AQA GCSE Biology | 8461

SPECIFICATION POINT 4.2.3.2

Plant organ system

Mark schemes and examiner comments

Tier	**Higher**
Question groups	**15**
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.

4.2.3.2 Plant organ system

Answer 01 · Mark scheme March 2008 | BLY1BP | Original Q8 | Legacy

Eight	**2**	**3**	**3**	**4**

Answer 02 · 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** <u>only</u> 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 <u>no</u> 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**

4.2.3.2 Plant organ system

Answer 02 · Mark scheme

COMPONENT NUMBER: BLY3H

COMPONENT NAME: Biology

STATUS: Final

DATE: June 2008

4.2.3.2 Plant organ system

Answer 03 · Mark scheme

June 2009 | BLY3H | Original Q4 | Legacy

Question 4

question	answers	extra information	mark
4(a)	guard (cell)	ignore stoma / stomata	1
4(b)	<u>Species A :</u> • stomata open in dark / at night **or** close in light / in day • stomata closed during warm(est) period **or** open when cool(er) • heat (energy) / warmth increases evaporation / transpiration • reduces water loss / evaporation / transpiration	allow converse points for species B must give explicit link between heat and transpiration ignore photosynthesis	 1 1 1 1
Total			**5**

4.2.3.2 Plant organ system

Answer 03 · Mark scheme

June 2009 | BLY3H | Original Q4 | Legacy

BLY3H

4.2.3.2 Plant organ system

Answer 04 · Mark scheme

June 2011 | BLY2H | Original Q1 | Legacy

Question 1

question	answers	extra information	mark
1(a) E	because water enters (the cell / it / named cell)	do **not** accept salt / sugar / solution entering	1
	by osmosis / diffusion	if osmosis / diffusion not given accept concentration inside cell greater than outside cell assume concentration refers to solute concentration unless answer indicates otherwise allow water goes <u>up</u> the concentration gradient allow water goes <u>down its</u> concentration gradient do **not** accept if diffusion of salt / sugar	1
	through a partially permeable membrane	allow semi / selectively permeable membrane **or** description	1
1(b) E	(plant cells) have (cell) <u>wall</u>	accept animal cells have no (cell) <u>wall</u> ignore reference to cell membrane do **not** accept reference to other organelles **or** any implication that animal cells have a cell wall eg plant cells have a thicker cell wall	1
Total			**4**

4.2.3.2 Plant organ system

Answer 04 · Mark scheme

June 2011 | BLY2H | Original Q1 | Legacy

BLY2H

4.2.3.2 Plant organ system

Answer 05 · Mark scheme

June 2013 | BL2HP | Original Q1 | Legacy

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**

4.2.3.2 Plant organ system

Answer 06 · Mark scheme

June 2013 | BL3HP | Original Q4 | Legacy

Question 4

question	answers	extra information	mark
4(a)	solution in soil is more dilute (than in root cells)	concentration of water higher in the soil (than in root cells)	1
	so water moves from the dilute to the more concentrated region	so water moves down (its) concentration gradient **or** water moves from a high concentration of water to a lower concentration	1
	concentration of ions in soil less (than that in root cells)		1
	so energy needed to move ions **or** ions are moved against concentration gradient	the direction of the concentration gradient must be expressed clearly accept correct reference to water potential or to concentrations of water	1
4(b)	any **three** from: • movement of water from roots / root hairs (up stem) • via xylem • to the leaves • (water) evaporates • via stomata		3
4(c)(i)	0.67/0.7	accept 0.66, 0.6666666... or ⅔ or $0.\dot{6}$ correct answer gains **2** marks with or without working if answer incorrect allow evidence of $\frac{100}{150}$ for **1** mark do **not** accept 0.6 or 0.70	2

Question 4 continues on the next page . . .

Question 4 continued

question	Answers	extra information	mark
4(c)(ii)	during the first 30 minutes any **one** from: • it was warmer • it was windier • it was less humid • there was more water (vapour) in the leaves		1
	so there was more evaporation **or** stomata open during first 30 minutes **or** closed after 30 minutes (1) so faster (rate of) evaporation in first 30min **or** reducing (rate of) evaporation after 30min (1)	ignore 'water loss'	1
Total			**11**

4.2.3.2 Plant organ system

Answer 07 · 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	

4.2.3.2 Plant organ system

Answer 07 · Mark scheme

June 2014 | BL3HP | Original Q5 | Legacy

Question	Answers	Extra information	Mark	AO / spec ref.

4.2.3.2 Plant organ system

Answer 08 · Mark scheme

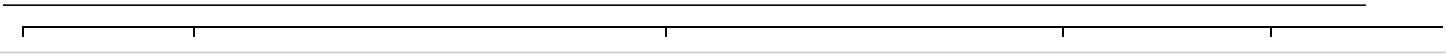
June 2016 | BL3HP | Original Q2 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.
2(a)	guard (cells)	allow phonetic spelling	1	AO1 3.1.3e
2(b)(i)	as carbon dioxide (concentration) increases, the (mean) number of stomata decreases (there is a) rapid drop initially	allow there is a negative correlation allow use of any number between 1.5 and 3.0 to indicate "initially"	1 1	AO2 3.1.3
2(b)(ii)	(there is) more carbon dioxide so plant doesn't need as many stomata (to obtain the amount needed) **or** (there is) less carbon dioxide so the plant needs more stomata (to obtain enough)		1	AO3 3.1.3c
2(c)(i)	may lose too much water	allow plant may wilt ignore references to oxygen / carbon dioxide plants lose a lot of water is insufficient ignore flaccid	1	AO3 3.1.3d
2(c)(ii)	any **one** from: • hot • dry • windy	ignore environments unqualified eg desert	1	AO3 3.1.3d
Total			6	

4.2.3.2 Plant organ system

Answer 08 · Mark scheme

June 2016 | BL3HP | Original Q2 | Legacy



4.2.3.2 Plant organ system

Answer 09 · Mark scheme

June 2016 | BL3HP | Original Q3 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.
3			6	AO1 3.1.1a/b/g 3.1.1a/d 3.2.3a

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.

0 marks	Level 1 (1–2 marks)	Level 2 (3–4 marks)	Level 3 (5–6 marks)
No relevant points are made	At least **one** process (P) for obtaining a material is given **or** at least **one** vessel (V) and the material it carries is given **or** there is a description of the direction of movement (M) for at least **one** material	At least **one** process for obtaining a specified material is given **and** is correctly linked to the vessel that the material is transported in **or** correctly linked to a description of the direction of movement of the material	Processes used for obtaining specified materials are given. **and** correctly linked to the vessels that the materials are transported in **or** correctly linked to a description of the direction of movement of the materials. **For full credit,** in addition to the above descriptors at least **one** of the processes must be linked to the vessel that the material is transported in **and** the direction of the movement of the material.

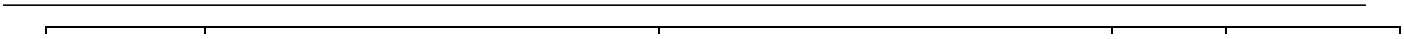
examples of points made in the response Ions:	extra information
(P) taken up by diffusion or active transport • from an area of high to low concentration (diffusion) **or** an area of low to high concentration (active transport) (V) travels in the xylem (M) to the leaves **or** from the roots / soil	
Water: (P) taken up by osmosis • from an area of low to high concentration (V) travels in the xylem (M) to the leaves **or** from the roots / soil (P) transpiration stream • movement replaces water as it evaporates from leaves (V) in the xylem	allow high concentration of water to low concentration of water allow from high water potential to low water potential ignore along a concentration gradient
Sugar: (P) made during photosynthesis (V) travels in the phloem (M) to other parts of the plant **or** to storage organs **or** travels up and down	

Total		6

4.2.3.2 Plant organ system

Answer 09 · Mark scheme

June 2016 | BL3HP | Original Q3 | Legacy



4.2.3.2 Plant organ system

Answer 10 · Mark scheme

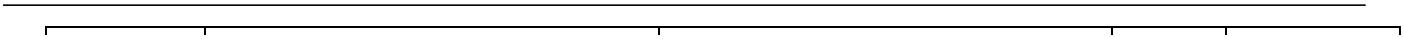
June 2017 | BL3HP | Original Q5 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.
5(a)	xylem transports mineral (ions) phloem transports sugars	allow xylem transports water allow phloem transports sucrose / glucose / carbohydrate ignore minerals / ions transported in phloem if no other marks given allow one mark for xylem and phloem	1 1	AO1 3.2.3a
5(b)(i)	lost the most water **or** lost water faster than the others (it) has the greatest number of stomata (per mm^2) (and) water is lost through the stomata	allow mass decreased the most	1 1 1	AO3 3.1.3d
5(b)(ii)	(transpiration rate would be) lower (because) slow(er) evaporation / diffusion (into the air) **or** (because) concentration gradient will be less (due to) high(er) humidity	at least one comparative must be given allow 'lower rate of evaporation' for these 2 marks allow air becomes saturated	1 1 1	AO2/3 3.1.3d
Total			**8**	

4.2.3.2 Plant organ system

Answer 10 · Mark scheme

June 2017 | BL3HP | Original Q5 | Legacy



4.2.3.2 Plant organ system

Answer 11 · Mark scheme

June 2019 | 8461/1H | Original Q4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.1	(by the guard cells) opening **and** closing the stomata	ignore ref to guard cells being plasmolysed / turgid	1	4.2.3.2 AO1
04.2	(water is) transported in xylem	ignore mechanism of water entering the roots do **not** accept translocation	1	4.2.3.2 AO1
	water evaporates (from leaves)	allow loss of water vapour	1	
	through the stomata	allow between the guard cells if no other marks awarded allow **1** mark for reference to transpiration	1	
04.3	any **one** from: • plant **A** has more stomata • plant **A** has more leaves • plant **A** has bigger leaves • plant **A** has a greater total surface area of leaves	allow converse for plant **B** allow (the plants) have different numbers of stomata allow (the plants) have different numbers of leaves allow (the plants) have different sized leaves allow (the plants) have different total surface area of leaves allow plant **A** has less (waxy) cuticle **or** (the plants) have different amounts of (waxy) cuticle allow plant **A** has fewer hairs on leaves **or** (the plants) have different number of hairs on the leaves	1	4.2.3.2 AO2

4.2.3.2 Plant organ system

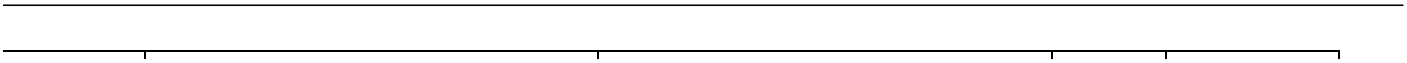
Answer 11 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.4		an answer of 10 scores **3** marks		4.2.3.2 AO2
	5.2	allow in range 4.8 to 5.6	1	
	(5.2 × 2 =) 10.4 **or** $\left(\frac{5.2}{0.5} =\right) 10.4$	allow their calculated value in the range 8.8 to 12.0	1	
	10 (cm^3/hour)	allow their calculated value in the range 8.8 to 12.0 correct to 2 significant figures	1	
04.5	(rate increased because) any **two** from: • (it was) warmer • light intensity was higher • (it was) less humid • (it was) windier	answers must be comparative allow greater water vapour gradient between leaves and environment	2	4.2.3.2 AO3
Total			**10**	

4.2.3.2 Plant organ system

Answer 11 · Mark scheme

June 2019 | 8461/1H | Original Q4



Answer 12 · Mark scheme

November 2020 | 8461/1H | Original Q2

The full source mark scheme begins on page 31. Follow original question 2 in that document.

4.2.3.2 Plant organ system

Answer 13 · 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

4.2.3.2 Plant organ system

Answer 13 · Mark scheme

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.		

4.2.3.2 Plant organ system

Answer 13 · 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**	

4.2.3.2 Plant organ system

Answer 13 · Mark scheme

November 2021 | 8461/1H | Original Q6

Question	Answers	Extra information	Mark	AO / Spec. Ref.

4.2.3.2 Plant organ system

Answer 14 · Mark scheme

June 2022 | 8461/1H | Original Q5

Question 5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.1	guard (cells)		1	AO1 4.2.3.2 4.2.3.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.2	any **two** from: • transpiration (stream) involves xylem **and** translocation involves phloem • transpiration (stream) transports water (and minerals / ions) **and** translocation transports (dissolved) sugars • transpiration (stream) moves substances upwards **and** translocation moves substances upwards and downwards	allow transpiration (stream) involves dead cells **and** translocation involves living cells allow transpiration (stream) transports water (and minerals / ions) **and** translocation transports (dissolved) sucrose ignore glucose / ions / minerals in translocation allow transpiration (stream) moves substances unidirectionally **and** translocation moves substances bidirectionally allow transpiration (stream) does not require energy (to move substances) **and** translocation does (require energy to move substances)	2	AO1 4.2.3.1 4.2.3.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.3	warm with low humidity		1	AO1 4.2.3.2

4.2.3.2 Plant organ system

Answer 14 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.4		ignore values for time and width		
	stomata (almost) closed at (mid)night because there is no / less light for photosynthesis	ignore dark for no / less light	1	AO3 4.2.3.2 4.4.1.1 4.4.1.2
	(closing stomata) reduces / prevents water loss		1	
	stomata open wide(st) at midday as maximum light intensity for photosynthesis	allow stomata open wider as light intensity increases throughout the morning for photosynthesis	1	
	(stomata open wide) to take in most / more carbon dioxide for photosynthesis	ignore (stomata open) to take in carbon dioxide unqualified	1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.5		allow descriptions of the area of open stomata for width		
	stomata are open wider **and** for more time		1	AO3 4.2.3.2 4.4.1.1 4.4.1.2
	(so allows plant) to take in more carbon dioxide for photosynthesis	allow (so allows) plant to take in as much carbon dioxide as in normal conditions for photosynthesis	1	

Total Question 5		10

4.2.3.2 Plant organ system

Answer 15 · 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

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

4.2.3.2 Plant organ system

Answer 15 · 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

AQA

GCSE
BIOLOGY
8461/1H

Paper 1 Higher Tier

Mark scheme

June 2020

Version: 1.0 Final

206G8461 1H/MS

4.2.3.2 Plant organ system

MARK SCHEME – GCSE BIOLOGY – 8461/1H – JUNE 2020

Mark schemes are prepared by the Lead Assessment Writer and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation events which all associates participate in and is the scheme which was used by them in this examination. The standardisation process ensures that the mark scheme covers the students' responses to questions and that every associate understands and applies it in the same correct way. As preparation for standardisation each associate analyses a number of students' scripts. Alternative answers not already covered by the mark scheme are discussed and legislated for. If, after the standardisation process, associates encounter unusual answers which have not been raised they are required to refer these to the Lead Examiner.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of students' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

Further copies of this mark scheme are available from aqa.org.uk

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MARK SCHEME – GCSE BIOLOGY – 8461/1H – JUNE 2020

Information to Examiners

1. General

The mark scheme for each question shows:

- the marks available for each part of the question
- the total marks available for the question
- the typical answer or answers which are expected
- extra information to help the Examiner make his or her judgement
- the Assessment Objectives, level of demand and specification content that each question is intended to cover.

The extra information is aligned to the appropriate answer in the left-hand part of the mark scheme and should only be applied to that item in the mark scheme.

At the beginning of a part of a question a reminder may be given, for example: where consequential marking needs to be considered in a calculation; or the answer may be on the diagram or at a different place on the script.

In general the right-hand side of the mark scheme is there to provide those extra details which confuse the main part of the mark scheme yet may be helpful in ensuring that marking is straightforward and consistent.

2. Emboldening and underlining

2.1 In a list of acceptable answers where more than one mark is available 'any **two** from' is used, with the number of marks emboldened. Each of the following bullet points is a potential mark.

2.2 A bold **and** is used to indicate that both parts of the answer are required to award the mark.

2.3 Alternative answers acceptable for a mark are indicated by the use of **or**. Different terms in the mark scheme are shown by a / ; eg allow smooth / free movement.

2.4 Any wording that is underlined is essential for the marking point to be awarded.

3. Marking points

3.1 Marking of lists

This applies to questions requiring a set number of responses, but for which students have provided extra responses. The general principle to be followed in such a situation is that 'right + wrong = wrong'.

Each error / contradiction negates each correct response. So, if the number of error / contradictions equals or exceeds the number of marks available for the question, no marks can be awarded.

However, responses considered to be neutral (indicated as * in example 1) are not penalised.

Example 1: What is the pH of an acidic solution?

[1 mark]

Student	Response	Marks awarded
1	green, 5	0
2	red*, 5	1
3	red*, 8	0

Example 2: Name two planets in the solar system.

[2 marks]

Student	Response	Marks awarded
1	Neptune, Mars, Moon	1
2	Neptune, Sun, Mars, Moon	0

3.2 Use of chemical symbols / formulae

If a student writes a chemical symbol / formula instead of a required chemical name, full credit can be given if the symbol / formula is correct and if, in the context of the question, such action is appropriate.

3.3 Marking procedure for calculations

Marks should be awarded for each stage of the calculation completed correctly, as students are instructed to show their working. Full marks can, however, be given for a correct numerical answer, without any working shown.

3.4 Interpretation of 'it'

Answers using the word 'it' should be given credit only if it is clear that the 'it' refers to the correct subject.

3.5 Errors carried forward

Any error in the answers to a structured question should be penalised once only.

Papers should be constructed in such a way that the number of times errors can be carried forward is kept to a minimum. Allowances for errors carried forward are most likely to be restricted to calculation questions and should be shown by the abbreviation ecf in the marking scheme.

3.6 Phonetic spelling

The phonetic spelling of correct scientific terminology should be credited **unless** there is a possible confusion with another technical term.

3.7 Brackets

(…..) are used to indicate information which is not essential for the mark to be awarded but is included to help the examiner identify the sense of the answer required.

3.8 Allow

In the mark scheme additional information, 'allow' is used to indicate creditworthy alternative answers.

3.9 Ignore

Ignore is used when the information given is irrelevant to the question or not enough to gain the marking point. Any further correct amplification could gain the marking point.

3.10 Do <u>not</u> accept

Do **not** accept means that this is a wrong answer which, even if the correct answer is given as well, will still mean that the mark is not awarded.

4. Level of response marking instructions

Extended response questions are marked on level of response mark schemes.

- Level of response mark schemes are broken down into levels, each of which has a descriptor.
- The descriptor for the level shows the average performance for the level.
- There are two marks in each level.

Before you apply the mark scheme to a student's answer, read through the answer and annotate it (as instructed) to show the qualities that are being looked for. You can then apply the mark scheme.

4.2.3.2 Plant organ system

Step 1: Determine a level

Start at the lowest level of the mark scheme and use it as a ladder to see whether the answer meets the descriptor for that level. The descriptor for the level indicates the different qualities that might be seen in the student's answer for that level. If it meets the lowest level then go to the next one and decide if it meets this level, and so on, until you have a match between the level descriptor and the answer.

When assigning a level you should look at the overall quality of the answer. Do **not** look to penalise small and specific parts of the answer where the student has not performed quite as well as the rest. If the answer covers different aspects of different levels of the mark scheme you should use a best fit approach for defining the level.

Use the variability of the response to help decide the mark within the level, ie if the response is predominantly level 2 with a small amount of level 3 material it would be placed in level 2 but be awarded a mark near the top of the level because of the level 3 content.

Step 2: Determine a mark

Once you have assigned a level you need to decide on the mark. The descriptors on how to allocate marks can help with this.

The exemplar materials used during standardisation will help. There will be an answer in the standardising materials which will correspond with each level of the mark scheme. This answer will have been awarded a mark by the Lead Examiner. You can compare the student's answer with the example to determine if it is the same standard, better or worse than the example. You can then use this to allocate a mark for the answer based on the Lead Examiner's mark on the example.

You may well need to read back through the answer as you apply the mark scheme to clarify points and assure yourself that the level and the mark are appropriate.

Indicative content in the mark scheme is provided as a guide for examiners. It is not intended to be exhaustive and you must credit other valid points. Students do **not** have to cover all of the points mentioned in the indicative content to reach the highest level of the mark scheme.

You should ignore any irrelevant points made. However, full marks can be awarded only if there are no incorrect statements that contradict a correct response.

An answer which contains nothing of relevance to the question must be awarded no marks.

4.2.3.2 Plant organ system

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.1	*before arrow* carbon dioxide **and** water *after arrow* glucose	allow correct chemical symbols ignore any attempt at balancing equation ignore light / chlorophyll either order ignore sugar / carbohydrate do **not** accept starch	 1 1	AO1 4.4.1.1
01.2	<u>light</u> (light) is captured / trapped / absorbed by chlorophyll / chloroplasts	ignore description of subsequent parts of the photosynthesis reaction allow sun<u>light</u> ignore sun allow (light) is used by chlorophyll / chloroplasts	1 1	AO1 4.1.1.2 4.4.1.1
01.3	$\frac{18.5 + 19.3 + 19.5}{3}$ **or** $\frac{57.3}{3}$ 19.1 (cm^3/hour)	 allow an answer correctly calculated using only two correct values	1 1	AO2 4.4.1.2 RPA 6
01.4	a ring around 14.2	allow clear indication of correct result	1	AO3 4.4.1.2 RPA 6

4.2.3.2 Plant organ system

01.5	any **one** from: • scale / value was misread • there was air / oxygen in the syringe / measuring cylinder / apparatus • the lamp / light was moved • temperature changed • had different mass / length of pondweed • pondweed had not acclimatised	ignore human error ignore references to counting bubbles or time allow measurement error allow light intensity changed ignore different bulb / lamp unqualified	1	AO3 4.4.1.2 RPA 6
01.6	did not use it in calculation (of mean)		1	AO3 4.4.1.2 RPA 6
01.7	any **one** from: • light (intensity) • carbon dioxide (concentration) • pondweed size / amount • pondweed species	do **not** accept temperature ignore time allow distance / power / colour of lamp / light allow same (piece of) pondweed	1	AO3 4.4.1.2 RPA 6
01.8	enzyme(s) lose the shape of the active site	allow enzyme(s) (start to) denature allow enzyme(s) destroyed / damaged do **not** accept enzyme(s) killed	1	AO2 4.2.2.1

4.2.3.2 Plant organ system

01.9	y-axis labelled '(rate of) photosynthesis in cm^3/hour'		1	AO2 4.4.1.2 RPA 6
	suitable scale on y-axis	must take up half or more of grid provided	1	
	all points plotted to within ± ½ small square	allow 3 or 4 correct plots for **1** mark ignore any attempt to plot a point at 20 °C	2	
	correct curved line of best fit	ignore line joined point to point with straight lines ignore extrapolation	1	
Total			**16**	

4.2.3.2 Plant organ system

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.1	movement / spreading out of molecules / particles	allow movement / spreading out of (named) substances / chemicals / gases / liquids ignore reference to membranes / cells	1	AO1 4.1.3.1
	from (an area of) high(er) concentration to (an area of) low(er) concentration	allow down / with the concentration gradient ignore along / across the concentration gradient do **not** accept movement from / to a concentration gradient	1	
02.2	increased carbon dioxide concentration in the air		1	AO2 4.1.3.1 4.2.3.2
	increased number of stomata that are open		1	

4.2.3.2 Plant organ system

02.3	**Level 3:** Relevant points (reasons/causes) are identified, given in detail and logically linked to form a clear account.	5–6	AO1 4.1.3.1 4.2.2.2 4.2.2.3
	Level 2: Relevant points (reasons/causes) are identified, and there are attempts at logical linking. The resulting account is not fully clear.	3–4	
	Level 1: Points are identified and stated simply, but their relevance is not clear and there is no attempt at logical linking.	1–2	
	No relevant content	0	

	Indicative content
	• (many) alveoli
	  • provide a large(r) surface area (**:** volume)
	
	• capillaries are thin
	  or alveoli / capillary walls are thin **or** one cell thick
	  or capillaries are close to the alveoli
	  • which provides short diffusion path (for oxygen / carbon dioxide)
	
	• breathing (mechanism) moves air in and out
	or lungs are ventilated
	  • to bring in (fresh) oxygen
	  • to remove carbon dioxide
	  • to maintain a concentration / diffusion gradient
	
	• large capillary network (around alveoli)
	or good blood supply
	  • to remove oxygen(ated blood) quickly
	  • to bring carbon dioxide to the lungs quickly
	  • to maintain a concentration / diffusion gradient		

4.2.3.2 Plant organ system

02.4	osmosis	allow diffusion	1	AO1 4.1.3.1 4.2.3.2 4.1.3.2
02.5	active transport (because) energy is needed (to move nitrate ions) from a low(er) concentration (in the soil) to a high(er) concentration (in the root / cell)	 allow (to move nitrate ions) against / up the concentration gradient allow (because) there is a lower concentration (of nitrate ions) in the soil **or** (because) there is a higher concentration (of nitrate ions) in the root / cell ignore reference to amount / number of nitrate ions ignore along / across the concentration gradient do **not** accept if reference to molecules / atoms moving	1 1 1	AO3 AO2 AO2 4.1.1.3 4.2.3.2 4.1.3.3
Total			**14**	

4.2.3.2 Plant organ system

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.1	any **two** from: (both have) • cytoplasm • (cell) membrane • DNA / genetic material • ribosomes	ignore reference to shape allow RNA ignore genetic information if no other mark awarded allow sub-cellular structures for **1** mark if no other mark awarded allow correct cellular process, e.g. respiration for **1** mark	2	AO2 4.1.1.1 4.1.1.2 4.1.2.1
03.2	any **three** from: • prokaryotic cell is smaller • prokaryotic cell has no mitochondria • prokaryotic cell has no nucleus **or** DNA is free in the cytoplasm **or** genetic material is free in the cytoplasm • prokaryotic cell has a single loop of DNA **or** prokaryotic cell has a single loop of genetic material • prokaryotic cell has plasmids	allow converse for eukaryotic cells allow reference to bacterium instead of prokaryotic cell ignore reference to features not shown in Figure **5** if neither mark awarded, allow prokaryotic cell has no membrane-bound organelles ignore genetic information ignore genetic information ignore circular / rings of DNA allow prokaryotic cells have smaller ribosomes	3	AO2 4.1.1.1 4.1.1.2 4.1.2.1

4.2.3.2 Plant organ system

03.3	1 µm = 0.001 mm **or** 1 mm = 1000 µm **or** 0.05 mm = 50 µm **or** 0.05 × 1000 (1:) 50	 do **not** accept if a unit is given	1 1	AO2 4.1.1.1 4.1.1.2
03.4	mitosis	correct spelling only	1	AO1 4.1.2.2
03.5	35%		1	AO2 4.1.2.2
03.6	 (stage 1) DNA / chromosomes replicate / duplicate mitochondria / ribosomes / sub-cellular structures increase in number **or** mitochondria / ribosomes / sub-cellular structures replicate (stage 2) one set of chromosomes is pulled / moved to each end of the cell (stage 3) the cytoplasm **and** cell membrane divides (to form two cells)	ignore names of the stages of the cell cycle ignore genetic material ignore DNA / chromosomes double / reproduce allow cytoplasm increases ignore cell grows unqualified allow one of each chromosome is pulled / moved to each end of the cell ignore nucleus divides allow cytoplasm divides **and** (new) cell membranes form ignore nucleus divides	 1 1 1 1	AO1 4.1.2.2
Total			**13**	

4.2.3.2 Plant organ system

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.1	fatty acids		1	AO1 4.2.2.1
	glycerol		1	4.4.2.3
04.2	enzyme binds to the substrate because they are complementary (shapes)	allow enzyme joins to the substrate because they fit together exactly allow enzyme joins to the substrate because the substrate fits the active site ignore reference to specificity do **not** accept same shape	1	AO2 4.2.2.1
	(so) substrate is broken down (into products)	allow (so) substrate splits (into products) ignore products are formed, unqualified	1	
	(so) products are released **or** enzyme is not changed	allow enzyme is not used up allow reference to activation energy for either marking point 2 **or** marking point 3	1	
04.3	each <u>active site</u> has a specific shape (so only fits one type of lipid molecule)	allow each <u>active site</u> is a different shape do **not** accept reference to the substrate having an active site	1	AO2 4.2.2.1
04.4	add Benedict's (solution / reagent to the liquid)		1	AO1 4.2.2.1 RPA 4
	boil / heat	allow any temperature of 65 °C or above	1	
	(if glucose is present the blue) colour changes to yellow / green / orange / brown / (brick)red		1	

04.5	add iodine solution / reagent (to the liquid) (if starch is present) it changes colour to blue / black (from yellow / orange / brown)	allow add a drop of iodine ignore iodine unqualified	1 1	AO1 4.2.2.1 RPA 4
04.6	glucose from photosynthesis (excess) glucose converted to starch	do **not** accept starch made in photosynthesis allow (excess) glucose is stored as starch	1 1	AO2 4.2.2.1 4.4.1.1 4.4.1.3 4.4.2.3
04.7	starch (stores) have been converted to glucose (so the glucose can be) used for respiration / (named) metabolic reactions **or** (so the glucose can be) used to release energy (because) there is no light to make (new / more) glucose by photosynthesis	ignore reference to residual glucose from previous photosynthesis do **not** accept idea of energy being produced / created / made	1 1 1	AO3 4.4.1.1 4.4.2.1 4.4.1.3
04.8	any **one** from: • test roots / stems of plants (in the light and dark) • test other species of plant • measure the concentrations of glucose **and** starch • vary the time in the dark / light • test variegated leaves	do **not** accept reference to changing the independent variable allow test other parts of the plants allow test other types of plant ignore mass / amount allow any other valid extension ignore repeats	1	AO3 4.4.1.2 4.4.1.3
Total			**17**	

4.2.3.2 Plant organ system

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.1	mechanical	allow physical allow structural	1	AO3 4.3.3.2
05.2	any **one** from: • to deter herbivores • to prevent animals damaging it	ignore to injure animals, unqualified allow to deter animals eating it do **not** accept to deter predators	1	AO2 4.3.3.2
05.3	chemical		1	AO3 4.3.3.2

05.4	any **two** from : • lack of magnesium (ions) (1) (so) not enough chlorophyll for (efficient) photosynthesis (1) (so) not enough glucose to make proteins for growth **or** not enough glucose to release energy for growth (1) • infection by pathogen / bacteria / virus / fungus (1) (so) leaves become discoloured / yellow so less photosynthesis (1) (so) not enough glucose to make proteins for growth **or** not enough glucose to release energy for growth (1) • infected by aphids (1) (which) remove sugars from phloem (1) (so) not enough glucose to make proteins for growth **or** not enough glucose to release energy for growth (1) • lack of (available) light (1) (so) chlorophyll breaks down (1) (so) not enough glucose to make proteins for growth **or** not enough glucose to release energy for growth (1)	allow (so) lack of chlorophyll produced causes yellow leaves (1), (so) not enough photosynthesis to produce glucose which is used to make proteins for growth (1) allow correctly named pathogen allow has rose black spot / TMV allow other symptoms of named pathogens / disease award once only award once only award once only	5	AO2 4.3.3.1 4.3.1.1 4.3.1.2 4.3.1.4 4.4.1.1 4.4.1.2 AO1 4.4.2.3 4.4.1.3

4.2.3.2 Plant organ system

05.5	(bacteria) obtain glucose / sugar (from the plant) (glucose used) for respiration **or** (glucose used) for making other named substances	 allow (glucose used) to release energy	1 1	AO3 AO2 4.2.3.2 4.4.1.3
05.6	(gorse plant) obtains nitrate (ions) needed for amino acids / proteins	 allow needed to make chlorophyll / DNA	1 1	AO2 4.1.3.3 4.4.2.3 AO1 4.3.3.1
05.7	willow bark		1	AO2 4.3.1.9
Total			**13**	

4.2.3.2 Plant organ system

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.1	any **two** from: • BMI / morphology / obesity level • smoking habits • diet • medication • family history of liver disease • fitness levels • ethnicity • area of UK they live in	ignore genetic factors allow mass / weight **and** height allow previous drinking habits allow medical conditions allow drug use allow level of exercise allow race	2	AO3 4.2.2.6
06.2	2.55 – 1.60 (= 0.95) $\left(\frac{0.95}{2.55} \times 100 = \right)$ 37 (.2549019608…) (%)	allow 1.60 – 2.55 (= –0.95) allow value for with meals in range 1.60 to 1.65 (for 1.60) allow answer correctly calculated from values in ranges 1.60 to 1.65 and 2.50 to 2.60 allow – 37(.2549019608...)(%)	1 1	AO2 4.2.2.6
06.3	12 × 2 × 7 = 168 (g/week) 1.8	 allow in range 1.8-1.9 allow correct reading from a calculation that omits the 2 **or** the 7 do **not** accept if a unit is given	1 1	AO2 4.2.2.6

4.2.3.2 Plant organ system

06.4	any **two** from: • consuming alcohol increases the RR (with / without meals) **and** supporting data • consuming less than 50 g/week of alcohol with meals does not increase the RR • even (small amounts of alcohol at) 25 g/week increases the RR if not with meals	allow risk for RR throughout allow data in terms of number of glasses of wine allow increasing alcohol consumption increases the RR at an increasing rate allow any value between 35 and 60 g/week	2	AO3 4.2.2.6
06.5	any **two** from: • large number in survey • long term / 15 year survey • well controlled	allow 800 000 in survey if neither mark awarded allow large study allow many controls	2	AO3 4.2.2.6
06.6	any **one** from: • people underestimate / overestimate alcohol consumption • people may change (lifestyle / drinking) habits over time • some people may drink all their weekly alcohol at once	allow people lie about alcohol consumption **or** people lie about other named control variables ignore survey only tested women	1	AO3 4.2.2.6

06.7	**Level 2:** Scientifically relevant facts, events or processes are identified and given in detail to form an accurate account.	3-4	AO2 4.4.2.3 4.2.2.1
	Level 1: Facts, events or processes are identified and simply stated but their relevance is not clear.	1-2	AO1 4.4.2.2 4.2.2.6 4.2.2.5 4.5.3.3
	No relevant content	0	
	Indicative content Responses may refer to either total or partial liver failure • no bile made (in the liver) ○ fats / lipids are not emulsified ○ surface area of fats / lipids not increased ○ pH of small intestine will not be alkaline / neutralised ○ enzymes (in small intestine) will not work effectively **or** (named) food not digested / absorbed ○ so may lose weight • lactic acid not broken down / oxidised ○ accumulation of lactic acid in blood / body ○ lactic acid is toxic **or** body will be poisoned ○ oxygen debt higher / prolonged ○ so muscle pain / fatigue • proteins / amino acids will not be broken down (in liver) ○ (amino acids) not deaminated ○ amino acids not made into urea **or** will not form ammonia ○ (however) any ammonia formed is toxic ○ so accumulation of amino acids in blood / body • liver does not break down / remove other toxins (like alcohol) ○ toxins accumulate in blood / body ○ body will be poisoned ○ so pain **or** jaundice **or** swollen liver **or** portal hypertension occurs • glycogen stores will not be formed ○ cannot control blood glucose ○ so hyperglycaemia / hypoglycaemia / diabetes / coma may occur		

Total			**15**

4.2.3.2 Plant organ system

Question	Answers	Extra information	Mark	AO / Spec.Ref.
07.1		ignore add mAbs and dye to slide (unbound)		AO2 4.3.2.2
	bind fluorescent dye to mAbs		1	
	put (bound) fluorescent mAbs on the slide (and rinse off)		1	
	mAbs will bind to Candida albicans / pathogens and show up under the microscope	allow mAbs will bind to Candida albicans / pathogens and show up under UV (lamp)	1	
07.2	more Candida albicans / pathogens will be engulfed / killed by phagocytes / white blood cells	allow Candida albicans / pathogens will be engulfed / killed by phagocytes / white blood cells more quickly do **not** accept white blood cells produce antibodies do **not** accept lymphocytes engulf Candida albicans	1	AO2 4.2.2.3 4.3.1.6 4.3.1.7
	therefore less damage to cells / tissues / organs	ignore less toxin released (by Candida albicans)	1	

07.3	**Level 2:** Scientifically relevant facts, events or processes are identified and given in detail to form an accurate account.		4-6	AO1 4.3.1.9
	Level 1: Facts, events or processes are identified and simply stated but their relevance is not clear.		1-3	
	No relevant content		0	
	Indicative content • given first to healthy volunteers ○ at (very) low dose ○ to test it is safe **or** to test for toxicity **or** to check for any side effects • then to some patients (with the disease) **or** people with the disease ○ to test for the correct / optimum dose ○ to check for any side effects ○ to test for efficacy **or** to test if it works ○ in a double blind trial ○ where neither patients nor doctors know who has the mAbs and who has a placebo (or alternative treatment) • reference to large trial **or** long duration **or** control variables			
07.4	any **one** from: • (the body will) not reject the mAbs **or** (the body is) less likely to reject the mAbs • mouse mAbs are (more likely to be) rejected • the human lymphocytes have already responded to that infection / cancer cell so they are known to work against the disease	do **not** accept idea of rejection of cells	1	AO3 4.3.2.2 4.3.2.1 4.3.1.6
Total			**12**	

4.2.3.2 Plant organ system

Answer 12 · Examiner comments November 2020 | 8461/1H | Original Q2

Question 2 (standard demand)

The use of the term concentration gradient was confused by many students throughout this question. Movement 'along/across' a concentration gradient gives no clear indication of direction and requires further qualification; movement to/from a high/low concentration 'gradient' is incorrect. Some students described cells moving, instead of ions or particles.

Students should take care when reading the command word for each question. **02.3** asked for explanation(s), and without this, level 2 and level 3 could not be accessed. Many students referred incorrectly to the cell walls of the alveoli or capillaries being thin, and several didn't to refer to walls; the alveoli being thin was not creditworthy. Some students stated that the alveoli contained villi. It is important to note that the alveoli having 'moist linings' is not a creditworthy answer to a question about adaptations for gas exchange. The gas exchange surfaces are moist **due** to diffusion, and therefore, a moist surface is a feature of the lungs but not a feature that maximises the diffusion of gases.

Answer 13 · 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.

Answer 14 · Examiner comments

June 2022 | 8461/1H | Original Q5

Question 5 (Standard, standard/high and high demand)

05.1 Over 90% of students were able to correctly identify the guard cells as controlling the opening and closing of the stomata.

05.2 Over 40% of students failed to gain a mark on this question, mostly due to a lack of comparative detail. The question asked for differences between the transpiration stream and translocation, however, many students just described one or the other, which was not creditworthy. A number of students failed to achieve bullet point 2 by being unsure about which molecules were transported by the phloem. A large proportion of pupils stated that glucose and mineral ions were transported, which was ignored, unless a correct reference to sugars or sucrose was given.

05.3 65% of students answered this question correctly, with the most common incorrect answer being ‘warm with high humidity’. Humidity remains a concept that many students struggle to understand.

05.4 Nearly half of all students scored no marks on this question, mainly due to a failure to acknowledge the command word ‘explain’. A number of students described the data from the figure but did not go on to explain how the changes described were an advantage to the plant. Some students missed out on MP1 by describing a lack of light as just ‘dark’ and some failed to go on to say that a lack of light meant less photosynthesis. The most commonly achieved mark point was MP2, knowing that stomata close to prevent water loss. Very few students were able to articulate that the stomata are open widest at midday because that’s when light intensity is highest, with many giving vague sentences such as ‘there is more light at midday’ which were not detailed enough. Very few students made the explicit link between opening the stomata to let in carbon dioxide and the fact that carbon dioxide is needed for photosynthesis.

05.5 Again, nearly half of all students scored no marks on this question. Whilst some acknowledged that the stomata open wider in low atmospheric carbon dioxide, very few managed to recognise that the stomata were also open for a longer period of time; both of these ideas were needed for mark point 1. Of the marks achieved, the most common was mark point 2, as those students who had the idea of wider stomata for MP1 often went on to correctly state that more carbon dioxide could enter for photosynthesis.

4.2.3.2 Plant organ system

Answer 15 · 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.

4.2.3.2 Plant organ system

Answer 15 · 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.