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GCSE

# Science A / Biology

BL1HP

Mark scheme

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4405 / 4401

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Version 1.0 Final Mark Scheme

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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](http://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 **not** 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.

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#### 4. 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)(i)	legal, recreational drugs		1	AO1 1.3.1e
1(a)(ii)	any <b>one</b> from: <ul style="list-style-type: none"> <li>dependence / addiction</li> <li>withdrawal (symptoms) or described</li> </ul>	allow reliance eg headache / sickness / nausea ignore side effects alone	1	AO1 1.3.1h
1(b)(i)	idea of not part of the drug company <b>or</b> it is another company	not biased can be accepted for either part bi or bii, but not both	1	AO2 1.3.1a
1(b)(ii)	idea of so they will not be biased	allow results will be trustworthy	1	AO3 1.3.1a
1(b)(iii)	no / reduced feeling of pleasure (from alcohol) (so) less likely to drink alcohol	allow brain less sensitive to alcohol allow so easier to stop (drinking alcohol)	1 1	AO3 1.3.1
1(c)(i)	higher % <b>or</b> more boys (than girls) drink beer / lager / cider higher % <b>or</b> more girls (than boys) drink spirits / alcopops / wine	allow boys drink more beer / lager / cider allow girls drink more spirits / alcopops / wine allow valid descriptions using % figures	1 1	AO2 1.3.1
1(c)(ii)	any <b>one</b> from: <ul style="list-style-type: none"> <li>only 100 boys were surveyed</li> <li>only done on 15-year-olds</li> <li>no data on the table about boys that don't drink alcohol</li> <li>data only about UK</li> <li>boys may have lied about alcohol consumption</li> </ul>	allow small sample may not be representative allow not done on all ages allow none of the bars are 100% or highest bar is 88%	1	AO3 1.3.1
<b>Total</b>			<b>9</b>	

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.				6	AO1 1.1.1a/b/c		
0 marks	<b>Level 1 (1-2 marks)</b>	<b>Level 2 (3-4 marks)</b>	<b>Level 3 (5-6 marks)</b>					
No relevant content.	At least one component of the diet is given (C) <b>or</b> at least one reason why a component is required (R) <b>or</b> why a healthy diet is needed. (N)	Components of the diet are given (C) <b>and</b> for at least one of these components a reason why the component is required (R) <b>or</b> why a healthy diet is needed. (N)	Most components of the diet are given (C) <b>and</b> different reasons why components are required are given. (R)					
<b>examples of biology points made in the response:</b> <ul style="list-style-type: none"> <li>• (C) carbohydrate</li> <li>• (C) protein</li> <li>• (C) fat</li> <li>• (R) (carbohydrate / protein / fat) for energy (release)</li> <li>• (R) (carbohydrate / protein / fat) to build cells / growth / repair</li> <li>• (C) vitamins</li> <li>• (R) (vitamins) for healthy functioning of the body</li> <li>• (N) (balanced diet) contains right balance of different foods to meet needs <b>or</b> avoid malnourishment <b>or</b> avoid under / over weight</li> <li>• (N) (balanced diet) contains right amount of energy to meet needs</li> </ul>				<b>extra information:</b> allow other components and needs, eg (C) fibre / roughage; (R) prevent constipation / bowel cancer (C) water; (R) transport / as solvent / part of cytoplasm / produce sweat  allow correctly named vitamin (C) with correct reason (R)  ignore ref to minerals / ions as a component of the diet and their use in the body				
<b>Total</b>					<b>6</b>			

Question	Answers	Extra information	Mark	AO / Spec. Ref.
3(a)	any <b>one</b> from: <ul style="list-style-type: none"> <li>• continuous readings</li> <li>• do not need to be there</li> <li>• (more likely to be) accurate</li> <li>• reduces human error</li> </ul>	allow automatic readings allow greater resolution do <b>not</b> allow valid allow easier to read	1	AO3 1.6.2
3(b)(i)	microorganisms (microorganisms) respire (respiration / decay / microorganisms) releases carbon dioxide	allow microbes / bacteria / fungi / decomposers for microorganisms, throughout  ignore carbon released	1 1 1	AO1 1.6.1a/b / 1.6.2a /1.5.1c
3(b)(ii)	all grass decomposed / decayed / rotted	allow idea that all microorganisms dead (due to accumulation of waste <b>or</b> lack of oxygen)  allow lack of / no oxygen (for respiration of microorganisms)	1	AO3 1.6.1b
<b>Total</b>			<b>5</b>	



Question	Answers	Extra information	Mark	AO / Spec. Ref.
<b>4(a)</b>	receptors detect / sense stimuli / change in surroundings <b>or</b> convert stimulus into an impulse	ignore send impulses to brain / spinal cord	1	AO1 1.2.1b/d/e
	example of a receptor	allow any appropriate organ or part of an organ, eg eye / retina or named type of receptor eg light receptor	1	
	effectors allow / make response <b>or</b> convert an impulse to an action	ignore receive impulses from brain / spinal cord	1	
	(effector) muscle / gland	allow an example ignore eg arm / leg	1	
<b>4(b)(i)</b>	junction	allow idea of a (small) gap / space	1	AO1 1.2.1e
	between neuron(e)s	do <b>not</b> allow if implication is that the neurones move allow named types of neurones	1	
<b>4(b)(ii)</b>	chemical	allow answers in terms of specific types of neurone	1	AO1 1.2.1e
	any <b>one</b> from: <ul style="list-style-type: none"> <li>(chemical released) from one neurone</li> <li>(chemical) passes (across synapse) to next neurone to stimulate / cause (electrical) impulse</li> </ul>	allow neurotransmitter / named neurotransmitter released  ignore produced allow diffuses for passes (across)	1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
4(c)(i)	skin	ignore hand / leg	1	AO2 1.2.1b
4(c)(ii)	1.6 (cm per millisecond)	allow 2 if evidence of rounding up of 1.6	1	AO2 1.2.1d/e
4(c)(iii)	any <b>two</b> from: <ul style="list-style-type: none"> <li>• synapses slow down transmission / impulse</li> <li>• fewer synapses (via brain)</li> <li>• (therefore) fewer delays</li> </ul>	ignore length of neurones allow idea of movement of chemical being slower than electrical impulse  allow one synapse compared to two <b>or</b> only one synapse  allow impulse travels more slowly in relay neurones	2	AO3 1.2.1d/e
<b>Total</b>			<b>12</b>	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
5(a)	any <b>two</b> from: <ul style="list-style-type: none"> <li>larger / longer / thicker</li> <li>fewer (bones in total)</li> <li>fewer bones touching the ground</li> </ul>	allow examples eg fewer toes <b>or</b> bones fused allow smaller surface area touching the ground	2	AO2 1.8.1d
5(b)(i)	large(r) surface / area in contact with the ground <b>or</b> low / less pressure on ground  (so) less likely to sink into mud / ground <b>or</b> (so) could run fast(er)	allow easy / easier to escape predators	1    1	AO2 1.4.1c/d
5(b)(ii)	variation (in size / number / arrangement of bones)  (and) those with large(r) / few(er) bones more suited to running <b>or</b> run faster (on harder / drier ground)  these survive <b>and</b> breed  (so) genes / DNA (for larger / fewer bones) passed on	allow mutation(s) (in size / number / arrangement of bones)    allow ref to offspring for breed  allow alleles passed on	1    1   1	AO1 / AO2 1.8.1e/f
<b>Total</b>			<b>8</b>	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
6(a)	0.67(%)	<p>allow 0.6 or 0.7</p> <p>allow 1 mark for evidence of <math>(2 \times 10^6) \div (3 \times 10^8)</math></p> <p><b>or</b></p> <p>allow 1 mark for 0.0067 or 0.6</p>	2	AO2 1.1.2
6(b)(i)	<p>idea that food chains start with plants / producers</p> <p>idea that these make food (for other organisms in the chain)</p>	<p>allow food chains do not start with animals <b>or</b> larvae are consumers</p> <p>allow idea that plants / producers photosynthesise <b>or</b> plants / producers get energy from the sun</p> <p>allow mosquito larvae do not make food / photosynthesise <b>or</b> mosquito larvae do not get energy from the sun</p>	1  1	AO1 1.5.1a

Question	Answers	Extra information	Mark	AO / Spec. Ref.
6(b)(ii)	<p>any <b>four</b> from:</p> <ul style="list-style-type: none"> <li>reasoned argument for <b>or</b> against release</li> </ul> <p><i>advantages:</i></p> <ul style="list-style-type: none"> <li>fewer mosquitos biting <b>or</b> spreading malaria</li> <li>fewer people get / die from malaria</li> <li>lower medical costs (for those infected <b>or</b> for treatment) <b>or</b> less healthcare needed</li> <li>better economically for developing / tropical countries.</li> </ul> <p><i>disadvantages:</i></p> <ul style="list-style-type: none"> <li>fewer crops reproduce</li> <li>poorer crop yield</li> <li>possible starvation (of people)</li> <li>high cost of GM production / mosquito release</li> <li>less food for bats / birds <b>or</b> bats / birds die</li> <li>gene could 'escape' into other wildlife / species</li> </ul>	<p>must refer to at least one advantage and one disadvantage. max <b>3</b> marks for either only advantages <b>or</b> only disadvantages</p> <p>allow people won't get / die from malaria</p> <p>allow fewer crops pollinated</p> <p>allow disruption to food chain / ecosystem <b>or</b> reduction of biodiversity</p> <p>ignore into plants</p>	4	AO3 1.7.2f
6(b)(iii)	<p>any <b>three</b> from:</p> <ul style="list-style-type: none"> <li>gene from bacteria cut out</li> <li>ref to enzymes (anywhere in process)</li> <li>(gene) transferred to chromosome of mosquito</li> <li>at an early stage of development</li> </ul>	<p>allow allele for gene</p> <p>allow at any point in process, ie in cutting or in splicing</p> <p>allow DNA for chromosome</p> <p>allow egg / embryo</p>	3	AO1 1.7.2d/e
<b>Total</b>			<b>11</b>	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
7(a)(i)	any <b>two</b> from: <ul style="list-style-type: none"> <li>• not all eaten</li> <li>• used for respiration</li> <li>• lost as CO<sub>2</sub> / water / urea</li> <li>• lost as faeces <b>or</b> not all digested</li> </ul>	allow eaten by other animals ignore used / lost in heat / movement if neither mark awarded allow 1 mark for lost as waste ignore references to energy losses do <b>not</b> allow for growth / repair / reproduction	2	AO1 1.5.1b/c
7(a)(ii)	any <b>one</b> from: <ul style="list-style-type: none"> <li>• thrushes eat other things</li> <li>• thrush numbers likely to vary (considerably)</li> <li>• thrushes were not present all the time</li> <li>• thrushes feed on a much bigger area</li> </ul>	allow it is only an estimate (of population size) <b>or</b> only counted thrushes for 5 hours	1	AO3 1.5.1
7(b)(i)	any <b>one</b> from: <ul style="list-style-type: none"> <li>• there are two dependent variables</li> <li>• there is no independent variable</li> <li>• to show the association / correlation / pattern (between the two variables)</li> </ul>		1	AO2 1.5.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
<b>7(b)(ii)</b>	(snails in woodlands) more have dark(er) colour (ed shells) <b>or</b> fewer have light-coloured shells	allow converse for grassland, if clear	1	AO2 1.4.1d/f/g
	(shells have) no / fewer stripes or have no stripes	allow converse for grassland, if clear	1	
<b>7(b)(iii)</b>	less likely to be seen (by predators / birds / thrushes)	allow camouflaged (from predators / birds / thrushes) allow light coloured shells with stripes would be more visible (to predators / birds / thrushes in woodland (than grassland)).	1	AO3 1.4.1d/f/g
<b>7(c)(i)</b>	<i>Indicator species</i> invertebrate (animals) <b>or</b> correctly named invertebrate <i>Environmental factor</i> (concentration of dissolved) oxygen	both required for <b>1</b> mark  allow water pollution allow other correct examples	1	AO1 1.4.2c
<b>7(c)(ii)</b>	oxygen meter	must match factor given in <b>(c)(i)</b> allow oxygen probe / sensor (and data logger) ignore pollution meter	1	AO1 1.4.2d
<b>Total</b>			<b>9</b>	