GCSE

Science A / Biology

BL1HP

Final Mark scheme

4405 / 4401

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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.

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

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

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	Pluto, Mars, Moon	1
2	Pluto, 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 '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 Accept / allow

Accept is used to indicate an equivalent answer to that given on the left-hand side of the mark scheme. Allow is used to denote lower-level responses that just gain credit.

3.9 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. Quality of Written Communication and levels marking

In Question 3(b) 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.

Question	Answers	Extra information	Mark	AO / Spec. Ref.
1(a)(i)	5000	allow **1** mark for 2500 **or** allow **1** mark for (3500 – 1000) x 2 **or** equivalent	2	AO2 1.5.1b/c
1(a)(ii)	Hawks produce faeces		1	AO2 1.5.1c
1(b)	photosynthesis sugar / glucose	 allow starch allow $C_6H_{12}O_6$	1 1	AO1 1.5.1a
Total			**5**	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
2(a)	any three from: • mutation **or** variation • better adapted survive **or** survival of the fittest • (survivors / better adapted) reproduce • genes passed on	allow points if given in example allow genetic changes allow differences in appearance allow ref to offspring	3	AO1 1.8.1e/f
2(b)(i)	wanted to discredit theory / Darwin	allow wanted to make Darwin / theory look stupid allow idea that (cartoon shows) humans evolved from monkeys	1	AO3 1.8.1b/c
2(b)(ii)	any **two** from: • Darwin's theory challenged idea that God created life • little / insufficient evidence • there were other (scientific) theories (at the time) • mechanism of inheritance not known	allow Darwin's theory challenged / against religious ideas/teaching. ignore against religion ignore no evidence allow examples, eg Lamarckism, allow genes / DNA not discovered ignore did not know about inheritance	2	AO1 1.8.1b/c
Total			**6**	

<table>
<tr><th>Question</th><th>Answers</th><th>Extra information</th><th>Mark</th><th>AO / Spec. Ref.</th></tr>
<tr><td>3(a)(i)</td><td><table><tr><th>Liquid</th><th>Organ</th></tr><tr><td>urine</td><td>kidney</td></tr><tr><td>sweat</td><td>skin</td></tr></table></td><td>award 1 mark for each liquid
award 1 mark for each organ correctly linked to the liquid
allow bladder instead of kidney
ignore water as a liquid</td><td>4</td><td>AO1
1.2.2a</td></tr>
<tr><td>3(a)(ii)</td><td>in food / diet / eating</td><td>allow in drinks / water</td><td>1</td><td>AO1
1.1.1a</td></tr>
</table>

Question	Answers	Extra information	Mark	AO / Spec. Ref.
3(b)			6	AO1 1.2.1a/b/c/d/e

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	identifies one type of receptor **or** the stimulus it detects **or** refers to at least one type of neurone **or** refers to passage of information **or** at least one response by an effector	identifies at least one link between: one type of receptor **and** the stimulus it detects **and / or** refers to at least one type of neurone **and / or** refers to passage of information **and / or** at least one response by an effector	identifies one type of receptor **and** the stimulus it detects **and** refers to different types of neurone **and** refers to passage of information **or** at least one response by an effector

examples of biology points made in the response:	**extra information:**
• *(R & S)* (receptors in) skin detects pressure / pain / change in temperature	*(R & S)* = receptor and stimulus
• *(R & S)* (receptors in) eyes detect light	*(P)* = passage of information
• *(R & S)* (receptors in) ears detect sound	*(N)* = type of neurone
• *(R& S)* (receptors in) ears detect changes in position	*(E)* = response by effector
• *(R& S)* (receptors on) tongue detects chemicals / taste	
• *(R & S)* (receptors in) nose detects chemicals / smell	
• *(N)* sensory / relay / motor neurone	
• *(P)* neurones carry impulses / electrical information	allow electrical signals ignore messages
• *(P)* ref to synapse	
• *(P)* (release of) chemical information at / across synapse	allow neurotransmitter or named neurotransmitter
• *(E)* muscle contracts	
• *(E)* gland releases hormone / chemical / enzyme	

Total		11

Question	Answers	Extra information	Mark	AO / Spec. Ref.
4	any **four** from: (living plants) • take in carbon dioxide • (CO_2 taken in) for photosynthesis • (use carbon to make) carbohydrate / fat / protein • (plants) respire • (plant respiration) releases carbon dioxide • store / 'lock up' / sequester carbon • (provide) food for animals	ignore other parts of the carbon cycle eg decay allow examples ignore respiration of animals do **not** allow store carbon dioxide ignore combustion ignore other references to animals / microorganisms	4	AO1 1.5.1a 1.6.2a
Total			**4**	

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

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**	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
6(a)(i)		allow converse for bacteria that cause the disease, if clear		AO1 1.1.2l
	bacteria (in vaccine) are dead / inactive / weakened	allow bacteria in vaccine are attenuated allow idea that only antigen from bacteria is in vaccine	1	
6(a)(ii)	for vaccinated person:	allow converse for non-vaccinated person		AO2/3 1.1.2l
	idea that white blood cells have previously encountered (TB) bacteria	allow ref to memory cells	1	
	so are ready to produce antibodies rapidly / immediately	allow idea of specificity of antibodies / white blood cells	1	
6(b)(i)	(most / all) non-resistant bacteria killed (by antibiotic)	allow converse	1	AO1/2 1.1.2j
	resistant bacteria reproduce		1	
	so offspring are resistant	allow resistance allele passed on	1	
6(b)(ii)	infection is mild / non-serious	allow not life-threatening	1	AO1/2 1.1.2i
	(not using antibiotic) reduces (rate of) development of resistant strains	allow might be viral (1) and antibiotics do not kill viruses (1)	1	
Total			**8**	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
7(a)	idea that sexual reproduction results in genetic variation	allow converse if clearly referring to asexual reproduction allow reference to natural selection / evolution (if conditions change)	1	AO1 1.7.2a
7(b)(i)	any **four** from: • nucleus taken from egg (cell) (of female) **A or** cytoplasm (and membrane) discarded • nucleus removed / discarded from egg (cell) (from female) **B or** only cytoplasm (and membrane) kept • nucleus from **A** inserted into (enucleated / empty cell / cytoplasm from) egg (cell) (of female) **B** • fertilised / fertilisation (of 'hybrid' cell) • electric shock (after fertilisation) **or** grown into embryo	accept throughout: female **A** = person with faulty mitochondria female **B** = person without faulty mitochondria allow egg and sperm fuse allow cell division / mitosis	4	AO1/3 1.7.2a/c
7(b)(ii)	idea of cytoplasm / mitochondria of 'hybrid' / fertilised cell / embryo comes from cell / female / B with 'normal' mitochondria **OR** only the nucleus is used from A (1) the nucleus does not contain mitochondria **or** these faulty genes (1)		1 1	AO2 1.7.2c

7(b)(iii)	any **one** from: • idea that child has unknown parentage **or** 3 parents • against religious beliefs / teachings • could cause (more) prejudice (against people with perceived imperfection)	ignore ref to unethical / immoral ignore ref to being against religion / God's will unqualified	1	AO3 1.7

Total		**8**

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**	