AQA Qualifications

GCSE
ADDITIONAL SCIENCE / BIOLOGY

BL2HP

Mark scheme

4405 / 4401

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Version: 1.0 Final

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 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

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.

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 are 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 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.

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)(i)	amino acid(s)	accept peptide(s) do **not** allow polypeptide(s)	1	AO1 2.5.2e
1(a)(ii)	protease		1	AO1 2.5.2e
1(b)(i)	2		1	AO3 2.5.2b, g
1(b)(ii)	repeat using smaller pH intervals between pH1 and pH3	do not allow other enzyme / substrate allow smaller intervals on both sides of / around pH2 allow smaller intervals on both sides of / around answer to (b)(i)	1 1	AO3 2.5.2b
1(b)(iii)	<u>enzyme / pepsin</u> denatured / shape changed <u>enzyme / pepsin</u> no longer fits (substrate)	do **not** allow enzyme killed allow enzyme 'destroyed' allow enzyme / pepsin does not work	1 1	AO1 / AO2 2.5.2a, b
1(c)	hydrochloric (acid)	allow phonetic spelling accept HCl allow HCL ignore hcl do **not** allow incorrect formula – e.g. H_2Cl / HCl_2	1	AO1 2.5.2g
Total			**8**	

Question	Answers	Extra information	Mark	AO / spec ref.
2			6	AO1 2.1.2a,b, c, 2.2.1d, 2.3.1a,b, c,g, 2.6.1

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.	An example is given of a named substance **or** a process **or** there is an idea of why diffusion is important eg definition.	At least one example of a substance is given **and** correctly linked to a process in either animals or plants.	There is a description of a process occurring in either animals or plants that is correctly linked to a substance **and** a process occurring in the other type of organism that is correctly linked to a substance.

examples of points made in the response

Importance of diffusion:

- to take in substances for use in cell processes
- products from cell processes removed

Examples of processes and substances:

- for gas exchange / respiration: O_2 in / CO_2 out
- for gas exchange / photosynthesis: CO_2 in / O_2 out
- food molecules absorbed: glucose, amino acids, etc
- water absorption in the large intestine
- water lost from leaves / transpiration
- water absorption by roots
- mineral ions absorbed by roots

extra information

Description of processes might include:

- movement of particles / molecules / ions
- through a partially permeable membrane
- (movement of substance) down a concentration gradient

osmosis: turgor / support / stomatal movements

Total			6

Question	Answers	Extra information	Mark	AO / spec ref.
3(a)	anaerobic respiration	allow phonetic spelling	1	AO1 2.6.2a, b,d
3(b)(i)	4.4	4.2, 4.3, 4.5 or 4.6 with figures in tolerance (6.7 to 6.9 and 2.3 to 2.5) and correct working gains 2 marks 4.2, 4.3, 4.5 or 4.6 with no working shown or correct working with one reading out of tolerance gains 1 mark correct readings from graph in the ranges of 6.7 to 6.9 **and** 2.3 to 2.5 but no answer / wrong answer gains 1 mark	2	AO2 2.6.2a, b,d
3(b)(ii)	more energy is needed / used / released (at 14 km per hour) not enough oxygen (can be taken in / can be supplied to muscles) so more anaerobic respiration (to supply the extra energy) **or** more glucose changed to lactic acid	do **not** allow energy production ignore work allow reference to oxygen debt do **not** allow less / no oxygen allow not enough aerobic respiration	1 1 1	AO1 / AO2 2.6.2a, b,d
Total			**6**	

Question	Answers	Extra information	Mark	AO / spec ref.
4(a)(i)	any **one** from: • can supply correct nutrients • can supply optimum concentrations / amount of nutrients • can maintain optimum pH	allow plants get enough (of required) nutrients ignore monitoring allow ions not lost / not wasted allow less chance of disease	1	AO2 2.3.1g, 2.4.1a
4(a)(ii)	provides oxygen (oxygen) for (aerobic) respiration (respiration) supplies energy (for the roots)	do **not** allow if extra gases or substances are given do **not** allow anaerobic allow use of energy – eg for <u>active</u> uptake of ions	1 1 1	AO1 / AO2 2.6.1b,e, 2.4.1a
4(b)(i)	plants can take in high amounts of all ions at this pH	allow the most ions taken up ignore reference to thickness of bars allow easier / easiest or faster / fastest	1	AO3 2.3.1g
4(b)(ii)	(to make chlorophyll which) traps light / energy for photosynthesis / for making food / for making organic substances	 allow correct named example – eg glucose / starch	1 1	AO2 2.3.1b
4(b)(iii)	nitrate	allow NO_3^- / NH_4^+ / ammonium ignore nitrite	1	AO1 2.3.1g
4(b)(iv)	to make protein / amino acids / enzymes	allow other correct example – eg DNA / ATP / chlorophyll / auxin	1	AO1 2.3.1g
Total			**9**	

Question	Answers	Extra information	Mark	AO / spec ref.
5(a)(i)	to get data re position of seaweed / of organism in relation to distance from sea / distance down shore / how long each seaweed was exposed		1 1	AO2 2.4.1b
5(a)(ii)	repeat several times elsewhere along the shore	minimum = 2 repeats	1 1	AO3 2.4
5(a)(iii)	bladder wrack is further up the shore (than the sea lettuce) / exposed for longer sea lettuce (only) in rock pools / in the sea / (only) in water	ignore found in dry areas / on bare rock	1 1	AO3 2.4.1a,b
5(b)	gets more light / closer to light (so) more photosynthesis	allow better access to CO_2 allow 1 mark for light for photosynthesis allow 1 mark for CO_2 for photosynthesis ignore reference to oxygen for respiration 'more' only needed once for 2 marks	1 1	AO1 / AO2 2.4.1a, 2.3.1c
Total			**8**	

Question	Answers	Extra information	Mark	AO / spec ref.
6(a)(i)	one form of a / one gene	do **not** allow 'a type of gene' allow a mutation of a gene	1	AO1 2.7.2c,e , 2.7.3a
6(a)(ii)	not expressed if dominant / other allele is present / if heterozygous **or** only expressed if dominant allele not present / or no other allele present	allow need two copies to be expressed / not expressed if only one copy / only expressed if homozygous	1	AO1 2.7.2c,e , 2.7.3a
6(b)(i)	two parents without PKU produce a child with PKU / **6** and **7** → **10**	allow 'it skips a generation'	1	AO3 2.7, 2.7.3a
6(b)(ii)	genetic diagram including: Parental gametes: 6: **N** and **n** **and** 7: **N** and **n** derivation of offspring genotypes: **NN Nn Nn nn** identification: **NN** and **Nn** as non-PKU **OR nn** as PKU correct probability only: 0.25 / ¼ / 1 in 4 / 25% / 1 : 3	accept alternative symbols if defined allow genotypes correctly derived from student's parental gametes allow correct identification of student's offspring genotypes do **not** allow 3 : 1 / 1 : 4 do **not** allow if extra incorrect probabilities given	1 1 1 1	AO2 / AO3 2.7, 2.7.3a
6(c)(i)	mitosis	correct spelling only	1	AO1 2.7.1a,c ,d
6(c)(ii)	8		1	AO2 2.7.1c,i, 2.7.3a, 2.7.3d
6(c)(iii)	DNA	allow deoxyribonucleic acid do **not** allow RNA / ribonucleic acid	1	AO1 2.7.2g, 2.7.3a, 2.7.3d

Question	Answers	Extra information	Mark	AO / spec ref.
6(d)(i)	may lead to damage to embryo / may destroy embryos / embryo cannot give consent	allow avoid abortion allow emotive terms – eg murder religious argument must be qualified allow ref to miscarriage allow idea of avoiding prejudice against disabled people allow idea of not producing designer babies	1	AO3 2.7, 2.7.3a
6(d)(ii)	any **one** from: • prevent having child with the disorder / prevent future suffering / reduce incidence of the disease • embryo cells could be used in stem cell treatment	ignore ref to having a healthy child ignore ref to selection of gender allow ref to long term cost of treating a child (with a disorder) allow ref to time for parents to become prepared	1	AO3 2.7, 2.7.3a
Total			**12**	

Question	Answers	Extra information	Mark	AO / spec ref.
7(a)	lack of fossils / fossils destroyed (due to soft parts) decaying / geological activity	allow lack of evidence allow an example – eg vulcanism or earth movements or erosion allow converse points re skeletons, shells, hard parts	1 1	AO1 2.8, 2.8.1 a,b,c
7(b)(i)	**A** and **B** did not mate successfully	'**A** and **B** did not mate' insufficient allow did not produce fertile offspring	1	AO2 2.8.1f
7(b)(ii)	any **two** from: • may not be mating season • **A** and **B** may not find each other attractive • this is just a one-off attempt / an anomaly / need repeats • may be juvenile / immature • may be the same sex	allow other sensible suggestion eg were put in unfavourable environment or one / both could be infertile	2	AO3 2.8.1f
7(c)	1. (two ancestral populations) separated (by geographical barrier / by land) / were isolated 2. genetic variation (in each population) **or** different / new alleles **or** mutations occur 3. different environment / conditions 4. natural selection occurs **or** some phenotypes survived **or** some genotypes survived 5. (favourable) alleles / genes / mutations passed on (in each population) 6. eventually two types cannot interbreed successfully	 allow abiotic or biotic example allow eventually cannot produce fertile offspring	1 1 1 1 1 1	AO1 / AO2 2.8.1f
Total			**11**	