
GCSE

Additional Science / Biology

BL2HP

Mark scheme

4408 / 4401

June 2016

Version/Stage: 1.0 Final Mark Scheme

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 **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.

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)	without <u>oxygen</u>	allow not enough oxygen ignore air ignore production of CO ₂ ignore energy	1	AO1 2.6, 2.6.2a
1(a)(ii)	more/high/increased lactic acid (at end)	allow approximate figures (to show increase) ignore reference to glucose	1	AO3 2.6, 2.6.2b
1(b)(i)	1.5	allow only 1.5 / 1½ / one and a half	1	AO3 2.6, 2.6.1g/h
1(b)(ii)	increases at first and levelling off suitable use of numbers eg rises to 10 / by 9 (dm ³ per min) or increases up to 1.5 (min) / levels off after 1.5 (min) (of x axis timescale) or after the first minute (of the run)	ignore subsequent decrease allow answer in range 1.4 to 1.5	1 1	AO2 2.6, 2.6.1g/h
1(b)(iii)	supplies (more) oxygen supplies (more) glucose for (more) respiration releases (more) energy (for muscle contraction)	need 'more/faster' once only for full marks allow removes (more) CO ₂ / lactic acid / heat as an alternative for either marking point one or two, once only do not allow energy production or for respiration	1 1 1 1	AO1 2.6.1b/e/f/g/h 2.6.2d
Total			9	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
2			6	AO1/2/3 2.3.1a/b/c/d +prac
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.	A partial description of how the apparatus is set up or a description of how light is supplied or a simple description of how photosynthesis can be measured. or a control variable	A description of how the apparatus is set up and a description of how photosynthesis can be measured. or a description of how light intensity is varied or a control variable or any other relevant point	A description of how the apparatus is used to measure the rate of photosynthesis at different light intensities is given. For full marks reference must be made to a control variable or repeats	
examples of the points made in the response - apparatus set up: - weed in water in beaker - light shining on beaker - method of varying the light intensity – eg changing distance of lamp from plant - method of controlling other variables - use same pond weed or same length of pond weed - temperature: water bath or heat screen - CO₂ - leave sufficient time at each new light intensity before measurements taken - method of measuring photosynthesis – eg counting bubbles of gas released or collecting gas & measuring volume in a syringe - measuring rate of photosynthesis by counting bubbles for set period of time - repetitions		extra information allow information in the form of a diagram		
Total			6	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
3(a)	a catalyst / speeds up a reaction	ignore it is not used up	1	AO1 2.5.1a/b
	it is a protein or it is specific / described or it has an active site	allow it only acts on one molecule	1	
3(b)	cytoplasm		1	AO1 2.1.1a 2.6.1a
3(c)	Advantage: any one from: • heat would denature proteins (in milk) • heat alters texture or flavour (of milk) • catalase / enzyme is specific or only affects hydrogen peroxide • less energy / fuel / lower temperature used so less expensive or less pollution Disadvantage: any one from: • (some pathogens may survive) causing illness • catalase / enzyme left in milk or may cause allergies or may alter taste		1	AO3 2.5, 2.5.2j
			1	
Total				5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
4(a)	digestive		1	AO1 2.2, 2.2.1d
4(b)(i)	covers / lines (surface)	allow protects ignore secretory functions	1	AO1 2.2.1b/c
4(b)(ii)	any three from: • produces enzyme(s) / protease • (digestive juice / enzyme) digests/breaks down protein • produces HCl / acid • (acid) kills bacteria/ pathogens or provides optimum pH	allow produces pepsin apply list principle for incorrect enzymes allow produces mucus allow (mucus) protects stomach lining against proteases or acid or against break down	3	AO1 2.2.1b/c 2.5.2b/c/e/ g
4(b)(iii)	contracts churns / mixes / moves stomach contents	ignore relaxes do not allow expands allow peristalsis or mechanical digestion	1 1	AO1 2.2.1b/c
Total			7	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
5(a)	testis / testes	allow testicle(s)	1	AO1 2.7.1f
5(b)(i)	B = 13.2 C = 6.6 E = 3.3	all 3 correct = 2 marks 2 or 1 correct = 1 mark If no marks awarded allow ecf for C and E based on answer to B ie C = $\frac{1}{2}$ B and E = $\frac{1}{2}$ C for one mark	2	AO2 2.7.1e/h
5(b)(ii)	6.6	allow twice answer for cell E in 5bi	1	AO2 2.7.1e/h/i
5(b)(iii)	mitosis	correct spelling only	1	AO1 2.7.1a/d/i
5(c)(i)	any two from: - cells that are able to divide - undifferentiated cells / not specialised - can become other types of cells / tissues or become specialised /differentiated	allow pluripotent	2	AO1 2.7.1k/l
5(c)(ii)	4-day embryo is a (potential) human life or destroying/damaging (potential) human life	allow cord would have been discarded anyway ignore reference to miscarriage allow cannot give consent	1	AO3 2.7
5(c)(iii)	perfect tissue match or hard to find suitable donors	allow same/matching antigens allow no danger of rejection allow no need to take immunosuppressant drugs (for life) ignore genetically identical or same DNA	1	AO2 2.7.1c

Question	Answers	Extra information	Mark	AO / Spec. Ref.
5(c)(iv)	stem cells have same faulty gene / allele / DNA / chromosomes	allow genetically identical ignore cells have the same genetic disorder	1	AO2 2.7.1c
Total			10	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
6(a)(i)	man has (inherited) polydactyly (PD) allele (from mother)	allow gene for allele	1	AO1/2/3 2.7, 2.7.2a/c/d 2.7.3a/b
	man has (inherited) other / normal / recessive allele from father		1	
	because father does not have PD allele or if father had it father would have had PD or father only has normal allele or father is homozygous recessive		1	
6(a)(ii)	0.5 / ½ / 1 in 2 / 1:1 / 50%	do not allow 1:2 or 50/50 allow 50:50	1	AO3 2.7, 2.7.2a/c/d 2.7.3a/b
6(b)	parental phenotypes: both brown	allow only on gametes answer line allow ecf from genotypes allow ecf from gametes do not penalise confusion of 'phenotypes' & 'genotypes' here	1	AO1/2/3 2.7, 2.7.2a/c/e
	parental genotypes: both Bb		1	
	gametes: B b and B b		1	
	offspring genotypes: BB (2)Bb bb		1	
	offspring phenotypes correctly assigned to genotypes: BB & Bb = brown bb = red		1	
Total	9			

Question	Answers	Extra information	Mark	AO / Spec. Ref.
7(a)	160 000	if incorrect answer / no answer: allow max. 2 for method: 1 mark for mean = total number ÷ area of ten quadrats eg $\frac{20}{0.625}$ or $\frac{20 \times 8}{5}$ or $\frac{160}{5}$ or 32 1 mark for final answer = mean x field area eg mean x 5000	3	AO2 2.4.1b
7(b)	Improvement: place quadrats randomly and Reason: avoid bias / (more) representative / (more) reliable Improvement: more quadrats and Reason: overcome random variation / (more) typical / (more) representative / (more) reliable / repeatable Improvement: larger quadrats or repeat when plants are bigger and Reason: less likely to miss plants	allow 1 mark if 2 correct improvements but no reasons / only incorrect reasons ignore accurate ,valid, precise and fair ignore anomalies	1 1 1	AO3 2.4, 2.4.1b
Total			6	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
8(a)	reference to interbreeding successfully between Island types	allow ref. to production of fertile offspring allow ref. to DNA analysis / comparison for 1 mark ignore ref. to grey fox	1 1	AO1/2 2.8.1f
8(b)(i)	(two ancestral populations) separated / isolated (by geographical barrier / sea) and genetic variation (in each population) or different / new alleles or mutations occur under different environment / conditions natural selection occurs or better adapted survived to reproduce so (favourable) alleles / genes / mutations passed on (in each population)	allow abiotic or biotic example allow different selection pressures ignore they adapt to their environment	1 1 1 1	AO1/2 2.8.1f
8(b)(ii)	any one from: - continued to mate with one another - few beneficial mutations (between island varieties) - similar conditions on each island so similar adaptations/features fit		1	AO3 2.8.1f
Total			8	