AQA GCSE Biology | 8461

SPECIFICATION POINT 4.2.3.1

Plant tissues

Mark schemes and examiner comments

Tier	**Higher**
Question groups	**8**
Available paper years	**2008–2023**

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.

4.2.3.1 Plant tissues

Answer 01 · Mark scheme

June 2008 | BLY3H | Original Q2 | Legacy

question	answers	extra information	mark
2(a)	**B**		1
	(**B** has) low(est) number of stomata **or** no stomata on upper surface **or** only 800 (on lower surface)		1
	less transpiration / evaporation / water loss owtte **or** water (vapour) is lost via stomata	only allow zero water loss if linked to no stomata on upper surface / linked to leaf B upper surface ignore references to leaf surface area	1
2(b)	reduce loss / amount of water (vapour) **or** reduced transpiration (from upper surface)	accept converse do **not** allow no water is lost	1
	warmer above leaf **or** wilted leaf folds over lower surface **or** lower leaf in shade **or** less light / heat / sun on lower side	accept converse ignore reference to dust	1
Total			**5**

4.2.3.1 Plant tissues

Answer 01 · Mark scheme

June 2008 | BLY3H | Original Q2 | Legacy

COMPONENT NUMBER: BLY3H

COMPONENT NAME: Biology

STATUS: Final

DATE: June 2008

4.2.3.1 Plant tissues

Answer 02 · Mark scheme

Question 1

question	Answers	extra information	mark
1(a)	any **one** from: • add a water bath • heat screen • use LED • low energy bulb / described	ignore 'check temperature'	1
1(b)(i)	rate / number of bubbles decreases **or** less oxygen / gas released	accept converse with reference to increasing light **or** shorter distance ignore reference to rate of photosynthesis	1
1(b)(ii)	temperature / CO_2 (concentration)	accept 'it was too cool' **or** not enough CO_2 accept number of chloroplasts / amount of chlorophyll allow heat allow CO2 do **not** allow CO^2	1

Question 1 continues on the next page . . .

BL2HP

Question 1 continued . . .

<table>
<tr><th>question</th><th>Answers</th><th>extra information</th><th>mark</th></tr>
<tr><td>1(c)</td><td colspan="2">Marks awarded for this answer will be determined by the Quality of Written Communication (QWC) as well as the standard of the scientific response. Examiners should also refer to the information on page 5, and apply a ‘best-fit’ approach to the marking.</td><td colspan="2">6</td></tr>
<tr><td></td><td>0 marks</td><td>Level 1 (1-2 marks)</td><td>Level 2 (3-4 marks)</td><td>Level 3 (5-6 marks)</td></tr>
<tr><td></td><td>No relevant content.</td><td>There is a brief description of at least 1 tissue or at least 1 function of an indicated part of the leaf.
The account lacks clarity or detail.</td><td>There is a clear description which includes at least 1 named tissue and at least 1 correct function described for an indicated part of the leaf.</td><td>There is a detailed description of most of the structures and their functions.</td></tr>
<tr><td></td><td colspan="4">examples of responses:
• epidermis
• cover the plant
• mesophyll / palisade
• photosynthesises
• phloem
• xylem
• transport.
The following points are all acceptable but beyond the scope of the specification:
• (waxy) cuticle – reduce water loss
• epidermis – no chloroplasts so allows light to penetrate
• stomata / guard cells – allow CO_2 in (and O_2 out) or controls water loss
• palisade (mesophyll) – <u>many</u> chloroplasts to trap light
– near top of leaf for receiving more light
• spongy (mesophyll) – air spaces for rapid movement of gases</td></tr>
<tr><td>Total</td><td colspan="2"></td><td colspan="2">9</td></tr>
</table>

4.2.3.1 Plant tissues

Answer 02 · Mark scheme

January 2013 | BL2HP | Original Q1 | Legacy

BL2HP

4.2.3.1 Plant tissues

Answer 03 · Mark scheme

Question 1

question	answers	extra information	mark
1(a)	xylem **and** phloem	either order allow words ringed in box allow mis-spelling if unambiguous	1
1(b)(i)	movement / spreading out of particles / molecules / ions / atoms	ignore names of substances / 'gases'	1
	from high to low concentration	accept down concentration gradient ignore 'along' / 'across' gradient ignore 'with' gradient	1
1(b)(ii)	oxygen / water (vapour)	allow O_2/O2 ignore O^2/O allow H_2O/H2O ignore H^2O	1
Total			**4**

4.2.3.1 Plant tissues

Answer 04 · Mark scheme June 2014 | BL3HP | Original Q5 | Legacy

5(a)(i)	guard (cells)	allow phonetic spelling	1	AO1 3.1.3e
5(a)(ii)	any **one** from: • allow carbon dioxide to enter • allow oxygen to leave.	ignore reference to cells allow control loss / evaporation of water **or** control transpiration rate allow 'gaseous exchange'	1	AO1 3.1.3a, c,e
5(b)(i)	200	correct answer gains 2 marks with or without working allow 1 mark for 0.1 × 0.1 = 0.01 (mm^2)	2	AO2 3.1.3
5(b)(ii)	more / a lot of / increased water loss	allow plant more likely to wilt (in hot / dry conditions)	1	AO3 3.1.3d
5(c)(i)	0.12		1	AO2 3.1.3
5(c)(ii)	the lower surface has most stomata stomata are now covered / blocked (by grease) so water cannot escape / evaporate from the stomata	 ignore waterproof to gain credit stomata must be mentioned at least once	1 1 1	AO3 3.1.3c, d
Total			9	

4.2.3.1 Plant tissues

Answer 04 · Mark scheme

June 2014 | BL3HP | Original Q5 | Legacy

Question	Answers	Extra information	Mark	AO / spec ref.

4.2.3.1 Plant tissues

Answer 05 · Mark scheme

June 2019 | 8461/2H | Original Q5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.1	same kingdom + phylum + class + order **or** same order **or** they have the top four groups the same	allow both Poales	1	AO3 4.6.4
05.2	**Rr / rR**	do **not** accept **RR** or **rr** ignore heterozygous do not accept homozygous	1	AO3 4.6.1.6 4.6.3.3
05.3	C^WC^W		1	AO3 4.6.1.6
05.4	parental genotypes / gametes correct for both parents: $C^R C^W$ $C^R C^W$ / C^R and C^W genotypes of offspring correctly derived in a Punnett square: C^RC^R C^RC^W C^WC^W correct identification of phenotypes from their cross: C^RC^R = red C^RC^W = pink C^WC^W = white	allow **R** and **W** throughout allow own symbols if defined allow correctly derived genotypes from incorrect gametes allow colours correctly identified from different offspring, only if pink and other colour(s) are given	1 1 1	AO2 4.6.1.6
05.5	answer correctly derived from Question **05.4** to match stated phenotypes	allow 50(%) if no offspring given in Question **05.4** allow to match genotypes if no phenotypes given	1	AO2 4.6.1.6

4.2.3.1 Plant tissues

Answer 05 · Mark scheme

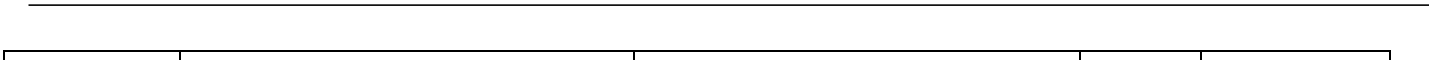
June 2019 | 8461/2H | Original Q5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.6	*(several groups)* so many / several plants can be produced	allow each (group) will give a new plant	1	AO1 4.1.2.3 4.6.1.3 4.6.2.5
	(nutrients) for making protein / amino acids **or** for making chlorophyll **or for providing** energy **or for respiration**	allow other examples do **not** accept making energy ignore for growth	1	
	(add hormones) so differentiation occurs **or** so roots / shoots develop	allow for the formation of different tissues / organs / named allow to stimulate cell division	1	
	(sterile conditions) to prevent growth / entry of microorganisms / named type **or** prevent decay / disease	ignore to kill microorganisms ignore contamination unqualified	1	
	(temperature = 20 ^{o}C) so optimum / good growth	allow reference to enzymes working well ignore enzymes not denatured ignore reference to pathogens / microorganisms	1	
05.7	(all new plants have been) produced by asexual reproduction / mitosis **or** produced without (fusion of) gametes	ignore produced from one parent	1	AO2 4.1 4.1.2.2 4.6.1.1 4.6.2.5
	(so) all are genetically identical / clones **or** all are C^RC^W **/** heterozygous	allow all are the same genotype / alleles / genes / DNA	1	
Total			14	

4.2.3.1 Plant tissues

Answer 05 · Mark scheme

June 2019 | 8461/2H | Original Q5



4.2.3.1 Plant tissues

Answer 06 · Mark scheme November 2021 | 8461/1H | Original Q6

06.1	A		1	AO2 4.2.3.1
06.2	chloroplast(s)	ignore chlorophyll	1	AO1 4.1.1.3 4.2.3.1
06.3	guard (cells)	ignore stoma(ta)	1	AO1 4.2.3.1 4.2.3.2
06.4	transpiration stream	ignore transpiration unqualified	1	AO1 4.2.3.2
06.5	increased humidity		1	AO2 4.2.3.2

4.2.3.1 Plant tissues

Answer 06 · Mark scheme

November 2021 | 8461/1H | Original Q6

06.6	**Level 2:** Scientifically relevant features are identified; the way(s) in which they are similar/different is made clear and (where appropriate) the magnitude of the similarity/difference is noted.	4–6	AO1 4.2.3.1 4.2.3.2
	Level 1: Relevant features are identified and differences noted.	1–3	
	No relevant content.	0	
	Indicative content: *Structure* • xylem is made of dead cells **and** phloem is made of living cells • phloem cells have pores in their end walls **and** xylem cells do not have pores in their end walls • xylem is hollow **or** xylem does not contain cytoplasm **and** phloem contains cytoplasm • xylem contains lignin **and** phloem does not (contain lignin) • both made of cells • both tubular *Function* • xylem transports water / mineral ions **and** phloem transports (dissolved) sugars • xylem is involved in transpiration **and** phloem is involved in translocation • xylem transports unidirectionally **and** phloem transports bidirectionally • both transport liquids / substances throughout the stem / leaves / roots / plant For **Level 2**, students must refer to both structure and function of xylem and phloem tissue.		

4.2.3.1 Plant tissues

Answer 06 · Mark scheme

November 2021 | 8461/1H | Original Q6

06.7	*(correct division)* 40 ÷ 7 (in hours) **or** 40 ÷ 420 (in minutes)	allow correct answer from student's readings throughout	1	AO2 4.2.3.2
	5.71 (in hours) **or** 0.0952…(in minutes)	allow correct division from incorrect reading(s) from the tangent	1	
	(correct conversion to minutes) 0.0952…	allow correct conversion at any point in the calculation allow correct conversion of calculated value to minutes	1	
	(answer in standard form) 9.5(238) x 10^{-2}	allow correct conversion of calculated value to standard form	1	
06.8	(less water loss at night)	allow converse if clearly describing 12:00		AO3 4.2.3.2
	stomata are (almost completely) closed		1	
	(because) it's cooler / colder **or** (because) there's less / no light	ignore it's dark at night	1	
Total			**17**	

4.2.3.1 Plant tissues

Answer 06 · Mark scheme

November 2021 | 8461/1H | Original Q6

Question	Answers	Extra information	Mark	AO / Spec. Ref.

4.2.3.1 Plant tissues

Answer 07 · Mark scheme

June 2022 | 8461/1H | Original Q3

Question 3

<table>
<tr><th>Question</th><th>Answers</th><th>Extra information</th><th>Mark</th><th>AO / Spec. Ref.</th></tr>
<tr><td>03.1</td><td>
<table>
<tr><th>Hazard</th><th>Risk</th><th>Plan to minimise risk</th></tr>
<tr><td>Iodine solution is an irritant</td><td>May cause allergic reaction or skin rash</td><td>wash skin immediately (after contact)
or
wear gloves
or
clean up spills

allow method to prevent spills e.g. use a dropper bottle

ignore do not spill</td></tr>
<tr><td>Sharp knife</td><td>may cut you / someone / skin</td><td>cut away from the body
or
cut on a chopping board
or
keep fingers away from blade (when cutting)

allow description of how to carry knife safely

ignore use a blunt knife</td></tr>
</table>
1 mark for each correct row
</td><td>1

1</td><td>AO3
4.1.1.5
RPA1</td></tr>
</table>

4.2.3.1 Plant tissues

Answer 07 · Mark scheme

June 2022 | 8461/1H | Original Q3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.2	**thin layer** (to) help see individual cells	allow so light can penetrate	1	AO2 4.1.1.5 RPA1
	iodine solution (to) stain / see the parts of the cell	allow visible named sub-cellular structures e.g. nucleus, cytoplasm, cell wall, starch grains ignore chloroplast ignore (to) stain the cell	1	
	at an angle (to) prevent / reduce air bubbles		1	

4.2.3.1 Plant tissues

Answer 07 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.3	*recall of equation* magnification = $\frac{\text{size of image}}{\text{size of real object}}$	allow magnification = $\frac{\text{length of image}}{\text{length of real object}}$ ignore use of equation triangle	1	AO1
	rearrangement of equation size of real object = $\frac{\text{size of image}}{\text{magnification}}$	allow length of real object = $\frac{\text{length of image}}{\text{magnification}}$ allow recall and rearrangement of equation implied at any stage	1	AO2
	substitution $\frac{4.8}{400}$	allow substitution of incorrectly converted value	1	AO2
	0.012 (cm)	allow answer using incorrectly converted value	1	AO2
	conversion 120 (µm)	allow conversion to µm at any stage	1	AO2 4.1.1.5 RPA1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.4	any **two** from: • include magnification / scale • use continuous lines **or** ensure no gaps in lines • do not draw overlapping cells • draw (wider) cell walls • do not shade • draw all the cells present • draw correct cell shapes • do not have gaps between cells • draw nuclei in correct location • label cell part(s)	ignore make it neater allow do not colour allow label named cell part(s)	2	AO3 4.1.1.2 RPA1

4.2.3.1 Plant tissues

Answer 07 · Mark scheme

June 2022 | 8461/1H | Original Q3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.5	(would) look more magnified / bigger (cell would) have more detail **or** (would) be at a higher resolution **or** (could) see more sub-cellular structures **or** sub-cellular structures seen in detail	ignore reference to zoom allow correct examples of sub-cellular structures such as ribosomes, mitochondria, cell membrane ignore chloroplast allow (could) be in 3D allow would be in black and white	1 1	AO1 4.1.1.5

Total Question 3		**14**

4.2.3.1 Plant tissues

Answer 08 · Mark scheme

June 2023 | 8461/1H | Original Q1

Question 1

Question	Answers	Extra information	Mark	AO / Spec Ref.
01.1	a group of the same / similar cells **or** a group of cells with a (similar / specific) function	ignore a group of cells unqualified ignore examples of tissue functions	1	AO1 4.2.1

Question	Answers	Extra information	Mark	AO / Spec Ref.
01.2	meristem (tissue)		1	AO1 4.1.1.4 4.1.2.3 4.2.3.1

Question	Answers	Extra information	Mark	AO / Spec Ref.
01.3	willow	ignore named parts of willow	1	AO1 4.3.1.9

Question	Answers	Extra information	Mark	AO / Spec Ref.
01.4	any **one** from: • (berries are) easy to access / pick • easier to extract chemical • taking berries will not harm the plant	ignore berries are not underground allow taking leaves / roots might damage / kill the plant (so it cannot produce more chemical) allow idea that the lower mass / amount (of chemical) will be less toxic / harmful allow greater mass of berries than of leaves / roots	1	AO3 4.2.3.1

4.2.3.1 Plant tissues

Answer 08 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec Ref.
01.5	(0.6 × 1.2 =) 0.72 (0.72 × 2 =) 1.44 1.44 × 1000 1440 (mg) **alternative route** (2 × 1.2 =) 2.4 (1) (2.4 × 0.6 =) 1.44 (1) 1.44 × 1000 (1) 1440 (mg) (1)	allow conversion to mg at any point in calculation allow conversion of a correct mass calculated for berries / roots allow a correct answer using an incorrect conversion factor of a multiple of 10	1 1 1 1	AO2 4.3.3.1

Question	Answers	Extra information	Mark	AO / Spec Ref.
01.6	any **one** from: • lack of chlorophyll • lack of magnesium (ions)	allow lack of chloroplasts allow lack of mineral (ions) **or** named example such as iron / nitrate / potassium / zinc (ions) ignore lack of nutrients / nitrogen allow lack of water allow incorrect pH of soil allow acidic / alkaline soil allow (named) infection allow lack of light allow other correct suggestions	1	AO1 4.3.3.1 4.3.1.2 4.3.1.4

4.2.3.1 Plant tissues

Answer 08 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec Ref.
01.7	any **two** from: • to check toxicity • to check dosage • to check its efficacy	allow to check it is safe allow to check for side effects allow to check it is not poisonous / dangerous / harmful allow to check how much is needed allow to check it works allow to check it does not interact with other drugs	2	AO1 4.3.1.9

Question	Answers	Extra information	Mark	AO / Spec Ref.
01.8	(writers / companies may get) financial gain **or** (competitor may suffer) financial loss	ignore because the report has not been peer reviewed ignore have not used a double-blind trial	1	AO3 4.3.1.9

Question	Answers	Extra information	Mark	AO / Spec Ref.
01.9	have the claims peer reviewed		1	AO1 4.3.1.9

Total Question 1	13

4.2.3.1 Plant tissues

Answer 06 · Examiner comments

November 2021 | 8461/1H | Original Q6

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

In **06.6**, most students were able to describe features of xylem and phloem, however, most did not acknowledge the command word and therefore did not make any creditworthy comparisons. Most students were good at recalling that xylem is made of dead cells and that it contains lignin. Some students thought that both xylem and phloem contain lots of mitochondria for energy and some implied that energy was used to move water. Many students think that the process of transpiration involves energy. Many students found it difficult to articulate themselves when describing cross walls and end walls, often using incorrect terminology. A few students thought that xylem vessels contained valves and went on to talk about blood vessels or substances being transported around the 'body' rather than the plant. Higher-attaining students were able to name sugars, or sucrose, as being transported by the phloem, but most students referred simply to 'food' (and sometimes incorrectly to mineral ions, confusing phloem with xylem) which was not sufficient.

In **06.7**, many students were able to access the question by attempting to find the gradient of the tangent. Whilst many were successful in undertaking this higher level skill, some students did not achieve full marks due to inaccurate graph readings and this is a skill students are advised to practise. Several students forgot to subtract the two *y*-axis values from one another, incorrectly assuming that the tangent started at zero.

4.2.3.1 Plant tissues

Answer 07 · Examiner comments

June 2022 | 8461/1H | Original Q3

Question 3 (Standard and standard/high demand)

03.1 Over 60% of students gained the first mark point for identifying a plan to minimise the risk when using iodine solution. The second mark point for the sharp knife was less frequently awarded as students were less able to give a valid method to minimise the risk. The most common incorrect response referred to wearing goggles. Responses were often vague such as 'place it away from you'. Some students abdicated responsibility completely by recommending that the teacher or an adult cut the onion and some were more imaginative and suggested buying pre-cut onion. A few candidates transferred their knowledge from other subjects e.g. technology and talked about specific knife grips that protect the fingers.

03.2 Just over 10% of students achieved full marks in this question. Reponses for marking points 1 and 2 often lacked sufficient detail or failed to answer the question, for example describing that the layer is only one cell thick for MP1 and suggesting staining organelles that could not be seen with a light microscope for MP2. Similarly, some students concentrated on the problems of a thick slice, rarely giving an adequate converse argument. Those who scored at all on MP1 generally referred to light penetration rather than the alternative of seeing individual cells. MP2 responses often stopped at staining the whole cell, rather than its individual parts and some students described the test for starch. The purpose of the cover slip was well understood. Incorrect answers mostly referred to the angle of the coverslip having something to do with reflecting light to see the sample better.

03.3 This question was well answered, with 50% of students scoring 5 out of 6 marks, and few scoring below that. The most common error was an incorrect conversion to micrometres. Many students fail to recognise that they need to convert centimetres to millimetres before converting to micrometres and many divide by factors of 1000 rather than multiply.

03.4 In this question, some students found it difficult to articulate themselves, often contradicting themselves or tying themselves in knots by not reading their final response over for mistakes. Answers such as 'add labels', or 'label organelles / structures' that couldn't be seen with a light microscope were not creditworthy.

03.5 Despite this being a common question that students seem to be familiar with, many struggled to articulate the idea of greater magnification and resolution when faced with the idea in the context of actual cells. Just over 50% of students gained full marks. Students sometimes showed their lack of understanding of resolution, frequently giving two alternative answers for MP2, and failing to recognise that these alternatives are due to the effects of higher resolution, thus gaining only 1 mark overall.

4.2.3.1 Plant tissues

Answer 08 · Examiner comments

Question 1 (Standard demand)

01.1 Whilst a large majority of students knew that a tissue consists of 'a group of cells', often adding 'working together'; these were insufficient to gain the mark. In order to be credited, students also needed to qualify this answer in terms of structure or appearance (ie 'being similar') or their functions being similar, and around 67% of students successfully gained the mark. As the question was asked in general terms, answers which gave the roles of specific tissues were not credited.

01.2 67% of students knew the name of this tissue. Common answers that failed to gain the mark included other cells or tissues that might be found in roots, such as 'root hairs' and 'xylem'.

01.3 63% of students were able to name 'willow' as the plant from which aspirin originates. Many students qualified their answers with specific parts of the willow, such as 'bark' or 'leaves' or just added 'tree' These details were ignored as being beyond expected knowledge. Incorrect answers included 'foxgloves' and 'fungus' as students mixed up the original sources of traditional drugs. Those who appeared not to have revised this area of the specification could only come up with improbable guesses such as 'the aspirin tree'.

01.4 Just over half of students gave correct responses in this question, with the most common correct responses referring to not causing damage or harm to the plant, or the idea that berries are easier to access. A number of students suggested that the berries would be 'easier to extract', which fell between the ideas of the berries being easier to access and the chemical being easier to extract; this idea was considered to be just sufficient to gain the mark. Suggestions that berries would 'grow back' after picking were insufficient as this would also be true of leaves and to some extent, of roots.

4.2.3.1 Plant tissues

Answer 08 · Examiner comments

June 2023 | 8461/1H | Original Q1

01.5 The most problematic part of this calculation was the conversion of grams to milligrams. Many students made no attempt at the conversion, stopping at '1.44', gaining 2 marks or alternatively '0.72' or '2.4', either of which gained just the first mark.
Students who attempted a conversion, using factors such as 100, 10 or even 0.001, were able to gain the fourth mark, provided their answers matched this conversion factor.
Unlike for more complicated calculations, most students laid out their calculations in a way that made interpretation fairly straightforward. Only a small minority of students appeared to have no idea of how to go about the calculation.

01.6 Many students were able to quote from their revision, that a 'lack of magnesium' would cause chlorosis. Whether this was expressed as a small deficiency or the plant getting no magnesium was not critical in gaining the mark. Other students were likely to offer ideas such as a 'lack of chlorophyll' or a 'lack of sunlight'. Only 17% of students failed to give a correct response with some suggesting that chlorosis might have been 'caught' or passed on' from other plants, without reference to a pathogen or infection.

01.7 Students were generally well-versed in the need for drug tests or trials, and 82% of students gained full marks. The most common error was to offer both the idea of checking toxicity and checking for side effects, as these amount to the same thing so could only be credited once. For many students the technical term 'efficacy' was well used, although some offered the idea of 'checking for efficiency', for which a mark was not awarded.

01.8 Although there may be many possible subordinate reasons for the writing of a biased report, all of these come down to one party or another being affected financially. Thus, only this idea was credited and the various reasons for this, such as 'disagreeing with the ethics' of the company were ignored.

01.9 A pleasing 90% of students correctly identified the need to have the claims peer reviewed.