AQA GCSE Combined Science - Trilogy | 8464

SPECIFICATION POINT 4.2.3.2

Plant organ system

Mark schemes and examiner comments

Tier	**Higher**
Question groups	**3**
Available paper years	**2019–2023**

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

June 2019 | 8464/B/1H | Original Q5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.1	$50=\frac{43}{\text{size of real object}}$	an answer of 860 (µm) scores 4 marks	1	AO1 3×AO2 4.1.1.5
	(size of real object =) $\frac{43}{50}$		1	
	(size of real object =) 0.86 (mm)		1	
	(size of real object =) 860 (µm)	allow correct conversion of their calculated value	1	
		if no other marks awarded allow 1 mark for $\text{magnification}=\frac{\text{size of image}}{\text{size of real object}}$		

Question	Answers	Mark	AO / Spec. Ref.
05.2	**Level 2:** Scientifically relevant facts, events or processes are identified and given in detail to form an accurate account.	3–4	AO1 4.1.1.2
	Level 1: Facts, events or processes are identified and simply stated but their relevance is not clear.	1–2	AO1
	No relevant content	0	
	Indicative content • place slide on stage • use lowest power / ×4 objective lens (initially) • adjust mirror **or** switch light on so light passes through slide • move stage as close to lens as possible • slide must not touch lens • turn focussing knob so slide moves away from lens • turn focussing knob until image comes into focus • use fine focus to get clear image • change objective lens to ×10 • ×5 eyepiece and ×10 objective lenses (gives total magnification of ×50) • refocus slide using focussing knob For Level 2 reference to how to focus the slide / cells **and** achieve magnification of ×50 is required		

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June 2019 | 8464/B/1H | Original Q5

05.3	any **three** from: • (rate) fastest in the first 0.5 hours • (rate gradually) decreases after first 0.5 hours **or** (rate gradually) decreases throughout the investigation • rate is constant between 1.0 and 2.0 hours **or** rate is constant between 2.0 and 3.5 hours • (rate) becomes zero between 3.0 and 3.5 hours	allow 'it' for rate allow fastest rate is 120 units per hour (at start) allow mean rate over 3.5 hours is 37.14 units per hour allow (rate) is zero after 3.5 hours	3	AO3 4.1.3.3 4.2.3.2

05.4	more nitrate ions are absorbed in the presence of oxygen	allow nitrate ions absorbed faster in the presence of oxygen	1	AO3
	(which suggests) they are absorbed by active transport / uptake		1	AO2
	which requires energy from respiration	do **not** accept energy produced / created / made	1	AO1
	some nitrate ions absorbed by diffusion **or** some nitrate ions absorbed (by active transport / uptake) requiring energy from anaerobic respiration **or** some nitrate ions absorbed by active transport / uptake using oxygen already dissolved in the solution		1	AO2 4.1.3.3 4.2.3.2

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Answer 01 · Mark scheme

05.5	nitrate ions are used with glucose to form amino acids (which are) used to synthesise proteins (needed for growth)		1 1 1	AO1 4.4.1.3 4.4.2.3
Total			**18**	

4.2.3.2 Plant organ system

Answer 02 · Mark scheme

November 2021 | 8464/B/1H | Original Q6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.1	(absorbed from soil) by osmosis through root hair (cells)	allow (absorbed from soil) by diffusion through root hair (cells)	1	AO1 4.1.3.2 4.2.1 4.2.3.1 4.2.3.2
	travels through xylem (vessels) to the leaves	ignore travels upwards in the xylem unqualified	1	
	lost through stomata (to atmosphere)		1	
	idea of driven by evaporation / transpiration	ignore evaporation / transpiration unqualified	1	
06.2	translocation		1	AO1 4.2.3.2
06.3	have pores in the end walls	allow sap for dissolved sugars	1	AO1
	(so) dissolved sugars / food / contents can move from cell to cell		1	AO2 4.1.1.3 4.2.1 4.2.3.1 4.2.3.2
	or			
	no nucleus **or** few / no sub-cellular structures (1)	allow few / no organelles ignore cells are empty		
	to maximise space for movement of dissolved sugars / food / contents (1)			
		allow thick / rigid cell wall (1) to withstand pressure inside cell (1)		

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06.4	any **one** from: (the process): • requires energy • is an active process • uses active transport (reason) cells have many mitochondria	 allow flow of dissolved sugars / food in sieve tube cell is not impeded (1) (reason) companion cell is flattened (1)	1 1	AO3 AO2 4.1.1.2 4.1.1.3 4.1.3.3 4.2.3.1 4.2.3.2 4.4.2.1
06.5	 sugars are made in the leaves by photosynthesis all cells / tissues need sugar for respiration (sugars) transported to meristems for growth / cell division / mitosis **or** (sugars) transported for storage as starch / fat / oil	allow glucose for sugar allow sugars are not made in the root / meristems (by photosynthesis) allow every cell / tissue needs sugar for respiration allow whole plant needs sugar as an energy source	 1 1 1	 AO1 AO2 AO2 4.2.1 4.2.3.1 4.2.3.2 4.4.1.3 4.4.2.3
Total			**12**	

4.2.3.2 Plant organ system

Answer 03 · Mark scheme

June 2023 | 8464/B/1H | Original Q4

Question 4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.1	A		1	AO1 4.2.1 4.2.3.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.2	has (large) air spaces (between cells)	allow has (large) gaps (between cells)	1	AO1 4.2.1 4.2.3.1
	(so) gases can diffuse / move through the leaf	allow carbon dioxide **or** oxygen **or** water vapour for gases	1	
	to / from the photosynthetic / palisade / B layer	allow to / from the upper mesophyll if named gas given for mp 2 direction of movement must be correct if no other marks awarded allow **1** mark for cells have chloroplasts for photosynthesis	1	

4.2.3.2 Plant organ system

Answer 03 · Mark scheme

June 2023 | 8464/B/1H | Original Q4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.3		reason must correctly match the structure		AO1 4.2.1
	composed of hollow tubes / cells	allow cells are empty allow no cytoplasm / nucleus / sub-cellular structures	1	4.2.3.1 4.2.3.2
	(so) no obstruction to water flow	allow (so) water flows easily if linked to hollow tubes allow to maintain the transpiration stream	1	
	OR			
	has lignin (1)	ignore has thick walls		
	(to) hold tubes open (1) **or** (to) strengthen the tubes	allow (to) keep water inside xylem allow (to) make tubes rigid		
	OR			
	no end walls (1)			
	(so) water flows easily (1) **or** (so) water flows continuously	must be linked to an adaptation allow (so) maintains a constant water flow allow to maintain the transpiration stream		

4.2.3.2 Plant organ system

Answer 03 · Mark scheme

June 2023 | 8464/B/1H | Original Q4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.4	water enters (guard) cells by osmosis	allow water enters (guard) cells because the concentration of water is higher outside the cell than inside the cell	1	AO2
	cells swell and curve (to open the stoma)	allow cells become turgid and curve (to open the stoma) allow inner wall of (guard) cell is thicker / stronger **or** less flexible than outer wall so cells curve (to open stoma)	1	AO3 4.1.1.2 4.1.1.3 4.1.3.2 4.2.3.1 4.2.3.2

Total Question 4	**8**

4.2.3.2 Plant organ system

Answer 01 · Examiner comments

June 2019 | 8464/B/1H | Original Q5

Question 5 (standard, standard/high & high demand)

05.1 Around 38% of students gained full marks for calculating the length of the root hair in micrometres. Around 33% of students scored three marks because they made an error with the unit conversion. As mentioned earlier, more students are showing their working for the calculation.

The first marking point was for substitution into the equation given in the specification. The second marking point was for reorganisation of the equation to calculate the real length of the root hair. The third marking point was for correctly calculating the length in mm. The final mark was for converting this value to µm. This was an independent marking point, so a conversion of their incorrectly calculated length could gain this mark. This was often awarded. The most common errors related to incorrectly reorganising the equation, or an incorrect unit conversion.

05.2 This extended response question highlighted that many students either did not understand how to use a light microscope, or could not explain the procedure in a clear step by step way.

Some students had not read the question carefully. Instead of starting with a prepared slide, they explained how they would prepare a slide, which was not creditworthy. Knowledge of the names of the parts of a microscope was poor.

If students only said that the ×10 objective lens should be used to give a total magnification of ×50, they gained one mark. In order to access Level 2, a detailed method in a logical sequence was needed, as well as a description of how to achieve a magnification of ×50. 9% of students achieved Level 2. Many responses lacked detail, or gave confused accounts of how to focus a microscope.

05.3 This question asked students to describe the changes in the rate of absorption of ions for the seedling with no oxygen added. Many students compared the seedlings with and without oxygen, saying the rate of absorption with oxygen was faster. This is a correct statement, but does not answer the question. Others described the change in mass of the ions absorbed, rather than the rate.

A fifth of students scored one or more marks. Where one mark was awarded, it was usually for saying that the rate gradually decreased as time went by. Students always find it more difficult to interpret data when it is given in a table, rather than displayed as a graph. It might help if students sketched the data as a graph, so the changes in rate would be more obvious. Alternatively they could calculate the rate at each time point.

05.4 Around 79% of students scored one mark for saying that more nitrate ions are absorbed in the presence of oxygen. Stating that the ions were absorbed better was insufficient as at this level the idea of more or faster was required. Only a few went on to explain that this was because the ions were absorbed by active transport, which requires energy from respiration. The last marking point was rarely seen.

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Answer 01 · Examiner comments

05.5 Students found this question difficult and approximately 11% scored one or more marks. A direct description, of how nitrate ions are used to help plants grow, was required. Although nitrate ions are used to form other substances in a plant, the direct link between the formation of proteins for growth was needed.

Many students gave a description of nitrate ion uptake and transport in the plant, but this did not answer the question. Reference to active transport was often seen. Many thought that nitrate ions are transported in phloem. The use of nitrates as a food or as a source of energy was often stated. Some thought that nitrates contain glucose.

4.2.3.2 Plant organ system

Answer 01 · Examiner comments

Use of statistics

Statistics used in this report may be taken from incomplete processing data. However, this data still gives a true account on how students have performed for each question.

Mark Ranges and Award of Grades

Grade boundaries and cumulative percentage grades are available on the Results Statistics page of the AQA Website.

4.2.3.2 Plant organ system

Answer 02 · Examiner comments

November 2021 | 8464/B/1H | Original Q6

Question 6 (standard, standard/high and high demand)

This question was about plant transport systems and the questions required detailed responses. Few students could describe how water is transported from the soil to the atmosphere through a plant. Most responses lacked the correct terminology or detail. A third of students scored any marks. A fifth of students knew the term translocation.

Few students identified any adaptation of sieve tube cells, although a few noticed that companion cells have many mitochondria. Saying the cells had mitochondria was insufficient, as some are found in all plant cells.

A tenth of students could give a reason why dissolved sugars must be moved upwards and downwards in a plant. Some mentioned respiration, but did not link this to the question. A reference to the whole plant, or all cells, needing sugar for respiration was needed.

Concluding remarks

It was clear that in the unusual teaching circumstances leading up to this exam had made it not possible for some topics and practical work to be covered in the normal way. It was a small and atypical cohort of students who have chosen to take the autumn series of examinations. Gaps in both knowledge and skills were evident.

4.2.3.2 Plant organ system

Answer 02 · Examiner comments

Mark Ranges and Award of Grades

Grade boundaries and cumulative percentage grades are available on the Results Statistics page of the AQA Website.

4.2.3.2 Plant organ system

Answer 03 · Examiner comments

Question 4

04.1 Three fifths of students correctly identified Tissue A as the epidermis. A quarter of students thought Tissue B, the palisade mesophyll, was the epidermis.

04.2 Half of the students scored at least 1 mark, usually for saying that the spongy mesophyll is adapted for its function by having air spaces. A description of these was allowed, such as gaps or air pockets. Only a fifth of students went on to explain the function of the air spaces, to score 2 marks. There was quite a lot of confusion regarding how water enters a plant, many thinking that it entered via the leaves. Some students thought the spongy mesophyll was a storage tissue. Quite a lot of students gained the compensation mark for saying the cells of the spongy mesophyll have chloroplasts for photosynthesis.

04.3 Fewer than a third of students scored any marks on this question. An adaptation of xylem had to be described in order to gain any marks. If a correct adaptation was given, the reason had to match the structure. Quite a lot of students talked about long tubes, which was insufficient. A reference to them being hollow or empty was needed. Some students gained 2 marks for saying the cells are strengthened with lignin. Others said the xylem cells did not have end walls, but only a few explained why this was useful.

04.4 Students struggled to answer this question which was set at the highest level of demand. Very few scored any marks. The most common responses referred to the stoma needing to open to either allow the transfer of gases for photosynthesis, or to allow the excess glucose to leave the leaf. Some said the glucose would be used in respiration to transfer energy to open the stoma. Few attempted to describe what caused the stoma to open.