Question 2

Question	Answers	Mark	AO / Spec. Ref.
02.1	 do **not** accept more than one line from a box on the left	1 1	AO1 4.7.1.1 4.7.1.2 4.7.3.2 4.6.2.4 4.7.3.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.2	owls		1	AO2 4.7.2.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.3	insects eat pests on the crop insects pollinate the crop		1 1	AO2 4.7.1.1 4.7.2.1

4.2.3.2 Plant organ system

Answer 07 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.4	any **one** from: • as a habitat for (beneficial) insects / animals • to keep (larger) animals out **or** to keep people out • (to increase) biodiversity • to reduce wind speed • as a habitat for predators of crop damaging organisms • to prevent / reduce soil erosion	allow as a shelter / space for (beneficial) insects / animals allow to protect (the crop) from (larger) animals allow to protect (the crop) from people ignore keep insects / birds out ignore to protect the crop unqualified ignore to stop pests eating the crop allow to increase the number of insects / plants allow descriptions of increasing biodiversity allow act as wind break ignore to reduce pests unqualified ignore so more (crop) can be grown	1	AO2 4.7.3.6 4.7.3.1 4.7.1.1

4.2.3.2 Plant organ system

Answer 07 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.5		allow converse if clearly referring to soil		
	water takes more time to drain (through)	allow there will be more water (in the peat compost) allow water drains / moves slow**er** allow water drains / moves more slowly ignore water drains slow / slowly	1	AO3 4.7.3.3
	(so) water is more likely to be taken up by plants **or** (so) do not need to water plants (as) frequently **or** (which is an advantage because) young plants cannot reach water that is deep (in soil / compost)	allow (so) there is more time for plants to take up water allow (so) reduces water use ignore references to cost allow **2** marks for water more likely to be taken up by plants before it drains away	1	

4.2.3.2 Plant organ system

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.6	(A) respiration (B) photosynthesis	answer line takes precedence	1 1	AO1 4.7.2.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.7	(burning peat) releases / increases carbon dioxide (which) causes / increases global warming	allow (burning peat) releases / increases CO_2 ignore burning releases carbon do **not** accept peat contains carbon dioxide allow (which) is a greenhouse gas allow (which) causes the greenhouse effect ignore (which) causes / increases climate change	1 1	AO1 4.7.2.2 4.7.3.3 4.7.3.5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.8	bacteria fungi		1 1	AO1 4.7.2.2 4.7.3.3

4.2.3.2 Plant organ system

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.9	farming (cattle / biofuel / crops / animals)	allow examples of farming a crop / animal allow building allow named type of building eg houses / factories allow mining allow landfill allow reforestation / rewilding	1	AO1 4.7.3.4

Total Question 2	**15**

4.2.3.2 Plant organ system

Answer 03 · Examiner comments

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

Question 4 (low & standard demand)

This question was about plant transport systems. Half of the students said that water is absorbed from the soil through the root, with stem being a common incorrect response. The name of an organ was asked for, so naming root hair cells was incorrect. Almost half of the students knew that nitrate ions are absorbed from the soil by active transport, with the remaining students being equally split between diffusion and osmosis. Over half knew that translocation is the process which moves sugars through the phloem. A similar proportion of students correctly named the guard cells and knew that the stomata open during the day to allow carbon dioxide to enter the leaf.

The two calculation questions were done reasonably well. When calculating the number of stomata per mm^2 no tolerance was allowed on counting the number of stomata in Figure 5. A common error was to divide 9 by 0.25^2 which was incorrect. Students who showed their working and divided 9 by 25 giving an answer of 0.36 scored 1 mark. Students who added a unit to a correct answer only scored 1 mark. Almost three quarters of students correctly calculated the mean number of stomata on the lower surface of the leaf, but some gave the median value of 35 instead. Almost half the students scored 1 mark in **04.9** for saying there are fewer stomata on the upper surface of leaves, but very few could explain why. Many thought the stomata were to allow water to enter the leaf.

4.2.3.2 Plant organ system

Answer 04 · Examiner comments

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

Question 3

03.1 Just over a quarter of students said plants obtain water from the soil or from the ground. Common responses that were ignored included from rain, from the air or from roots.

03.2 Three fifths of students knew that the evaporation of water from leaves is called transpiration. The most common incorrect response was respiration.

03.3 Almost three fifths of students scored both marks for calculating the mass of the plant on the balance after 5 hours. There were two ways to calculate the answer, both of which were seen. Some students subtracted the mass of water lost at 5 hours (9 g) from the starting mass (510.7 g), whilst others subtracted the difference in water loss between 4 and 5 hours (1.8 g) from the mass of the plant at 4 hours (503.5 g). Both gave the answer 501.7 grams. The answer of 507.1 g was often seen, which might have been due to a transcription error. However, some students showed that they added together the 5 values of mass for 0, 1, 2, 3 and 4 hours, and then divided the total by 5, giving a final answer of 507.1 g. Very few students scored only 1 mark, but over a third scored 0 marks.

03.4 Two thirds of students correctly worked out the rate of water loss from the plant as 1.8 grams/hour. They could have used the table of results or the graph to work out the answer. The most common incorrect response was 9.0 grams/hour.

03.5 Students were asked to draw a line on the graph to show how the results would be different if the investigation was repeated at a lower temperature. The rate would have been slower, therefore a less steep line should have been drawn. The reaction would still have started at 0 hours and finished at 5 hours, so a straight line, drawn using a ruler from 0,0 to 5 hours was needed. Almost two thirds of students scored at least 1 mark and over half of the students scored both marks. It was good to see a ruler being used by the majority of students.

03.6 The question asked for one change to the investigation that would increase the rate of water loss from the plant. A factor that would affect the rate did not gain credit unless it was clear whether the factor should be increased or decreased. Quite a lot of students said increase the time the plant was left for. This would not affect the rate so was ignored.
Only a tenth of students gave a creditworthy response. The most common correct response was to increase the light intensity. Those who just wrote light intensity did not gain credit. References to increasing the temperature were ignored. This idea had been tested in the previous question, and students were told not to refer to temperature in their answer. Quite a lot of students said remove the bag. They did not realise that transpiration is from the leaves and the bag was there to prevent loss of water from the soil.

4.2.3.2 Plant organ system

Answer 05 · Examiner comments

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

Question 2 (low & standard demand)

02.1 The majority of students were unable to identify that this was a control and that it allowed a comparison to be made. Most just repeated that it was to see the loss of mass with the fan off. Whilst this is a correct statement, it does not answer the question.

02.2 Many students did not express their answer well, saying that mass loss 'changed' without qualifying that the mass loss increased.

© 2024 AQA and its licensors. All rights reserved.

4.2.3.2 Plant organ system

Answer 05 · Examiner comments June 2024 | 8464/B/1F | Original Q2

02.3 This proved a challenging question for many students and 81% did not gain any credit. Students were unable to link the idea of water loss to the mass loss from the leaves. A few students were able to articulate that mass was lost because water was lost. However, many of these students expressed this as water blowing off the leaf rather from inside the leaf.

Many students stated that the mass decreased due to bits of the leaf blowing off; 'dirt', 'dust' and 'parts' were all regularly used as a reason for the mass loss.

There were many other incorrect descriptions of how parts of the leaf could be lost or how the pressure of the wind would affect the leaf. Some students said that the leaf could no longer photosynthesise, and this was why it would lose mass. Others wrote about the leaf using energy as it was blown around by the fan. A small number of students wrongly described the water being lost by the guard cells.

A very high proportion of students had no clear understanding of what was being lost, through what process and which leaf structure enabled the loss.

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

[3 marks]

Leaves will loose mass from transpiration. which is the process of water vapour escaping (evaporating) out of the stomata. Wind increase the rate of transpiration therefore higher fan setting increase the loss of mass But this happens normally.

An example of a response that gained full credit.

02.4 60% of students correctly picked greater with the common incorrect answer being smaller.

02.5 About three-quarters of students correctly picked how to improve repeatability.

© 2024 AQA and its licensors. All rights reserved.

Answer 06 · Examiner comments

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

Question 3 (Low and Standard demand)

03.1 Many students understood the importance of controlling variables in practical work, however more precision in the language used was required particularly around quantities and control methods to access full marks.

When describing the potato samples, the use of vague terms such as 'similar' or 'about the same size' were not sufficient to gain credit. Students often failed to describe how these would be standardised in size or mass.

A similar lack of precision was where students were expected to describe how to control the volume of the solution. Phrases like 'measure the volume' or 'record the volume' were insufficient.

03.2 48% of students gained the mark on this question.

03.3 68% of students gained the mark on this question.

03.4 This question proved challenging to most students where only 13% of students gained full marks for this calculation.

A wide range of responses was seen, with many students making errors with the method or units. The majority of incorrect answers were due to only calculating part of the surface area or confusing surface area with volume. Many students did not gain the unit mark by giving the final answer in cm^3. instead of cm^2. A common incorrect answer was 9, where students had calculated the area of only one face of the cube (i.e. $3 \times 3 = 9$)

03.5 Many students failed to gain credit due to either misinterpreting the question or using imprecise language. Less than 10% of students gained the mark.

Successful responses simply stated, 'cut it' or 'cut the potato'. Other valid suggestions included 'cutting off the edges', 'cutting it into smaller pieces', or 'cutting a hole in the cube'.

The most common incorrect response was 'cut the potato into larger pieces' or 'use a bigger cube'. While these actions would increase surface area, they would also alter the volume and invalidate the investigation.

© 2024 AQA and its licensors. All rights reserved.

Answer 07 · Examiner comments

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

Question 2 (Low and Standard demand)

02.1 The correct role of fertiliser was seen more frequently than that of herbicide, but many students did not seem familiar with either term.

02.2 Fewer than half of students could identify the secondary consumer in the food chain. 'Mice' was the most commonly selected answer, presumably with students focussing on the 'secondary' rather than understanding the term 'secondary consumer'.

02.3 Most often, students could identify that insects pollinating the crop would increase yield, but fewer students realised that insects eating pests on the crop would also increase crop yield.

02.4 Many students gave a correct suggestion about why farmers increase the size of hedgerows. Most frequently this was the idea of keeping animals or people out or increasing the number of insects. Reponses suggesting that this gives more space for crops to grow was a frequent misconception, along with incorrect ideas of what hedges are and how much of a barrier they represent, for example, preventing insects passing through or preventing the spread of disease. Some students mistakenly thought hedgerows would keep birds out. Overall, there was a lack of appreciation for the role of hedgerows in increasing biodiversity.

02.5 Student can never be given credit to repeating information in the question, so statements such as 'the water drains slow' could not be awarded mark point 1. If students went a little further to state that 'the water drains more slowly', the response was then comparative and the mark could be awarded.

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]

They have a low mineral ion concentration
A slow speed at which water drains
through.

This student has not added any information that is not taken directly from Table 1, therefore no marks could be awarded. If the student had stated 'A slower speed at which water drains through' then the mark would be awarded for that comparative response.

© 2024 AQA and its licensors. All rights reserved.

4.2.3.2 Plant organ system

Answer 07 · Examiner comments June 2025 | 8464/B/2F | Original Q2

02.6 **‘**Transpiration’ was frequently given as an incorrect answer. Presumably because students are more familiar with plants transpiring, than with plants respiring.

02.7 Students were provided with the information that peat contains carbon compounds and that burning peat contributes to climate change. Therefore, neither of those ideas could be awarded credit. The most common response that did not gain credit was that ‘burning peat releases carbon and contributes to climate change’. Some students were incorrectly linking carbon dioxide with the ozone layer.

02.8 Nearly 50% of students could identify that both bacteria and fungi cause decay. The most common incorrect answer was ‘algae’.

02.9 The wide mark scheme indicates the many and varied ways that students could answer this question. All the ideas on the mark scheme were seen. When the mark was not awarded, this was usually because students had not read or understood the question and they responded in terms of ‘fewer trees giving out oxygen’.