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GCSE

# Additional Science / Biology

BL2HP

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 / ; e.g. 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,<br>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)      | surface of organ(s)   | allow covering / lining organ<br>allow named example of an organ, e.g. surface of stomach<br><br>allow the skin                                   | 1          | AO1<br>2.2.1b/c        |
| 1(a)(ii)     | A (cell) membrane<br><br>B cytoplasm  | allow phonetic spelling<br>allow cell surface membrane<br>do <b>not</b> allow (cell) wall   | 1<br><br>1 | AO1<br>2.1.1a          |
| 1(b)         | Protein synthesis   |   | 1          | AO1<br>2.1.1a          |
| 1(c)         | movement of <u>particles</u> / <u>molecules</u><br><br>from high to low concentration / down a concentration gradient | allow movement of ions / atoms<br>ignore carbon dioxide or other named substance<br><br>ignore along / across gradient<br>ignore through membrane | 1<br><br>1 | AO1<br>2.1<br>2.1.2a/b |
| <b>Total</b> |   |   | <b>6</b>   |                        |

| Question  | Answers   | Extra information  | Mark   | AO / Spec. Ref.  |  |
|---|---|--|--|------------------|--|
| 2   |   |  | 6  | AO1/2/3          |  |
| 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.   |   |  |  | 2.4              |  |
|   |   |  |  | 2.4.1a/b<br>Prac |  |
| 0 marks   | Level 1 (1–2 marks)   | Level 2 (3–4 marks)  | Level 3 (5–6 marks)  |                  |  |
| No relevant content.  | A simple correct statement is made about the investigation, e.g. counting plants in a quadrat<br><b>or</b> measuring pH<br><b>or</b> random placement of a quadrat. | There is a description of how a quadrat could be used to collect data at different locations.<br><b>or</b><br>how a pH meter could be used to collect data at different locations.<br><b>For four marks</b> an additional point is made e.g. reference to randomness <b>or</b> compare to other's results. | There is a description of how a quadrat <b>and</b> pH meter could be used to collect data at different locations.<br><b>For full marks</b> an additional point to ensure validity is made e.g. repeat in a different marshland <b>or</b> randomness <b>or</b> measure pH at the same depth each time <b>or</b> large number of repeats <b>or</b> graph or correlate results. |                  |  |
| <b>examples of points made in the response:</b> <ul style="list-style-type: none"> <li>• placing of quadrat and measuring plants</li> <li>• randomly in area where plant is growing</li> <li>• randomly in area where plant is not growing</li> </ul><br><ul style="list-style-type: none"> <li>• many times</li> <li>• score number <b>or</b> % cover <b>or</b> dry mass or heights of plants per quadrat</li> <li>• measure soil pH in each quadrat</li> <li>• control variables such as measurements at same depth</li> <li>• repetition of pH measurements in a quadrat</li> <li>• calculate mean pH for each quadrat</li> <li>• relate quantity of plants to soil pH – e.g. graph</li> </ul> |   | <b>extra information</b> <ul style="list-style-type: none"> <li>allow</li> <li>• regular intervals along a transect</li> <li>• from an area where plants are growing to an area where plants are not growing</li> </ul><br>allow presence / absence  |  |                  |  |
| <b>Total</b>  |   |  | <b>6</b>   |                  |  |

| Question  | Answers   | Extra information  | Mark | AO / Spec. Ref.       |
|-----------|---|--|------|-----------------------|
| 3(a)      | sugar(s) / glucose  | allow maltose<br>do not allow if extra incorrect answers   | 1    | AO1<br>2.5.2d<br>Prac |
| 3(b)(i)   | any <b>two</b> from: <ul style="list-style-type: none"> <li>• volume of pH solution</li> <li>• volume of amylase / enzyme solution</li> <li>• volume of starch / suspension / substrate</li> <li>• time left (before mixing)</li> </ul>   | allow amount for volume<br>if neither mark given allow 1 mark for volume(s) of solution(s)<br><br>ignore time between samples<br><br>ignore ref. to (room) temperature<br><br>ignore ref. to concentration | 2    | AO2<br>2.5.2b<br>Prac |
| 3(b)(ii)  | 4 minutes: (dark) blue<br><b>and</b><br>6 minutes: (light) brown  | allow black<br>ignore purple<br>do <b>not</b> allow light blue<br>allow yellow / orange  | 1    | AO3<br>2.5.2b<br>Prac |
| 3(b)(iii) | any <b>two</b> from: <ul style="list-style-type: none"> <li>• take each reading more than once</li> <li>• use colour standards for deciding end-point</li> <li>• test more pH values between 6 and 8 <b>or</b> test at smaller pH intervals</li> <li>• test at shorter intervals</li> <li>• same temperature (in a water bath)</li> </ul> | ignore take more readings<br>allow compare with another group<br>allow use a colorimeter<br>ignore wider range of pH unqualified<br><br>allow example – e.g. every half min                                | 2    | AO3<br>2.5.2b<br>Prac |



|                 |   |   |          |                   |
|-----------------|---|---|----------|-------------------|
| <b>3(b)(iv)</b> | no reaction <b>or</b> stays (dark) blue<br><b>or</b> takes >9 minutes | allow takes longer  | 1        | AO2/3<br>2.5.2a/b |
|                 | enzyme denatured  | allow description of denaturing,<br>i.e. shape change<br><br>allow description of trend on<br>graph | 1        |                   |
| <b>Total</b>    |   |   | <b>8</b> |                   |

| Question  | Answers  | Extra information   | Mark       | AO / Spec. Ref.          |
|-----------|--|---|------------|--------------------------|
| 4(a)      | carbon + water $\longrightarrow$ glucose + oxygen<br>dioxide   | LHS = 1 mark<br>RHS = 1 mark<br><br>allow sugar instead of glucose, ignore starch<br>allow correct formulae:<br>H <sub>2</sub> O, CO <sub>2</sub> , C <sub>6</sub> H <sub>12</sub> O <sub>6</sub> and O <sub>2</sub><br>if words <b>and</b> formulae given, accept correct words and ignore incorrect formulae<br>ignore balancing<br>ignore light / heat / energy / chlorophyll on LHS<br>do <b>not</b> allow light / heat / energy on RHS | 2          | AO1<br>2.3.1a            |
| 4(b)(i)   | 16   | allow answers in range 15.8 to 16.2   | 1          | AO2<br>2.3<br>2.3.1c     |
| 4(b)(ii)  | 25 (%)   | ignore 0.25<br>allow ecf from answer to <b>bi</b>   | 1          | AO2<br>2.3<br>2.3.1c     |
| 4(b)(iii) | no extra photosynthesis <b>or</b> maximum rate is reached<br><br>(so) no extra yield <b>or</b> less profit <b>or</b> not cost-effective <b>or</b> waste of money | ignore graph levels off<br><br>allow CO <sub>2</sub> not limiting <b>or</b> another factor is limiting (the rate of photosynthesis)<br><br>ignore cost unqualified  | 1<br><br>1 | AO2/AO3<br>2.3<br>2.3.1c |

|                 |  |  |            |                             |
|-----------------|--|--|------------|-----------------------------|
| <b>4(b)(iv)</b> | increased temperature<br><br>increased light (intensity) | allow use of a heater<br><br>allow turn on lamps<br><br>allow increased<br>minerals / ions / salts /<br>water / correct named<br>example<br><br>if no other marks<br>awarded allow one<br>mark for temperature<br><b>and</b> light | 1<br><br>1 | AO1<br><br>2.3,<br>2.3.1c,d |
| <b>Total</b>    |  |  | <b>8</b>   |                             |

| Question | Answers  | Extra information | Mark | AO / Spec. Ref.          |
|----------|--|-------------------|------|--------------------------|
| 5(a)     | any <b>two</b> from: <ul style="list-style-type: none"><li>• to avoid a psychological effect <b>or</b> avoid cyclists trying harder in one session <b>or</b> avoid cyclists pedalling for longer</li><li>• to avoid bias(ed results)</li><li>• to show the true effect of consuming glucose <b>or</b> to give a valid comparison</li></ul> |                   | 2    | AO2/3<br>2.6<br>2.6.1b/f |

|                       |  |   |          |   |
|-----------------------|--|---|----------|---|
| <p><b>5(b)(i)</b></p> | <p>any <b>four</b> from:</p> <p>Pro:</p> <ul style="list-style-type: none"> <li>• exercise is standardised / same intensity / same cyclists</li> <li>• results show blood glucose level doesn't fall too low with glucose drink</li> <li>• extra hour of cycling <b>or</b> cycle longer with glucose drink / with higher blood glucose</li> <li>• it was a blind trial <b>or</b> cyclists don't know if they are taking a placebo</li> </ul> <p>Con:</p> <ul style="list-style-type: none"> <li>• sample size is too small <b>or only 7</b></li> <li>• no other athletes tested <b>or only</b> tested on cyclists</li> <li>• <b>only</b> tested once / no repetition</li> <li>• effect may be due to hydration level (as opposed to glucose)</li> <li>• other factors before / outside of the sessions may not be controlled, e.g. diet, training regime, drugs, health</li> <li>• no data concerning variation between individuals' results</li> <li>• should have been a double-blind trial</li> </ul> | <p>max 3 marks for only pros or cons given</p> <p>points must clearly relate to a pro or con</p> <p>allow with glucose drink, blood glucose stays high or stays higher than placebo</p> <p>allow suggested improvement – e.g. should have some cycling with and some without glucose at same time, then swap for 2<sup>nd</sup> session</p> | <p>4</p> | <p>AO3</p> <p>2.6</p> <p>2.6.1b/f</p> <p>2.6.2d</p> |
|-----------------------|--|---|----------|---|

|                        |   |  |                                     |  |
|------------------------|---|--|-------------------------------------|--|
| <p><b>5(b)(ii)</b></p> | <p>increased <u>oxygen</u> supply</p> <p>increased removal of <u>carbon dioxide</u></p> <p>increased <u>respiration</u></p> <p>so increased <u>energy</u> release for muscle contraction / action</p> | <p>'increased' / 'more' must be given at least once for full marks</p> <p>allow idea of less lactic acid <b>or</b> less (muscle) fatigue <b>or</b> less oxygen debt <b>or</b> less anaerobic respiration</p> <p>do <b>not</b> allow increased anaerobic respiration</p> <p>do <b>not</b> allow makes (more) energy</p> | <p>1</p> <p>1</p> <p>1</p> <p>1</p> | <p>AO1</p> <p>2.6.1b/f/g/h</p> <p>2.6.2d</p> |
| <p><b>Total</b></p>    |   |  | <p><b>10</b></p>                    |  |

| Question  | Answers   | Extra information   | Mark                         | AO / Spec. Ref.        |
|-----------|---|---|------------------------------|------------------------|
| 6(a)(i)   | 46<br>or<br>23 pairs  |   | 1                            | AO1<br>2.7.2b          |
| 6(a)(ii)  | (alternative / different) form(s) of a gene / of the same gene  |   | 1                            | AO1<br>2.7.2c          |
| 6(a)(iii) | only expressed if the dominant (allele) is not present / if the other (allele) is not present<br>or<br>only expressed if 2 (recessive alleles) are present  | allow won't be expressed if the dominant allele is present  | 1                            | AO1<br>2.7.2e          |
| 6(b)(i)   | having 2 different alleles  | do <b>not</b> allow 2 different genes<br>ignore carrier   | 1                            | AO1<br>2.7             |
| 6(b)(ii)  | genetic diagram including:<br><br>correct gametes <b>or</b> parental genotypes<br><b>N</b> and <b>n</b> <u>and</u> <b>N</b> and <b>n</b><br><b>or</b> <b>Nn</b> <u>and</u> <b>Nn</b><br><br>offspring genotypes correctly <u>derived</u> :<br><b>NN Nn Nn nn</b><br><br>identification of <b>nn</b> as AKU<br><br>correct probability only: 0.25 / ¼ / 1 in 4 / 25% / 1 : 3 | allow alternative symbols if defined<br><br>do <b>not</b> allow if alternative symbols used and not defined<br><br>allow genotypes correct for student's parental gametes<br><br>allow correct identification of student's offspring genotypes<br><br>do <b>not</b> allow 3 : 1 / 1 : 4<br>do <b>not</b> allow if extra incorrect probabilities given | 1<br><br>1<br><br>1<br><br>1 | AO2/3<br>2.7<br>2.7.3a |

|                 |  |   |           |                      |
|-----------------|--|---|-----------|----------------------|
| <b>6(c)(i)</b>  | mitosis  | correct spelling only   | 1         | AO1<br>2.7.1a/d      |
| <b>6(c)(ii)</b> | 4  |   | 1         | AO2<br>2.7.1a,d      |
| <b>6(d)(i)</b>  | any <b>one</b> from: <ul style="list-style-type: none"> <li>• may lead to damage to embryo <b>or</b> may destroy embryos</li> <li>• embryo cannot give consent</li> <li>• ref to possible miscarriage (of implanted embryo)</li> <li>• idea of avoiding prejudice against disabled people</li> <li>• idea of not producing designer babies</li> </ul>  | allow emotive terms e.g. murder<br>allow disposal of embryos<br>allow embryos used in research<br><br>ignore religion unqualified         | 1         | AO3<br>2.7<br>2.7.3d |
| <b>6(d)(ii)</b> | any <b>one</b> from: <ul style="list-style-type: none"> <li>• prevent having child with the disorder <b>or</b> reduce incidence of <u>the</u> disease / inherited / <u>genetic</u> diseases <b>or</b> prevent future suffering of child from the disease</li> <li>• embryo cells could be used in stem cell treatment</li> <li>• can have another child without need for IVF</li> <li>• provides embryos for research</li> <li>• ref to avoiding long term cost of treating a child (with a disorder) <b>or</b> avoid parental stress</li> </ul> | ignore ref to having a healthy child<br><br>ignore ref to selection of gender<br><br>allow reference to parents being prepared in advance | 1         | AO3<br>2.7<br>2.7.3d |
| <b>Total</b>    |  |   | <b>12</b> |                      |



| Question | Answers  | Extra information   | Mark | AO / Spec. Ref.         |
|----------|--|---|------|-------------------------|
| 7(a)(i)  | organisms that can breed / mate<br>or organisms that can reproduce together  | allow converse points re. 2 different species   | 1    | AO1<br>2.8.1f           |
|          | successfully   | allow produces fertile offspring for 2 marks<br>allow can reproduce to form fertile offspring for 2 marks | 1    |                         |
| 7(a)(ii) | any <b>two</b> from: <ul style="list-style-type: none"> <li>• fossils show how species have changed or show changes over time</li> <li>• older fossils are simpler (than later ones or present day species)</li> <li>• fossils have features similar to present-day species</li> </ul> | allow fossils enable us to compare old species with present-day species                                   | 2    | AO1<br>2.8,<br>2.8.1a/d |

|                    |  |   |          |                         |
|--------------------|--|---|----------|-------------------------|
| <p><b>7(b)</b></p> | <p>any <b>six</b> from:</p> <ul style="list-style-type: none"> <li>• (geographical) isolation (prevents interbreeding)</li> <li>• similar environmental conditions required similar adaptations / favoured similar mutations</li> <li>• an example of a suitable similar adaptation is explained</li> <li>• lack of predators / dinosaurs allowed survival without flight<br/><b>or</b><br/>plentiful food near ground allowed survival without flight</li> <li>• genetic variation / mutation (in each population)</li> <li>• natural selection / better adapted survive</li> <li>• favourable alleles passed on</li> </ul> | <p>allow ref. to continental drift</p> <p>allow description via example</p> <p>allow survival of the fittest</p> <p>allow genes / mutations</p> | <p>6</p> | <p>AO1/2<br/>2.8.1f</p> |
|--------------------|--|---|----------|-------------------------|

|                     |  |                  |
|---------------------|--|------------------|
| <p><b>Total</b></p> |  | <p><b>10</b></p> |
|---------------------|--|------------------|