AQA GCSE Biology | 8461

SPECIFICATION POINT 4.3.3.2

Plant defence responses

Mark schemes and examiner comments

Tier	**Higher**
Question groups	**11**
Available paper years	**2007–2022**

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.

4.3.3.2 Plant defence responses

Answer 01 · Mark scheme June 2007 | BLY1B | Original Q6 | Legacy

Six	1	2	1	*

Answer 02 · Mark scheme June 2008 | BLY1BP | Original Q4 | Legacy

Four	1	2	2	3

Answer 03 · Mark scheme June 2008 | BLY1BP | Original Q7 | Legacy

Seven	1	3	3	2

Answer 04 · Mark scheme March 2009 | BLY1BP | Original Q8 | Legacy

Eight	4	3	4	3

Answer 05 · Mark scheme March 2010 | BLY1BP | Original Q4 | Legacy

Four	2	1	1	3

Answer 06 · Mark scheme March 2011 | BLY1BP | Original Q4 | Legacy

Four	3	4	3	2

4.3.3.2 Plant defence responses

Answer 07 · Mark scheme

June 2012 | BL1HP | Original Q3 | Legacy

Question 3

question	information		mark
3	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 2, and apply a 'best-fit' approach to the marking.		6
0 marks	**Level 1 (1-2 marks)**	**Level 2 (3-4 marks)**	**Level 3 (5-6 marks)**
No relevant content.	There is at least one example of an adaptation of either an animal **or** a plant. However it may not be clear how the adaptation helps the organism to avoid being eaten.	There is a description of an adaptation of at least one animal **and** at least one plant. It is clear how at least one of these adaptations helps the organism to avoid being eaten.	There are clear and detailed descriptions of a range of adaptations of named animals **and** named plants. It is clear how most of these adaptations help the organisms to avoid being eaten.

examples of clear and detailed biology points made in response:

- **camouflage** – the method of camouflage should be described plus a statement that the predator is less likely to see the prey
- **mimicry / warning colouration** – the method should be described plus a statement that the predator is likely to confuse the prey with e.g. a poisonous organism
- **thorns / prickles / spines / horns** – a statement that these are sharp and are likely to hurt a predator
- **long limbs / streamlining** – a statement that these increase speed and make it more likely that prey will outrun predator
- **bad taste** / **poison** – a statement that predator will find this unpleasant and 'spit out' prey / not attack same prey again
- **large ears / position of eyes** – a statement that predators will be detected earlier so the prey can escape sooner

Total		6

4.3.3.2 Plant defence responses

Answer 07 · Mark scheme June 2012 | BL1HP | Original Q3 | Legacy

BL1HP

Answer 08 · Mark scheme June 2014 | BL1HP | Original Q2 | Legacy

The full source mark scheme begins on page 11. Follow original question 2 in that document.

4.3.3.2 Plant defence responses

Answer 09 · Mark scheme June 2017 | BL1HP | Original Q5 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.
5(a)(i)	have (most branched) roots near surface **or** roots at 0 – 1 m **and** long / deep roots **or** roots below 6 m		1	AO2/3 1.4.1b
	(roots near surface) absorb (recent) rain / dew	allow (roots near the surface) absorbs water quickly or before it evaporates	1	
	(long roots) absorb water from deep underground or underground streams		1	
		if neither mark points 2 or 3 are awarded allow **1** mark for idea of increased anchorage		
5(a)(ii)	reduced / less /small surface area	ignore surface area : volume	1	AO2
	reduces water loss / evaporation	allow reduces transpiration	1	1.4.1f
5(b)	deter herbivores	allow deter animals from eating / damaging them	1	AO2 1.4.1g
5(c)(i)	any **one** from: • energy (storage) • insulation • idea of metabolic water	allow idea of (physical) protection	1	AO2 1.1.1a 1.4.1d/f

4.3.3.2 Plant defence responses

Answer 09 · Mark scheme

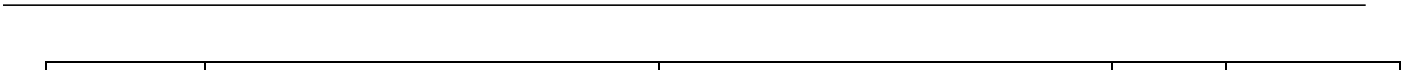
June 2017 | BL1HP | Original Q5 | Legacy

5(c)(ii)	**either** *camel / fat in hump:* reduced insulation (on most of body) so more (thermal) energy released **or** *llama / (layer) under the skin:* increased insulation (all over) (1) to reduce (thermal) energy loss (1)	 allow more 'heat' released **or** allow insulates upper surface (1) to reduce heat gain (1) **or** allow more insulation in cold night (1) when camel is sitting / lying (1) allow to reduce 'heat' loss	 1 1	AO2/3 1.4.1d/e/f
Total			**9**	

4.3.3.2 Plant defence responses

Answer 09 · Mark scheme

June 2017 | BL1HP | Original Q5 | Legacy



Answer 10 · Mark scheme

November 2020 | 8461/1H | Original Q5

The full source mark scheme begins on page 24. Follow original question 5 in that document.

4.3.3.2 Plant defence responses

Answer 11 · Mark scheme

June 2022 | 8461/1H | Original Q4

Question 4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.1	Thick, waxy layer on leaf surface: ✓ Berries that are poisonous: ✓ Bark on trees that falls off: ✓ all three rows correct = **2** marks two rows correct = **1** mark one row correct = **0** marks		2	AO1 4.3.3.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.2	(it looks like the hornet so) predators / animals are tricked / deceived (by the colouring) **and** so avoid eating it	allow (it looks like the hornet so) predators / animals are warned off **and** so avoid eating it allow correctly named predators eg birds	1	AO2 4.3.3.2

4.3.3.2 Plant defence responses

Answer 11 · Mark scheme

June 2022 | 8461/1H | Original Q4

Question	Answers	Mark	AO / Spec. Ref.
04.3	**Level 3:** Relevant points (reasons / causes) are identified, given in detail and logically linked to form a clear account.	5–6	AO2 4.2.3.1 4.2.3.2 4.4.1.1 4.4.1.3 4.3.3.1
	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
	
	• less absorption of water
	  ○ less water so lower rate of photosynthesis
	  ○ so less glucose produced
	  ○ for respiration / energy release
	  ○ so less cellulose produced so fewer cells walls / cells made
	  ○ so fewer amino acids produced to make new proteins
	  ○ cells lose turgidity
	
	• less absorption of (named) ions / minerals
	  ○ fewer nitrates so fewer proteins made for growth
	  ○ fewer magnesium ions so less chlorophyll produced
	  ○ so lower rate of photosynthesis
	
	• damage to phloem
	  ○ less transport of sugars to root cells
	  ○ for respiration / energy release
	
	• damage to xylem
	  ○ less water transported (to cells)
	  ○ fewer nitrates reach cells
	  ○ so fewer proteins made for growth
	  ○ fewer magnesium ions reach cells
	  ○ so less chlorophyll produced
	  ○ less magnesium / chlorophyll so lower rate of photosynthesis
	
	• less anchorage		

4.3.3.2 Plant defence responses

Answer 11 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.4	genetic material / DNA / chromosomes is doubled / replicated / copied / duplicated		1	AO1 4.1.2.2
	the (replicated) chromosomes are pulled / moved apart	the (replicated) chromosomes are separated	1	
	cytoplasm divides into two (cells) **or** cell membrane divides to form two cells	allow two new nuclei form allow the nucleus divides (into two)	1	
	the set of chromosomes in each new cell are identical (to one another)	allow each new cell has the same set of DNA / alleles / genes (as the other)	1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.5	differentiation	ignore specialisation	1	AO1 4.1.2.3 4.1.1.4

Total Question 4		**14**

4.3.3.2 Plant defence responses

PMT

AQA Qualifications

GCSE

SCIENCE A / BIOLOGY

BL1HP

Mark scheme

4405 / 4401

June 2014

Version: 1.0 Final

4.3.3.2 Plant defence responses

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 Assessment Writer.

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Further copies of this Mark Scheme are available from aqa.org.uk

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4.3.3.2 Plant defence responses

PMT

MARK SCHEME – GCSE Science A / Biology – BL1HP – JUNE 2014

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 Assessment Objectives 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

Full marks can be given for a correct numerical answer, 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 or by each stage of a longer calculation.

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 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 Ignore / Insufficient / Do <u>not</u> allow

Ignore or insufficient are 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.

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

4.3.3.2 Plant defence responses

Quality of Written Communication and levels marking

In Question 2 students are required to produce extended written material in English, and will be assessed on the quality of their written communication as well as the standard of the scientific response.

Students will be required to:

- use good English
- organise information clearly
- use specialist vocabulary where appropriate.

The following general criteria should be used to assign marks to a level:

Level 1: basic

- Knowledge of basic information
- Simple understanding
- The answer is poorly organised, with almost no specialist terms and their use demonstrating a general lack of understanding of their meaning, little or no detail
- The spelling, punctuation and grammar are very weak.

Level 2: clear

- Knowledge of accurate information
- Clear understanding
- The answer has some structure and organisation, use of specialist terms has been attempted but not always accurately, some detail is given
- There is reasonable accuracy in spelling, punctuation and grammar, although there may still be some errors.

Level 3: detailed

- Knowledge of accurate information appropriately contextualised
- Detailed understanding, supported by relevant evidence and examples
- Answer is coherent and in an organised, logical sequence, containing a wide range of appropriate or relevant specialist terms used accurately.
- The answer shows almost faultless spelling, punctuation and grammar.

4.3.3.2 Plant defence responses

Question	Answers	Extra information	Mark	AO / spec ref.
1(a)	3-layered triangular pyramid	as blocks or layered triangle, ignore (small) gaps between layers	1	AO2 1.5.1b
	(pyramid) labelled in food chain order	all three labels are required for **2** marks the pyramid must be fully correct	1	
1(b)(i)	C		1	AO3 1.5.1c
1(b)(ii)	shortest **or** fewest stages / transfers / (trophic) levels	allow only if (b)(i) is C or blank	1	AO1 / AO2 1.5.1c
	less losses in waste / faeces / urine / CO_2 / excretion	allow smaller amount uneaten	1	
	less loss in respiration / heat / movement	allow less lost keeping warm do **not** allow energy for respiration do **not** allow respiration makes energy	1	
		allow less loss (of biomass / energy) **or** less transfer (of biomass / energy) to surroundings if neither 2nd nor 3rd point given, for **1** mark		
Total			**6**	

4.3.3.2 Plant defence responses

Question	Answers	Extra information	Mark	AO / spec ref.
2	Marks awarded for this answer will be determined by the Quality of Written Communication (QWC) as well as the standard of the scientific response. Examiners should also refer to the information on page 5 and apply a 'best-fit' approach to the marking.		6	AO1 1.4.1d,f

0 marks	Level 1 (1-2 marks)	Level 2 (3-4 marks)	Level 3 (5-6 marks)
No relevant content.	At least **one** way in which animals **and / or** plants are adapted to survive.	A description of ways in which animals **and / or** plants are adapted **and** an attempt to link at least **one** adaptation to how it increases the chance of survival.	A description of ways in which animals **and** plants are adapted **and** a description of how at least **one** adaptation increases the chance of survival.

examples of biology points made in the response:

(animals)
- (A) change / decrease in surface area / example
  - (decrease in surface area which) reduces area from which sweat / water may be lost
- (A) hump with fat / fat stores
  - (fat in hump) to convert to water (via respiration)
- (A) long eyelashes
  - (long eyelashes) to keep (wind-blown) dust out of eyes
- (A) nocturnal / 'keep out of the sun'
  - reduce sweat loss (in heat of the day)

(plants)
- (A) decrease in surface area
- (A) leaves are spikes
  - (reduced area / leaves are spikes) reduces water loss / transpiration / evaporation
- (A) long / wide spread / extensive roots
  - (long / wide spread /extensive roots) to absorb (more) water
- (A) fleshy / thick stem
  - (fleshy / thick stem) to store water

extra information

allow adaptations of specific animals to living in specified dry conditions, eg a desert
- (A) change / increase in surface area / example
  - (increase in surface area which) increases area heat may be lost from (by radiation)
- (A) changes to thickness of insulating coat
  - (thicker coat on upper surface) increases insulation from sun's heat
- (A) thin (layer) / reduced amount of body fat
  - (reduced amount of body fat which) reduces insulating layer
- (A) wide feet
  - (wide feet) to reduce pressure / spread weight / prevent sinking

allow adaptations of specific plants to living in specified dry conditions, eg a desert
- (A) thick wax
  - (thick wax) to reduce evaporation / water loss / transpiration
- (A) few(er) stomata
  - (few stomata) to reduce evaporation / water loss / transpiration

Total			6	

4.3.3.2 Plant defence responses

Question	Answers	Extra information	Mark	AO / spec ref.
3(a)	microorganisms	allow microbes / bacteria / fungi / decomposers	1	AO1 / AO2 1.6.1b
	(microorganisms) respire	do **not** allow dead plants respire	1	
	(respiration / decay / microorganisms) releases (thermal) energy / 'heat'	ignore produce 'heat' do **not** allow produce energy do **not** allow dead plants release 'heat'	1	
3(b)(i)	any **three** from: • (opening) allows oxygen in		3	AO1 / AO2 / AO3
	• microorganisms / eggs need oxygen	allow air for oxygen		1.6.1b, c, 1.6.2
	• oxygen needed for respiration			
	• (opening) allows release of carbon dioxide (from microorganisms / respiration / eggs)	allow gaseous exchange (1 mark) of / for microorganisms / eggs (1 mark) if none of first four points given		
	• (opening) allows energy / 'heat' to escape • (closing) retains energy / 'heat' if too cool / at night	if no mark awarded for either of these points allow 1 mark for vents open in the day to prevent overheating **and** close at night to prevent it getting too cold		
	• (closing) retains moisture	allow (opening) releases moisture		
3(b)(ii)	any **one** from: • maintains sex balance	e.g. equal / best / correct numbers of male and female	1	AO3 1.6.1
	• (survival of species depends on there being) males and females in population	allow so the offspring are not all the same sex		
Total			**7**	

4.3.3.2 Plant defence responses

MARK SCHEME – GCSE Science A / Biology – BL1HP – JUNE 2014

Question	Answers	Extra information	Mark	AO / spec ref.
4(a)	mumps rubella / German measles	in either order both needed for the mark ignore measles unqualified	1	AO1 1.1.2l
4(b)(i)	80(.0)	allow **1** mark for $\frac{504}{630}$ **or** 0.8	2	AO2 1.1.2
4(b)(ii)	less chance of epidemic / pandemic **or** less chance of spread of disease / measles / mumps / rubella	allow idea of herd immunity (increased protection for those who are not vaccinated) ignore less chance of getting the disease **or** to eradicate the disease	1	AO2 1.1.2e,l
4(c)(i)	dead / inactive pathogens / viruses / bacteria	allow antigens / proteins from pathogens / viruses / bacteria ignore microorganisms	1	AO1 1.1.2l
4(c)(ii)	white blood cells produce <u>antibodies</u> antibodies produced rapidly (on re-infection) **or** response rapid (on re-infection) these antibodies kill pathogens / viruses / bacteria	 allow ecf if antibodies incorrectly identified in first marking point do **not** accept idea that original antibodies remain in blood and kill pathogens	1 1 1	AO1 1.1.2c, d,e,l
4(d)(i)	antibiotics don't kill viruses (because measles) virus / pathogen lives inside cells	allow antibiotics only kill bacteria allow antibiotics do not work inside cells **or** killing virus / pathogen would kill / damage cell	1 1	AO1 / AO2 1.1.2h
4(d)(ii)	(bacteria / pathogens) develop resistance (to antibiotic)	ignore reference to immunity ignore viruses develop resistance	1	AO1 1.1.2i,j
Total			**11**	

4.3.3.2 Plant defence responses

MARK SCHEME – GCSE Science A / Biology – BL1HP – JUNE 2014

Question	Answers	Extra information	Mark	AO / spec ref.
5(a)	motor	allow efferent / postsynaptic allow **another** relay (neurone)	1	AO1 1.2.1d, e
5(b)	release of chemical (from relay neurone)	allow ecf for 'motor' neurone from (a) allow release of neurotransmitter / named example	1	AO1 / AO2 1.2.1e
	chemical crosses gap / junction / synapse	allow diffuses across allow chemical moves to X	1	
	chemical attaches to X / motor / next neurone (causing impulse)		1	
5(c)	(curare) decrease / no contraction	accept (muscle) relaxes	1	AO2 / AO3 1.2.1e
	(strychnine) increase / more contraction	if no other mark awarded allow 1 mark for (curare) decrease / no response **and** (strychnine) increase / more response	1	
Total			**6**	

4.3.3.2 Plant defence responses

MARK SCHEME – GCSE Science A / Biology – BL1HP – JUNE 2014

Question	Answers	Extra information	Mark	AO / spec ref.
6(a)(i)	idea of poor sleeping	allow as a sleeping pill	1	AO1 1.3.1d
6(a)(ii)	(for) morning sickness (in pregnant women)	ignore sickness unqualified ignore leprosy	1	AO1 1.3.1d
6(a)(iii)	limb abnormalities / defects	accept description e.g. short / no arms / legs ignore disabled / deformed	1	AO1 1.3.1d
6(a)(iv)	drug not tested / trialled on pregnant animals / women	allow not tested for treatment of morning sickness	1	AO3 1.3.1b,d
6(b)(i)	changes to chemical processes	ignore addiction	1	AO1 1.3.1h
6(b)(ii)	dependency on (some) legal drugs is more than / equal to on (some) illegal drugs example of a named legal drug for which dependency is equal to **or** greater than a named illegal drug	allow idea of no / little consistency between dependency and classification allow two pairs of named examples for 2 marks	1 1	AO3 1.3.1e
6(b)(iii)	any **one** from: • the harm it does / harmfulness • effect on health • side effects	ignore cost / addiction / dependency accept (severity of) withdrawal symptoms accept named health effects e.g. mental illness **or** effect on heart / circulatory system	1	AO3 1.3.1f,g
Total			**8**	

4.3.3.2 Plant defence responses

Question	Answers	Extra information	Mark	AO / spec ref.
7(a)(i)	variation (in population) / mutation		1	AO1 / AO2
	longer nosed individuals get more food / leaves	allow longer nosed individuals more likely to survive	1	1.8.1a,d, e,f
	(these) survivors breed (more)		1	
	pass on genes / alleles / DNA (for long nose)	allow pass on mutation	1	
7(a)(ii)	Phiomia / ancestor stretched its nose (during its lifetime) to reach food / leaves		1	AO1 / AO2
	passed on (stretched nose) to offspring	allow offspring inherit (stretched nose) do **not** allow ref to genes	1	1.8.1c
7(b)(i)		ignore other theories, eg religion		AO1
	insufficient evidence / no proof	do **not** allow no evidence	1	1.8.1b
	mechanism of inheritance not known	allow genes / DNA not discovered	1	
7(b)(ii)	God made all living things / them	allow creationism ignore religion	1	AO1 1.8.1b
Total			9	

4.3.3.2 Plant defence responses

Question	Answers	Extra information	Mark	AO / spec ref.
8(a)	any **three** from: • (gene) cut out • (gene / cut out) from (bacterial) chromosome / DNA • ref to enzymes (at any point) • (gene spliced) into maize chromosome / DNA • (gene added) at an early stage of development	accept (gene / cut out) from (bacterial) plasmid	3	AO1 1.7.2d, e
8(b)	any **four** from: • justification based on comparison of the relative merits of at least one advantage and one disadvantage Advantages: • less effort for farmer **or** less likely to harm farmer • (pesticide) always there **or** doesn't wash away • less insects to eat crop / maize **or** carry disease • so greater crop production / yield Disadvantages: • (toxin) kills other insects • so (some) crops don't get pollinated / (sexually) reproduce • possible harm when eaten by humans / animals • damage to food chains • gene may spread to other species	max **3** marks if only advantages or disadvantages given ignore ref to cost allow examples eg no need to spray allow pesticide doesn't contaminate water courses ignore ref to cost allow maize not pollinated allow may have unpleasant taste allow reduced biodiversity	4	AO3 1.7.2e, f
Total			**7**	

AQA

GCSE
BIOLOGY
8461/1H

Paper 1 Higher Tier

Mark scheme

June 2020

Version: 1.0 Final

206G8461 1H/MS

4.3.3.2 Plant defence responses

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

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Information to Examiners

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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.

4.3.3.2 Plant defence responses

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.

4.3.3.2 Plant defence responses

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

4.3.3.2 Plant defence responses

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

4.3.3.2 Plant defence responses

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**	

4.3.3.2 Plant defence responses

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	

4.3.3.2 Plant defence responses

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		

4.3.3.2 Plant defence responses

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**	

4.3.3.2 Plant defence responses

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

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**	

4.3.3.2 Plant defence responses

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

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**	

4.3.3.2 Plant defence responses

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

4.3.3.2 Plant defence responses

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

4.3.3.2 Plant defence responses

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**	

4.3.3.2 Plant defence responses

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

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**

4.3.3.2 Plant defence responses

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 o at (very) low dose o 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 o to test for the correct / optimum dose o to check for any side effects o to test for efficacy **or** to test if it works o in a double blind trial o 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**	

4.3.3.2 Plant defence responses

Answer 10 · Examiner comments November 2020 | 8461/1H | Original Q5

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

Some students referred incorrectly to herbivores as predators in **05.2**. In **05.4**, many students were able to correctly name two reasons for the symptoms, but explanations were either not worded well or underdeveloped. Several students were unclear about the distinctions between chlorosis, chloroplasts and chlorophyll.

Very few students answered **05.5** correctly (89% scored zero marks), because they were so focussed on the nitrates mentioned in the question that they missed the other requirements of the bacteria. Many students found the novel context regarding root nodules perplexing and didn't score any marks.

Answer 11 · Examiner comments

June 2022 | 8461/1H | Original Q4

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

04.1 Nearly 90% of students gained full marks in this question.

04.2 At standard/high demand, there were multiple parts needed in the response to this question, which only 19% of students achieved. Most students understood the idea that animals avoid eating the hornet moth because it looks like a hornet, but the higher level idea that the animals have 'learned' that they get stung was missed by most.

04.3 The most common score in this extended response question was 2 marks out of 6. Students were required to provide a response detailing the reasons why a tree might die if moth larvae damaged the roots, with a link(s) to the impact the reason(s) would have on the tree. Although there are clear mark points on the mark scheme, the list was not exhaustive, so non-listed appropriate indicative content was also acceptable. The impact of less absorption of water and mineral ions was more commonly cited compared to damage to xylem or phloem, with numerous students referencing support and anchorage for the tree. Many students understood the consequence of a lack of magnesium ions and nitrates and these were common responses seen. However, on occasion, some students confused the two or did not make it clear which ion linked to which consequence they were writing about. To achieve marks in both levels 2 and 3, correct linking was required, hence why many students limited themselves to level 1, as they failed to make the link between the effect of the damage and the consequence.

04.4 Only 1% of students gained full marks in this question, highlighting several misconceptions or surface levels of understanding of the events of mitosis. The majority of students who gained marks on this question did so with MPs 1 and 3, although a number of students continue to use the term 'genetic information' which is not sufficient at this level. As seen in previous years, students continue to find the idea of the separation of the chromosomes difficult and many failed to obtain MP2 because of messy written language, sometimes describing all of the chromosomes moving to one side of the cell. Many answers also clearly confused the arrangement of the chromosomes at the centre of the cell between mitosis and meiosis for this mark point. Very few students were able to access MP4, with most simply repeating the stem of the question, that two genetically identical daughter cells are produced

04.5 Over three quarters of students answered this question correctly, and on the whole, spelling was correct. Of the incorrect answers, many were erroneous biological terms. Specialisation was ignored as it was given in the question stem.