AQA GCSE Biology | 8461

SPECIFICATION POINT 4.5.4.1

Control and coordination

Mark schemes and examiner comments

Tier	**Higher**
Question groups	**11**
Available paper years	**2007–2025**

Using this booklet

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

Name: _____ **Date:** _____

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

4.5.4.1 Control and coordination

Answer 01 · Mark scheme

June 2007 | BLY1H | Original Q5 | Legacy

The full source mark scheme begins on page 26. Follow original question 5 in that document.

4.5.4.1 Control and coordination

Answer 02 · Mark scheme

June 2008 | BLY2H | Original Q6 | Legacy

question	answers	extra information	mark
6(a)	any **three** from: • ((mean) mass) increases up to 7 / 8 units (of light) then levels off • light limiting factor up to 7 / 8 units • for photosynthesis • other factor / temperature limiting above 7 / 8 units	must be in correct context	3
6(b)	any **two** from: • cost of providing conditions / heat / light / CO_2 • effect of treatment on profit • relevant use of data from graph eg limiting factors • named other factors eg fertiliser / pest control / weeds / density of planting	allow too much of factor is wasteful allow taste / appearance	2
6(c)	**nitrate function** produce amino acids / proteins / enzymes **nitrate deficiency** stunted growth **magnesium function** produce chlorophyll **magnesium deficiency** yellow leaves / plant	ignore DNA do **not** allow chlorophyll allow description ignore plant dies ignore chloroplasts ignore plant dies	1 1 1 1
Total			**9**

4.5.4.1 Control and coordination

Answer 03 · Mark scheme

June 2013 | BL1HP | Original Q5 | Legacy

Question 5

question	answers	extra information	mark
5(a)	auxin	accept other named plant hormones	1
5(b)(i)	any **three** from: • no (fusion of) gametes / fertilisation • only one parent • no mixing of genetic material • no genetic variation **or** genetically identical offspring	 allow no meiosis **or** new cells only produced by mitosis allow not two parents allow clones	3
5(b)(ii)	more / many offspring / plants (produced from one parent plant)	allow less damage to parent plant ignore speed / cost	1
Total			**5**

4.5.4.1 Control and coordination

Answer 04 · Mark scheme June 2015 | BL1HP | Original Q3 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.
3(a)(i)	any **one** from: • (same) (type of) weed killer • (same) volume / 5dm^3 of solution used (on each area) • effect on daisies (not other weeds / plants) • (same) area / 10m^2 • (same) time **or** (effect after) two weeks	ignore references to same lawn / weather / soil, which are not given in the question. allow amount of solution used do **not** allow amount / volume / concentration of weed killer do **not** allow number of daisy plants	1	AO2 1.2.3d
3(a)(ii)	more (daisies) growing after use of weed killer **or** after two weeks	allow it does not fit pattern (of other results)	1	AO3 1.2.3d
3(a)(iii)	any **one** from: • as a control • to compare (to the other areas) • to check other factor(s) are not affecting the results / daisies	ignore to see if it / water has an effect do **not** allow as a control variable	1	AO2 1.2.3d
3(a)(iv)	80 (arbitrary units of weed killer) also killed all the daisies	allow ref to possible experimental design flaws such as 'only tested once' or 'not repeated' or 'different number of daisies in each area at first' allow idea that other weed species may not respond in the same way as daisies allow idea that 100 (units) may also kill wanted species / grass	1	AO3 1.2.3d

4.5.4.1 Control and coordination

Answer 04 · Mark scheme

June 2015 | BL1HP | Original Q3 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref
3(b)			6	AO1 1.2.3a/b/c

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 content.	Reference to at least one environmental factor plants respond to **or** at least one response **or** a named hormone	Reference to at least one environmental factor plants respond to **and** at least one associated response **or** reference to a named hormone **and** at least one associated response	Reference to at least one environmental factor plants respond to **and** at least one associated response **and** reference to a named hormone

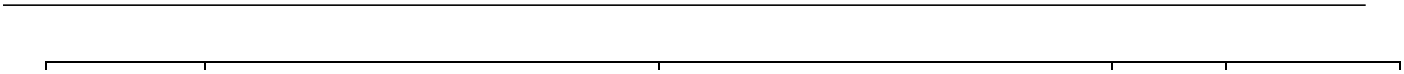
examples of biology points made in the response:	extra information
environmental factors	
• light	allow phototropism
• (direction of the force of) gravity	allow gravi/geotropism
• moisture / water	allow hydrotropism
effects on direction of growth	
• shoots grow upwards	allow reference to 'positive' and 'negative' in terms of tropisms as indicating direction of growth
• shoots grow towards light	
• shoots grow against (the force of) gravity	
• roots grow downwards	
• roots grow towards moisture	
• roots grow towards (the force of) gravity	
hormone	
• reference to auxin	allow other named hormone(s)
• unequal distribution of hormone causes unequal growth (rates)	allow higher concentration of hormone causes faster growth in shoots allow higher concentration of hormone causes slower growth in roots

Total		10

4.5.4.1 Control and coordination

Answer 04 · Mark scheme

June 2015 | BL1HP | Original Q3 | Legacy



4.5.4.1 Control and coordination

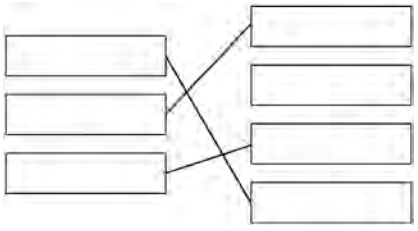
Answer 05 · Mark scheme June 2017 | BL1HP | Original Q8 | Legacy

Question	Answers	Extra information	Mark	AO / Spec ref.
8(a)		ignore ref to roots / moisture		AO2/AO3
	(shoots) grow against (the force / direction of) gravity	allow negative geotropism / gravitropism	1	1.2.3a
	(gravity is down and) shoots are growing upwards		1	
	cannot conclude anything about light / phototropism as growth is in the dark		1	
8(b)		ignore shoots		AO3
		no mark for moisture unqualified		1.2.3a
		max **1** mark if moisture not stated as more important **or** if gravity given as more important		
	(after 5 days / Figure 7) when gravity and moisture are in the same direction / down the roots grow towards both / down	allow (after 5 days / Figure 7) roots grow towards moisture and gravity	1	
	(after 2 more days / Figure 8) when moisture and gravity are in opposite directions, the roots grow towards water	allow (after 2 more days / Figure 8) roots grow towards moisture and away from gravity	1	
8(c)(i)	unequal distribution of hormone / auxin	allow more hormone / auxin on darker side **or** converse	1	AO1
	(so there is) unequal growth rates	allow more / faster growth on darker side **or** converse	1	1.2.3b/c
8(c)(ii)	more surface area exposed to light **or** more light absorbed (by leaves / plant)		1	AO2
	more photosynthesis	allow more glucose / carbohydrate / biomass produced	1	1.5.1a
		for **2** marks there must be a reference to 'more' at least once		
Total			**9**	

4.5.4.1 Control and coordination

Answer 06 · Mark scheme

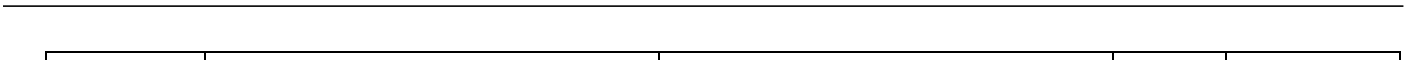
June 2018 | 8461/2H | Original Q6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.1	to prevent water affecting the direction of root growth		1	AO3 4.5.4.1
06.2	gravity acts evenly on all sides	allow cancel out the effect of gravity do **not** accept there is no gravity	1	AO3 4.5.4.1
06.3	(mean) includes the (anomalous) result for seedling 4	allow (mean) includes the (anomalous) result which only grew 1 mm	1	AO3 4.5.4.1
06.4	calculate (mean) from just seedlings 1, 2, 3 and 5 **or** repeat the investigation **and** recalculate (a new mean)	allow omit seedling 4 from (mean) calculation	1	AO3 4.5.4.1
06.5	uneven distribution of hormone in (root / seedling of) A even distribution of hormone in B (so) top grows fast(er) (than bottom) in (root / seedling of) A (and equal growth in B)	allow reference to auxin allow more hormone at bottom do **not** accept more hormone at the top allow B does not have an uneven distribution of hormone allow (more) cell elongation or cell division on top of A allow converse for lower surface	1 1 1	AO1 4.5.4.1 AO1 4.5.4.1 AO3 4.5.4.1
06.6		extra line for a hormone cancels mark for that hormone	1 1 1	AO1 4.5.4.2
Total			**10**	

4.5.4.1 Control and coordination

Answer 06 · Mark scheme

June 2018 | 8461/2H | Original Q6



4.5.4.1 Control and coordination

Answer 07 · Mark scheme

June 2019 | 8461/2H | Original Q3

Question	Answers	Extra information	Mark	AO / Spec.
03.1	named example of tropism – eg geotropism / gravitropism correct corresponding stimulus – eg gravity	allow hydrotropism **or** chemotropism **or** thermotropism allow water **or** chemical **or** 'heat'	1 1	AO1 4.5.4.1
03.2	**Level 3:** The method would lead to the production of a valid outcome. All key steps are identified and logically sequenced.		5–6	AO1 AO2 4.5.4.1
	Level 2: The method would not necessarily lead to a valid outcome. Most steps are identified, but the plan is not fully logically sequenced.		3–4	
	Level 1: The method would not lead to a valid outcome. Some relevant steps are identified, but links are not made clear.		1–2	
	No relevant content		0	
	Indicative content • several seedlings in each batch **or** one pot of seedlings in each batch • measure heights of shoots • leave some in dark with light from one side / direction in box with hole • control(s) with all-round light **or** rotating on clinostat **or** in dark • control variable(s) eg same temperature / water / soil type • after suitable time (at least several hours) • record appearance of seedlings re. light direction • re-measure heights of shoots • detail of how bent shoots were measured – eg use thread or straighten them out • calculate mean height increase for each group • use ruler / protractor to estimate angle of bending for level 3 a reference to comparing the growth of plants with light from one direction with plants either in darkness or in full light along with a control variable is required			

4.5.4.1 Control and coordination

Answer 07 · Mark scheme

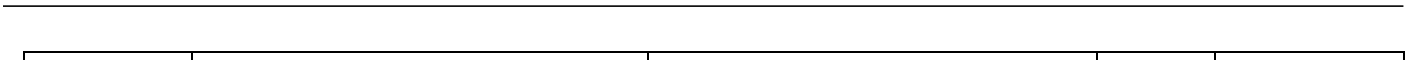
June 2019 | 8461/2H | Original Q3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.3	leaves / plant receive(s) / absorb(s) more light (so) more photosynthesis (so plant) produces more glucose	 allow starch / carbohydrate / sugar / organic material / other named organic substance if no other mark awarded allow **1** mark for any **two** of the mark points with no reference to 'more'	1 1 1	AO2 4.5.4.1 4.7.2.1 4.4 4.4.1.2 AO1
Total			**11**	

4.5.4.1 Control and coordination

Answer 07 · Mark scheme

June 2019 | 8461/2H | Original Q3



4.5.4.1 Control and coordination

Answer 08 · Mark scheme

November 2020 | 8461/2H | Original Q3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.1	to increase fruit size to promote flower production		1 1	AO1 4.5.4.2
03.2	any **two** from: • keep temperature the same (for all dishes) • use equal numbers of seedlings (in each dish) • use seedlings of the same (initial) height • use more seedlings in each dish • give all dishes the same volume of water • use seed(ling)s of the same species • measure light intensity	allow move equal distance **or** away from radiator **or** turn off radiator **or** use heat shield between lamp and seedlings allow use seedlings of the same (initial) size allow give all dishes the same amount of water allow use seed(ling)s of the same type allow measure distance from lamp allow put lamp above each dish and use different light intensity **or** power for each allow same concentration of mineral ions **or** named example ignore nutrients / food do **not** accept keep the same light intensity	2	AO3 4.5.4.1 RPA8
03.3	any **one** from: • use a piece(s) of thread / string **and** measure length of thread (with ruler) • straighten seedling / shoot **and** measure (with ruler) • measure with a flexible ruler **or** a tape measure	allow use a piece of thread **and** (put the thread against) a ruler allow straighten seedling against a ruler allow use a flexible ruler **or** a tape measure	1	AO2 4.5.4.1 RPA8

4.5.4.1 Control and coordination

Answer 08 · Mark scheme

03.4		reference to side only needed once		4.5.4.1 RPA8
	(side nearest the lamp) receives more light (on side P)	allow side Q receives less light allow side Q is in the shade ignore side P is in the light	1	AO2
	(therefore) unequal distribution of auxin	allow more auxin on side Q allow (so) more auxin present on side away from the lamp do **not** accept more auxin on light side **or** side P	1	AO1
	(auxin causes) more growth on side away from the lamp	allow more growth on side Q allow (auxin causes) cell elongation on side away from the light ignore mechanism of auxin action	1	AO2
03.5	ethene is released from bananas	allow ethylene is released from bananas allow the hormone is ethene / ethylene	1	AO2 4.5.4.1 4.5.4.2
Total			**9**	

4.5.4.1 Control and coordination

Answer 08 · Mark scheme

November 2020 | 8461/2H | Original Q3

4.5.4.1 Control and coordination

Question 9

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.1	any **two** from: • (same volume of) water • (same) temperature • (same) species / type of plant • (same) age of shoot	allow (same amount of) water allow (amount of) minerals / ions / salts ignore (same) time ignore (same) height of shoot ignore carbon dioxide (concentration) do **not** accept light	2	AO3 4.5.4.1 RPA8

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.2	**B** shows response (in **A**) is due to light (as **B** has no light)	allow **B** gives a comparison between no light and (one-sided) light ignore **B** shows the effect of no light	1	AO2 4.5.4.1 RPA8
	C shows response (in **A**) is due to one-sided light (as **C** has light from all sides)	allow **C** gives a comparison between all-round light and one-sided light ignore **C** shows the effect of light from all sides	1	

4.5.4.1 Control and coordination

Answer 09 · Mark scheme

June 2022 | 8461/2H | Original Q9

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.3		ignore reference to auxin ignore reference to left and right sides		AO3 4.5.4.1 RPA8
	growth / elongation occurs (just) behind / below / at the tip	allow no growth **or** very little growth at the base ignore shoot is taller	1	
	bending occurs (just) behind / below / at the tip **or** more growth on the side away from the light		1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.4	phototropism / phototropic	allow positive phototropism ignore tropism do **not** accept negative phototropism do **not** accept phototrophic / phototrophism	1	AO1 4.5.4.1 RPA8

4.5.4.1 Control and coordination

Answer 09 · Mark scheme

June 2022 | 8461/2H | Original Q9

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.5		ignore references to **D** and **E** ignore references to left and right sides unless at least one is identified as side nearer to or further from the light		AO3 4.5.4.1
	in **F** there is more auxin in the side furthest from the light		1	
	in **G** there is the same mass of auxin in each side		1	
	in **F** auxin can move through the shoot but in **G** the glass prevents this		1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.6	all four (blocks) have (approximately) the same mass of auxin	allow examples such as mass of auxin in **D** / **E** is (about) the same as in **F** / **G** **or** those in light have same mass of auxin as those in dark	1	AO3 4.5.4.1

Total Question 9		11

4.5.4.1 Control and coordination

Answer 10 · Mark scheme

June 2024 | 8461/2H | Original Q4

Question 4

Question	Answers	Extra information	Mark	AO / Spec Ref.
04.1	to prevent (direction of) light affecting the results **or** to prevent (direction of) light affecting growth (of roots)	allow to prevent phototropism ignore ref to shoot allow so **only** gravity affects results / growth ignore as a control variable	1	AO3 4.5.4.1 RPA8

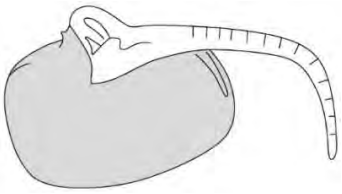
Question	Answers	Extra information	Mark	AO / Spec Ref.
04.2	to prevent water affecting the direction of root growth to provide enough water for root growth		1 1	AO3 4.5.4.1 RPA8

Question	Answers	Extra information	Mark	AO / Spec Ref.
04.3	to compare (with apparatus **A**) (so) it shows that gravity caused the results in apparatus **A** **or** (because) gravity acted equally in all directions (in apparatus **B**) **or** to cancel out the (one-sided) effect of gravity	allow to see the difference (between **B** and **A**) ignore reference to auxin ignore to cancel out gravity	1 1	AO3 4.5.4.1 RPA8

4.5.4.1 Control and coordination

Answer 10 · Mark scheme

June 2024 | 8461/2H | Original Q4

Question	Answers	Extra information	Mark	AO / Spec Ref.
04.4	root drawn bending downwards root drawn longer than at start ink marks spread out in bent region	 do **not** accept ink marks spread out before the bend example: 	1 1 1	AO2 4.5.4.1 RPA8

Question	Answers	Extra information	Mark	AO / Spec Ref.
04.5	(in B) horizontal	allow (grows) straight (out) allow not bent (at all)	1	AO2 4.5.4.1 RPA8

Question	Answers	Extra information	Mark	AO / Spec Ref.
04.6	uneven distribution of auxin (so) upper side grows faster / more (than lower)	allow more auxin on the lower side ignore more auxin on upper side allow lower side grows slower / less (than upper)	1 1	AO1 AO3 4.5.4.1 RPA8

Question	Answers	Extra information	Mark	AO / Spec Ref.
04.7	any **two** from: • weed killers • rooting (powders) • (promoting) growth in tissue culture	 allow to grow plants from cuttings ignore reference to shoots allow inhibiting lateral buds	2	AO1 4.5.4.2

4.5.4.1 Control and coordination

Answer 10 · Mark scheme

June 2024 | 8461/2H | Original Q4

Question	Answers	Extra information	Mark	AO / Spec Ref.
04.8	any **two** from: • promote / start / initiate / force flowering • more fruit • bigger fruits	allow to grow more flowers if neither given allow bigger yield (of apples) allow idea of fruits ripening simultaneously	2	AO2 4.5.4.2

Total Question 4	15

4.5.4.1 Control and coordination

Answer 11 · Mark scheme

June 2025 | 8461/2H | Original Q3

Question 3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.1	growth (response) due to gravity	ignore direction of growth	1 1	AO1 4.5.4.1

4.5.4.1 Control and coordination

Answer 11 · Mark scheme

Question	Answers	Mark	AO / Spec. Ref.
03.2	**Level 3:** The method would lead to the production of a valid outcome. The key steps are identified and logically sequenced.	5–6	AO1 4.5.4.1 RPA8
	Level 2: The method would not necessarily lead to a valid outcome. Most steps are identified, but the plan is not fully logically sequenced.	3–4	
	Level 1: The method would not lead to a valid outcome. Some relevant steps are identified, but links are not made clear.	1–2	
	No relevant content	0	
	Indicative content • place a seedling in box with slit • place a seedling in darkness **or** in all-round light • measure initial heights of shoots • measure final heights of shoots **or** measure shoots with a ruler **or** measure the growth of shoots • record a named feature of appearance of seedlings • detail of how bent shoots are measured eg use thread or straighten them out • repeat with several seedlings • calculate mean height increase for each condition • compare results (for each condition) *control variable(s)* o same number of seedlings (per pot / condition) o same temperature o same volume of water o same soil type / volume o same age of seedlings o same species / type of plant o same time left for For **Level 3**, a method comparing the growth of plants in light from one direction with plants in full light / darkness along with control variables is required.		

4.5.4.1 Control and coordination

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.3	auxin		1	AO1 4.5.4.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.4	there is an uneven distribution of the hormone		1	AO1 4.5.4.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.5	leaves / plant receive(s) / absorb(s) more light (so) more photosynthesis (which produces) more glucose	 allow (which produces) more starch / carbohydrate / sugar allow (which produces) more (named) organic material / other named organic substance if no other marks awarded allow **1** mark for any two of the mark points with no reference to 'more'	1 1 1	AO2 4.5.4.1 4.4.1.1 4.4.1.3

Total Question 3	13

4.5.4.1 Control and coordination

Version 1.0: 0707

ASSESSMENT and QUALIFICATIONS ALLIANCE

General Certificate of Secondary Education

Science B 4462 / Biology 4411

BLY1H Unit Biology 1

Mark Scheme

2007 examination - June series

4.5.4.1 Control and coordination

Mark schemes are prepared by the Principal Examiner and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation meeting attended by all examiners and is the scheme which was used by them in this examination. The standardisation meeting ensures that the mark scheme covers the candidates' responses to questions and that every examiner understands and applies it in the same correct way. As preparation for the standardisation meeting each examiner analyses a number of candidates' scripts: alternative answers not already covered by the mark scheme are discussed at the meeting and legislated for. If, after this meeting, examiners encounter unusual answers which have not been discussed at the meeting they are required to refer these to the Principal Examiner.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of candidates' 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 to download from the AQA Website: www.aqa.org.uk

Copyright © 2007 AQA and its licensors. All rights reserved.

The Assessment and Qualifications Alliance (AQA) is a company limited by guarantee registered in England and Wales (company number 3644723) and a registered charity (registered charity number 1073334). Registered address: AQA, Devas Street, Manchester M15 6EX.
Dr Michael Cresswell, Director General.

4.5.4.1 Control and coordination

MARK SCHEME

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 and help to delineate what is acceptable or not worthy of credit or, in discursive answers, to give an overview of the area in which a mark or marks may be awarded.

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

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 lines 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.)

3. Marking points

3.1 Marking of lists

This applies to questions requiring a set number of responses, but for which candidates 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.

4.5.4.1 Control and coordination

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

Candidate	Response	Marks awarded
1	4,8	0
2	green, 5	0
3	red*, 5	1
4	red*, 8	0

Example 2: Name two planets in the solar system. (2 marks)

Candidate	Response	Marks awarded
1	Pluto, Mars, Moon	1
2	Pluto, Sun, Mars, Moon	0

3.2 Use of chemical symbols / formulae

If a candidate 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

Full marks can be given for a correct numerical answer, as shown in the column 'answers', without any working shown.

However if the answer is incorrect, mark(s) can be gained by correct substitution / working and this is shown in the 'extra information' column;

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 are 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 e.c.f. 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 Unexpected Correct Answers not in the Mark Scheme

The Examiner should use professional judgement to award credit where a candidate has given an unexpected correct answer which is not covered by the mark scheme. The Examiner should consult with the Team Leader to confirm the judgement. The Team Leader should pass this answer on to the Principal Examiner with a view to informing all examiners.

4.5.4.1 Control and coordination

BLY1H Question 1

	answers	extra information	mark
(a)	scientists figures based on research / calculations / data **or** scientists sample whole area	ignore reasons based on bias	1
	fishermen based on impression / hearsay / experience **or** fishermen fish in well-stocked / limited areas	scientists sample a wider area = **2** marks fishermen only fish in well-stocked areas = **2** marks if no marks gained fishermens' opinion **and** scientists' opinion gains **1** mark	1
(b)	any **two** from: • economic considerations • political impact • pressure groups **or** fears of extinction	eg fear for jobs, profits, big demand for cod eg allow EU / government decide or laws will be passed	2
total			4

4.5.4.1 Control and coordination

BLY1H Question 2

	answers	extra information	mark
(a)	any **two** from: • area of bed sampled • sampling time • size of net • kicking action • net position	control variables from information given	2
(b)	any **two** from: • some animals not dislodged • some animals missed / through / escaped net • invertebrates difficult to identify • invertebrates from outside area	must be ideas related to a sample ignore reliability etc	2
(c)	10 to 99 **or** 10 – 99 **or** 99 to 10 **or** 99 – 10		1
(d)	any **two** from: • increased / goes up • 0 at sample 4 • to (more than) 100	allow increase implied from all data described	2
(e)	mayfly because not found downstream of point where sewage enters stream **or** only in the unpolluted water		1 1
total			9

4.5.4.1 Control and coordination

BLY1H Question 3

	answers	extra information	mark
	adaptation and linked advantage eg	max **2** for 3 adaptations	max 2 max 2
	• roots widespread / long (1) to collect water from large area (1)	ignore large roots accept to collect more water	
	• some roots deep / long (1) to collect water from deep down (1)	ignore large roots accept to collect more water	
	• absence of leaves (1) reduces water loss (1)		
	• swollen stem (1) to store water (1)		
	• roots near surface (1) to absorb rainwater (1)		
	• roots widespread (1) support in sandy soil (1)		
total			4

4.5.4.1 Control and coordination

BLY1H Question 4

	answers	extra information	mark
(a)(i)	viruses live inside cells		1
	viruses inaccessible to antibiotic	allow drug / antibiotic (if used) would (have to) kill cell	1
(ii)	mutation	ignore mutation caused by antibiotic	1
	natural selection **or** no longer recognised by antibiotics	accept description of natural selection	1
(b)	(stimulate) antibody production	ignore antitoxin	1
	(by) white cells		1
	<u>rapidly</u> produce antibody on re-infection	ignore antibodies remain in blood	1
total			7

4.5.4.1 Control and coordination

BLY1H Question 5

	answers	extra information	mark
(a)	ovary or ovaries		1
(b)	(hormone) implant		1
(c)	do not have to remember to take		1
(d)	does not involve hormone **or** it is a mechanical method	allow coil may be dislodged allow egg <u>is</u> fertilised / released allow not preventing egg fertilisation / release	1
(e)	involves death of fertilised egg **or** (regard) fertilised egg as human **or** stops fertilised egg developing	allow embryo / baby for fertilised egg ignore against religion only allow fertilised egg is alive ignore side effects	1
(f)(i)	inhibit FSH (production) so no eggs mature / develop / are produced	allow inhibits LH allow (LH) <u>stimulates</u> egg release ignore progesterone	1 1
(ii)	contains FSH which causes egg to mature / develop / be produced **or** in women whose FSH is low	allow contain LH allow (LH) <u>stimulates</u> egg release	1 1
total			9

4.5.4.1 Control and coordination

BLY1H Question 6

	answers	extra information	mark
(a)	asexual reproduction / mitosis **or** no fusion of gametes **or** division after fusion **or** from fertilised egg **or** from same embryo **or** from same egg **and** sperm	ignore cloning	1
	each embryo has identical genetic information / genes / DNA / chromosomes		1
(b)	any **two** from: • experimental subject and control are identical **or** fair test since monkeys identical • monkeys similar to humans, so effect of drugs likely to be similar • all identical so will have same reaction to drugs / disease • it's better than catching wild ones	allow closely related so… ignore evolved from	2
total			4

4.5.4.1 Control and coordination

BLY1H Question 7

	answers	extra information	mark
(a)	any **two** from: • balance between two important for good heart health • high LDL causes heart disease / high cholesterol • high HDL reduces heart disease / cholesterol	ignore blood pressure do **not** accept converse argument do **not** accept converse argument	2
(b)	heart attacks greater amongst patients with low HDL levels statins reduce heart attacks of patients **or** placebo is less effective	ignore statins cause heart disease ignore comparative effects of the two statins allow pravastatin is more effective supported by appropriate calculations eg pravastatin > 39 33% < 39 31.4% Average 32.4 > 39 32% < 39 28.2% Average 30.05%	1 1
total			4

4.5.4.1 Control and coordination

BLY1H Question 8

	answers	extra information	mark
(a)	present day organisms have evolved from simpler organisms	ignore answers in terms of natural selection	1
	over long periods of time **or** millions / billions of years		1
(b)	(natural selection operates on successful) characteristics produced by chance / (random) mutation		1
	in this experiment caused by hormones / environment	allow this example indicates inheritance of acquired characteristics for **2** marks allow this is Lamarckism only for **1** mark	1
total			4

4.5.4.1 Control and coordination

Answer 08 · Examiner comments — November 2020 | 8461/2H | Original Q3

Question 3 (standard & standard/high demand)

This question was about plant hormones and in **03.2** most students understood that the given investigation was inadequate due to the presence of the radiator nearer to some of the seedlings than to others. Many also suggested that the same number of seedlings should have been used in each dish. A few suggested that equal amounts of water should have been provided in each dish or that the light intensity could actually have been measured. A common incorrect answer was that the seedlings should have been subjected to the same light intensity (this being the independent variable).

Answer 08 · Examiner comments — November 2020 | 8461/2H | Original Q3

In **03.3** suggestions for how the length of the curved seedling might be measured were often inadequate – eg 'with a ruler'. Successful students realised that the seedling would either need to be straightened before measuring or that a flexible device such as a tape measure or a piece of thread would need to be employed. And in **03.4** students were very confused about differential growth rates on the two sides of a seedling for bringing about the phototropic response. A substantial proportion thought that the seedling grew more on the side facing the light, sometimes citing an increased rate of photosynthesis on that side to fuel extra growth.

4.5.4.1 Control and coordination

Answer 09 · Examiner comments

June 2022 | 8461/2H | Original Q9

Question 9

This question was about investigations involving phototropism and the redistribution of auxin.

09.1 The amount of water given, the temperature and the type of plant were common correct answers for control variables in the investigation shown in **Figure 13**. 'Light' was an inappropriate suggestion as this was different in each of the three experiments. 'Time' was not rewarded as this was given as 12 hours in the diagram. More than three-quarters of students were able to suggest at least one correct control variable, with almost one third giving two.

09.2 Most responses to this question were very weak, with only one in eight scoring any marks. Most answers simply described experiments **B** (in the dark) and **C** (with all-round light) rather than stating these could be compared with experiment **A** (one-sided light) to show that light caused the effect in experiment **A** and that this light had to come from one side.

09.3 Careful inspection of **Figure 13** was necessary to answer this question – which showed the ink marks just behind the tip of the shoot were further apart in all three seedlings after 12 hours and that this region was also the part that bent towards the light in experiment **A**. Hence growth and response/bending occurred in this region. Both points were evident to only one in 20 students.

09.4 Nearly three-quarters of students knew that the response shown by seedling **A** was called *phototropism*. There was the inevitable confusion with the term 'phototropism', and 'tropism' unqualified was considered inadequate. Some correctly used the term 'positive phototropism' but the qualification 'negative' cancelled what would otherwise have been worth the mark.

09.5 This question, and the next, examined the ability to select appropriate information from **Figure 14** about the distribution of auxin in shoot tips under different light regimes. Most answers (two-thirds of students) correctly referred to shoot tip **F** which showed that a higher amount of auxin had moved into the agar beneath the side receiving less light. Far fewer students chose to compare this with the situation in shoot tip **G** where auxin was prevented from moving sideways through the shoot by the thin sheet of glass and thus resulted in equal amounts of auxin in the agar beneath the shaded and the illuminated sides. Many made inappropriate references to the results from the shoot tips kept in the dark (**D** and **E**).

4.5.4.1 Control and coordination

Answer 09 · Examiner comments June 2022 | 8461/2H | Original Q9

09.6 The hypothesis that light causes the breakdown of auxin was easily refuted by the observation that all four blocks of agar, whether beneath shoot tips in the light or in the dark, contained approximately equal amounts of auxin. Only one fifth of students made relevant observations about the shoot tips in the light compared with those in the dark, while many simply focused on the results for shoot tip **G** and did not gain credit.

4.5.4.1 Control and coordination

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.

4.5.4.1 Control and coordination

Answer 10 · Examiner comments

June 2024 | 8461/2H | Original Q4

Question 4 (standard, standard/high and high demand)

04.1 Just over half of students knew why the student placed both sets of apparatus in the dark. Many answers referred to preventing phototropism to gain the marking point. Some students referenced control variables, which was insufficient to gain the mark. Many incorrect responses did include references to gravity, however the response was not qualified with 'only gravity' as per the mark scheme, so therefore could not be awarded the marking point. Vague responses such as 'to keep it a fair test' or 'to make sure nothing affects the investigation' also could not be credited. Other students did not refer to results/growth, for example, 'so light doesn't affect them'.

04.2 A third of students identified two reasons for surrounding the seedings with damp blotting paper, gaining full marks. A noticeable number of students only ticked one box and students are reminded to read the question carefully.

04.3 Around 45% of students gained one mark on this question, with a further 10% gaining both available marks. Marking point 1 was by far the most commonly awarded mark, with many students realising that Apparatus B was for a comparison. Marking point 2 was awarded much less often as many students lacked detail in their responses and could not be given credit. For example, many responses referenced that Apparatus B 'removes' or 'cancels' gravity rather than the *effect* of gravity. However, the correct representation of this alternative point was by far the most common seen for marking point 2. Some students only described the distribution of auxin which didn't answer the question, so were not credited.

04.4 In this question students were asked to complete a diagram of the root after 24 hours to show both the appearance and the ink marks expected. Almost one third of students gained full marks for their diagram. Students that drew the root completely straight were restricted to 1 mark, assuming they had drawn the root longer. The spacing of the ink marks in marking point 3 proved challenging for many students, often drawing them all equal, or adding in spaces before the bend which negated this mark.

© 2024 AQA and its licensors. All rights reserved.

4.5.4.1 Control and coordination

Answer 10 · Examiner comments June 2024 | 8461/2H | Original Q4

04.5 55% of students knew that the root would grow straight and gained the mark. However, a minority of students suggested that the root would grow 'straighter', which implies some bending and therefore, could not be credited.

04.6 Students were asked to explain how auxin causes the results in Apparatus A. Over 50% of students did not score anything on this question, with 20% gaining both available marks. Many students conveyed the idea of uneven distribution of auxin, but several students became confused as to which side of the root had the most growth. Other responses lacked comparative language when explaining the direction of growth and could not gain credit for marking point 2. Some responses referenced light affecting the auxin and just wrote about what they knew about auxin rather than addressing the question.

04.7 Just over 30% of students gained at least one mark for giving a use of auxin, with a further quarter of students gaining two marks. The use of auxin as weed killer, or a rooting powder were by far the most common correct answers given by students. Some responses just stated that auxins were used for growth, which was too vague at this level of demand. Many responses showed confusion between the roles of auxin and gibberellin (which was the focus of question 04.8).

04.8 15% of students gained full marks for knowing two reasons why the farmer sprayed the apple tree with gibberellin, with 45% of students being awarded at least one mark usually for the idea of 'more' or 'bigger' fruit. Many responses were awarded the fallback mark for referring to an increase in yield. Of the three alternative answers to this question, the promotion of flowering (bullet point 1) was the least common correct response.

A lot of responses referred to 'ending seed dormancy' which does not answer the question and therefore could not be credited. As with question 04.7, there was evident confusion between the roles of gibberellin and auxin.

Answer 11 · Examiner comments June 2025 | 8461/2H | Original Q3

Question 3 (Standard demand)

03.1

Almost 60% of students were able to correctly define geotropism. Of those students who did

Answer 11 · Examiner comments

not achieve both available marks most were clear that a tropism affected the growth of the plant but were unclear of the link between geotropism and gravity, with references to geographical features being a common incorrect response.

03.2

This extended response question required students to plan an investigation, with some examples of equipment suggested. It was clear that many students had carried out the required practical on tropisms assessed in this question. Around 50% of students reached Level 3, with the majority of those gaining full marks. Those that did, successfully described investigating at least 2 light regimes as well as measuring/observing results and giving several control variables.

Some students that did not gain full marks did so for predicting the results, rather than describing how to take final measurements and/or observations in the investigation. The vast majority of students scored some marks due to being able to list control variables. Some students thought placing seedings on a windowsill would give them all-round light and therefore provide a comparison with the seedings placed in the box with a slit.

Just over 15% of students were limited to Level 1 mostly due to being unable to provide a comparison between the effects of unilateral light and all-round/no light.

03.3

This was a well answered question by the majority of students with 90% being able to name the hormone auxin. Where incorrect responses were seen, it was usually for naming a different plant hormone – such as gibberellin.

03.4

Almost 90% of students knew that an uneven distribution of the hormone controlled the plant's responses to the direction of light.

03.5

This question required students to explain how a plant's response to light aided survival. Many students used up much of the available space describing how unilateral light influenced the uneven distribution of auxin, resulting in uneven growth of the stem. This was not required, as the question asked how this response was advantageous to the plant. These students then often omitted more than passing reference to the focus of the question, perhaps stopping at the idea that this allowed the plant to receive light. Many students seemed unaware that even if the leaves are directed away from the light source, they will still be able to absorb light.

What was required in responses was that by facing the light source, leaves could absorb *more* light, allowing *more* photosynthesis resulting in *more* glucose being produced. Those students who did not incorporate the idea of 'more' into their answers could gain one mark for linking two of the critical processes of light absorption, photosynthesis and glucose production.

Most students could make a connection between plants absorbing light, allowing photosynthesis to happen (and producing glucose) – allowing students to gain the compensation mark - as they neglected to mention these processes would be increased or maximised by the response to light. A quarter of students gained 2 marks, usually for stating that more light was absorbed and linked this to increased photosynthesis. Mark point 3 was least commonly seen.