AQA GCSE Combined Science - Trilogy | 8464

SPECIFICATION POINT 4.2.3.1

Plant tissues

Mark schemes and examiner comments

Tier	**Foundation**
Question groups	**2**
Available paper years	**2022–2025**

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.

4.2.3.1 Plant tissues

Answer 01 · Mark scheme

June 2022 | 8464/B/1F | Original Q2

Question 2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.1	cells contain (many) chloroplasts	allow positioned nearest to the light **or** at the top of the leaf allow cells are closely packed **or** no gaps between cells allow chlorophyll for chloroplast	1	AO1 4.1.1.3 4.2.1 4.2.3.1 4.4.1.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.2	stomata		1	AO1 4.2.3.1 4.2.3.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.3	(real length) $= \frac{28}{400}$ (real length in mm =) 0.07 (real length in µm =) 70	allow answer given for length in mm correctly multiplied by 1000	1 1 1	AO2 4.1.1.1 4.1.1.2 4.1.1.5 RPA1

4.2.3.1 Plant tissues

Answer 01 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.4	diffusion		1	AO1 4.1.3.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.5	A Reason any **one** from: • steeper (diffusion) gradient • bigger difference in concentration of carbon dioxide inside and outside the cell	no marks if wrong cell chosen allow higher concentration of carbon dioxide outside the cell than inside the cell allow particles / molecules for carbon dioxide	1 1	AO3 AO2 4.1.3.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.6	(number / amount of) bubbles time	allow volume of gas / oxygen allow suitable time eg 1 / 5 / 10 minutes	1 1	AO1 4.4.1.2 RPA5

4.2.3.1 Plant tissues

Answer 01 · Mark scheme

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Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.7	any **two** from: • temperature (of water) • light intensity **or** distance of light (from pondweed) • concentration of carbon dioxide (in water)	do **not** accept colour of light ignore time allow amount of light ignore light unqualified allow amount / mass of sodium hydrogen carbonate (in water) allow type / size of plant ignore volume of water / solution	2	AO3 4.4.1.2 RPA5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.8	y-axis labelled: rate of photosynthesis in arbitrary units		1	AO2 4.4.1.2 RPA5
	suitable scale		1	
	all **bars** plotted correctly	allow ± ½ a small square the bars can be in any order	1	
	all bars labelled correctly		1	

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Answer 01 · Mark scheme

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Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.9	blue		1	AO3 4.4.1.2 RPA5

Total Question 2		**17**

4.2.3.1 Plant tissues

Answer 02 · Mark scheme

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Question 2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.1	the length of the pondweed the temperature of the water		1 1	AO1 4.4.1.2 RPA5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.2	as the distance increases the volume / oxygen decreases	allow as the light intensity decreases the volume / oxygen decreases ignore use of figures	1	AO2 4.4.1.2 RPA5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.3	3.6 (cm^3)		1	AO2 4.4.1.2 RPA 5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.4	accuracy		1	AO2 4.4.1.2 RPA5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.5	greater (because) the rate of photosynthesis is higher	no marks if incorrect word chosen allow (because) photosynthesis would be faster / quicker allow (because) there is more photosynthesis allow (because) photosynthesis is controlled by enzymes allow (because) enzymes work faster allow (because) particles have more energy allow (because) the rate of reaction is faster / quicker	1 1	AO2 4.4.1.2

4.2.3.1 Plant tissues

Answer 02 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.6	palisade mesophyll		1	AO1 4.2.3.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.7	chlorophyll		1	AO1 4.1.1.2 4.4.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.8	destroy the affected leaves		1	AO2 4.3.1.4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.9	less / no light absorbed (so) less / no photosynthesis (so) less / no glucose / sugar (is made / produced)	 allow (because) chloroplasts / chlorophyll is needed for photosynthesis allow (so) less / no protein / fat / starch / cellulose (is made / produced)	1 1 1	AO2 4.3.1.4 4.4.1.2

Total Question 2	13

4.2.3.1 Plant tissues

Answer 01 · Examiner comments

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Question 2 (low & standard demand)

02.1 This question was not answered well. Students did not seem to understand the word adaptation. Some students talked about a protective layer to stop water getting in or out. There were many references to a large surface area, or to the palisade layer being thick or thin. All of these were ignored. A tenth of students scored the mark, usually for saying the layer contained chlorophyll or chloroplasts.

02.2 40% of students thought the small pores on a leaf are called guard cells. A third of students selected the correct answer, stomata.

02.3 More than half of the students scored full marks for calculating the real length of the cell in micrometres. An additional quarter of students scored two marks. This was either for:

- a correct substitution and calculation in mm, or
- a correct substitution and correct conversion of an incorrectly calculated length in mm.

8% of the students scored one mark either for a correct substitution, or for a correct conversion of mm to micrometres.

02.4 39% of students thought carbon dioxide moved in and out of cells by active transport. Slightly fewer selected the correct response, diffusion.

02.5 Very few students scored two marks. A quarter of the students scored a mark for identifying cell A as the cell into which carbon dioxide would move at the fastest rate. For the reason, a definition of diffusion was insufficient; a comparison was required. This would ideally be a comparison between the different cells in Figure 3, although a comparison between the concentration inside and outside the cell was allowed.

02.6 Just under half the students gave the two measurements that would be required to calculate the rate of photosynthesis. 36% of students scored one mark, usually for the number of bubbles produced. References to the distance of the lamp from the pondweed were ignored.

02.7 17% of students scored two marks for two correct control variables. 61% of students scored at least one mark. The most common correct answers were amount of light and the size or type of pondweed.

02.8 Most students could draw a bar chart. 42% of students scored full marks, and an equal proportion scored three marks. A complete label, including units, was needed for the *y*-axis. A suitable scale was 1 cm for every arbitrary unit, although 2 units per cm was allowed. Bars had to be plotted and labelled with the colour of light, not with just a letter.

02.9 The vast majority of students correctly interpreted the results to conclude that blue light would be the best colour of light to grow plants in. The second most common response was green light, selected by less than a tenth of students.

Answer 02 · Examiner comments

June 2025 | 8464/B/1F | Original Q2

Question 2 (Low and Standard demand)

02.1 82% of students gained at least one mark, with 24% achieving both marks.

02.2 This question was generally well answered, with many students correctly identifying that as the distance increased, the volume of oxygen decreased.

However, students who failed to gain credit often gave vague responses such as ‘it went down’ or ‘it decreased’, without specifying what changed or how the two variables were related.

Some students attempted to explain the trend instead of describing it—for example, by writing ‘as the distance increased, photosynthesis was slower’. While this demonstrated some understanding, it did not directly answer the question and could not be awarded credit.

02.3 The direction of the scale confused many students, most of whom incorrectly gave the value corresponding to the shaded area (representing water) instead. As a result, the most common incorrect responses fell within the range of 4.2 to 4.6, which reflected the volume of water rather than of oxygen.

02.4 78% of students gained the mark on this question.

02.5 This question was generally well attempted, with many students correctly selecting ‘greater’. However, some students were not awarded this mark by either not selecting a word from the list or by choosing their own term.

Despite many students recognising that the volume of oxygen collected would increase, few successfully linked this to photosynthesis as the underlying biological process. Instead, a common error was to rephrase the question stem with responses such as ‘the warmer it is, the more oxygen is produced’, which lacked scientific reasoning.

Some students attempted to explain the increase in oxygen production by referencing energy, but many incorrectly linked this energy increase to the lamp or plant rather than to the particles involved in the reaction.

02.6 49% of students gained the mark on this question. The most frequently chosen incorrect response was spongy mesophyll.

02.7 This question was generally well answered, with most students, 51%, able to provide a recognisable version of the correct answer such as 'chloraphyill’ or ‘chlorofill’.
However, ambiguous responses such as ‘chloroplasm’ were not awarded credit.

02.8 42% of students gained the mark on this question. The most frequently chosen incorrect response was the use of an antitoxin on the affected leaves.

02.9 Very few students, only 8%, gained two or more marks on this question. Some students misinterpreted the question, assuming that all leaves had been infected or removed. In these cases, responses that stated no light absorbed, no photosynthesis, or no glucose/protein production were accepted for each respective marking point, as this was a reasonable interpretation.

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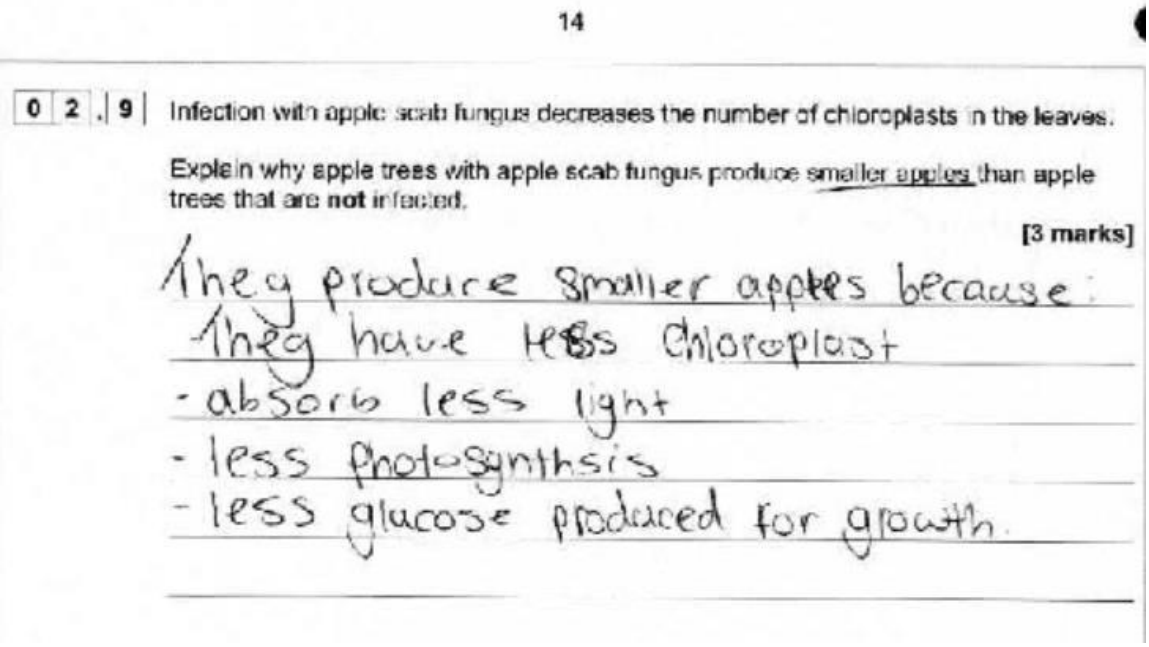
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Answer 02 · Examiner comments June 2025 | 8464/B/1F | Original Q2

Many students correctly identified that less photosynthesis would occur. Some students were credited for recognising that less light is absorbed. Acceptable alternatives included less light is taken in, but responses such as 'less light is attracted to the leaf' were not creditworthy.

A number of students made the connection between smaller apples and glucose production or referred to complex substances such as starch. cellulose, fat or protein, all of which were acceptable.

Answers that referred to less energy, but without qualifying this in terms of glucose or product synthesis, could not be credited.



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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]

They produce smaller apples because:
They have less chloroplast
- absorb less light
- less photosynthsis
- less glucose produced for growth.

In this example, all three required points are clearly communicated. Although the student presents their explanation using bullet points, the logical progression and linking of ideas are still evident.
The use of bullet points did not detract from the clarity or completeness of the response. As the key ideas were well expressed and appropriately connected, full credit was awarded with 3 marks.
This highlights that well-structured bullet point responses can still fully meet the marking criteria when the content is accurate and coherently linked.

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