GCSE
SCIENCE A / BIOLOGY

BL1HP
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	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.

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.

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 allow less loss (of biomass / energy) **or** less transfer (of biomass / energy) to surroundings if neither 2nd nor 3rd point given, for **1** mark	1	
Total			**6**	

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:	**extra information**
(animals)	allow adaptations of specific animals to living in specified dry conditions, eg a desert
• (A) change / decrease in surface area / example	• (A) change / increase in surface area / example
o (decrease in surface area which) reduces area from which sweat / water may be lost	o (increase in surface area which) increases area heat may be lost from (by radiation)
• (A) hump with fat / fat stores	• (A) changes to thickness of insulating coat
o (fat in hump) to convert to water (via respiration)	o (thicker coat on upper surface) increases insulation from sun's heat
• (A) long eyelashes	• (A) thin (layer) / reduced amount of body fat
o (long eyelashes) to keep (wind-blown) dust out of eyes	o (reduced amount of body fat which) reduces insulating layer
• (A) nocturnal / 'keep out of the sun'	• (A) wide feet
o reduce sweat loss (in heat of the day)	o (wide feet) to reduce pressure / spread weight / prevent sinking
(plants)	allow adaptations of specific plants to living in specified dry conditions, eg a desert
• (A) decrease in surface area	
• (A) leaves are spikes	• (A) thick wax
o (reduced area / leaves are spikes) reduces water loss / transpiration / evaporation	o (thick wax) to reduce evaporation / water loss / transpiration
• (A) long / wide spread / extensive roots	• (A) few(er) stomata
o (long / wide spread /extensive roots) to absorb (more) water	o (few stomata) to reduce evaporation / water loss / transpiration
• (A) fleshy / thick stem	
o (fleshy / thick stem) to store water	

| **Total** | | | **6** | |

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 • microorganisms / eggs need oxygen • oxygen needed for respiration • (opening) allows release of carbon dioxide (from microorganisms / respiration / eggs) • (opening) allows energy / 'heat' to escape • (closing) retains energy / 'heat' if too cool / at night • (closing) retains moisture	 allow air for oxygen allow gaseous exchange (1 mark) of / for microorganisms / eggs (1 mark) if none of first four points given 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 allow (opening) releases moisture	3	AO1 / AO2 / AO3 1.6.1b, c, 1.6.2
3(b)(ii)	any **one** from: • maintains sex balance • (survival of species depends on there being) males and females in population	 e.g. equal / best / correct numbers of male and female allow so the offspring are not all the same sex	1	AO3 1.6.1
Total			**7**	

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**	

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) chemical crosses gap / junction / synapse chemical attaches to X / motor / next neurone (causing impulse)	allow ecf for 'motor' neurone from (a) allow release of neurotransmitter / named example allow diffuses across allow chemical moves to X	 1 1 1	AO1 / AO2 1.2.1e
5(c)	(curare) decrease / no contraction (strychnine) increase / more contraction	accept (muscle) relaxes if no other mark awarded allow 1 mark for (curare) decrease / no response **and** (strychnine) increase / more response	1 1	AO2 / AO3 1.2.1e
Total			**6**	

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**	

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 1.8.1c
	passed on (stretched nose) to offspring	allow offspring inherit (stretched nose) do **not** allow ref to genes	1	
7(b)(i)		ignore other theories, eg religion		AO1 1.8.1b
	insufficient evidence / no proof	do **not** allow no evidence	1	
	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**	

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**	