



GCSE

Biology

BL3HP
Mark scheme

4401
June 2016

Version 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 3 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) | <u>diffusion</u> <u>active transport</u> | this order only | 1 1 | AO2 3.1.1a/g |
| 1(b)(i) | concentration (of sugar) in the bag was higher (than in the drink) or higher concentration of <u>water</u> outside the bag or in the drink / boiling tube (so) <u>water</u> moved in (to the tubing) by osmosis | allow concentration (of sugar) in the drink was lower (than in the bag) allow higher <u>water</u> potential outside the bag or lower <u>water</u> potential inside the bag allow <u>water</u> moves down its concentration gradient do not allow sugar moving allow diffusion (of water) do not allow sugar moving by osmosis or water moving by active transport | 1 1 1 | AO2 3.1.1.a/b/c |
| 1(b)(ii) | B | | 1 | AO3 3.1.1a/b/c |
| 1(b)(iii) | close(st) to the concentration in the bag or to 5% (so rate of) diffusion / osmosis is slow | allow small(est) diffusion gradient or close(st) to an equilibrium allow (so) less water moves in (to the bag) ignore ref. to sugar | 1 1 | AO2/3 3.1.1a/b/c |
| Total | | | 8 | |

| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|--------------|--|--|----------|-----------------|
| 2(a) | guard (cells) | allow phonetic spelling | 1 | AO1 3.1.3e |
| 2(b)(i) | as carbon dioxide (concentration) increases, the (mean) number of stomata decreases | allow there is a <u>negative correlation</u> | 1 | AO2 3.1.3 |
| | (there is a) rapid drop initially | allow use of any number between 1.5 and 3.0 to indicate "initially" | 1 | |
| 2(b)(ii) | (there is) more carbon dioxide so plant doesn't need as many stomata (to obtain the amount needed) or (there is) less carbon dioxide so the plant needs more stomata (to obtain enough) | | 1 | AO3 3.1.3c |
| 2(c)(i) | may lose too much water | allow plant may wilt ignore references to oxygen / carbon dioxide plants lose a lot of water is insufficient ignore flaccid | 1 | AO3 3.1.3d |
| 2(c)(ii) | any one from: <ul style="list-style-type: none"> • hot • dry • windy | ignore environments unqualified eg desert | 1 | AO3 3.1.3d |
| Total | | | 6 | |

| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|--|--|---|--|---|
| 3 | | | 6 | AO1 3.1.1a/b/g 3.1.1a/d 3.2.3a |
| 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 points are made | At least one process (P) for obtaining a material is given or at least one vessel (V) and the material it carries is given or there is a description of the direction of movement (M) for at least one material | At least one process for obtaining a specified material is given and is correctly linked to the vessel that the material is transported in or correctly linked to a description of the direction of movement of the material | Processes used for obtaining specified materials are given. and correctly linked to the vessels that the materials are transported in or correctly linked to a description of the direction of movement of the materials. For full credit , in addition to the above descriptors at least one of the processes must be linked to the vessel that the material is transported in and the direction of the movement of the material. | |
| <p>examples of points made in the response</p> <p>Ions: (P) taken up by diffusion or active transport</p> <ul style="list-style-type: none"> from an area of high to low concentration (diffusion) or an area of low to high concentration (active transport) <p>(V) travels in the xylem (M) to the leaves or from the roots / soil</p> <p>Water: (P) taken up by osmosis</p> <ul style="list-style-type: none"> from an area of low to high concentration <p>(V) travels in the xylem (M) to the leaves or from the roots / soil (P) transpiration stream</p> <ul style="list-style-type: none"> movement replaces water as it evaporates from leaves <p>(V) in the xylem</p> <p>Sugar: (P) made during photosynthesis (V) travels in the phloem (M) to other parts of the plant or to storage organs or travels up and down</p> | | <p>extra information</p> <p>allow high concentration of water to low concentration of water allow from high water potential to low water potential ignore along a concentration gradient</p> | | |
| Total | | | 6 | |

| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|-----------------|---|---|----------|-----------------------------|
| 4(a)(i) | forest at the edges (of the island) has been removed | allow centrally the forest remains | 1 | AO3 3.4.2 |
| | an appropriate area on the island is identified eg south east or bottom right | | 1 | |
| 4(a)(ii) | any two from: <ul style="list-style-type: none"> • (to provide land) for farming / agriculture • (to provide land) for quarrying • (to provide land / wood) for building • to provide fuel • to produce paper | allow to provide timber allow forest fires | 2 | AO2 3.4.1c 3.4.2c |
| 4(b) | any two from: <ul style="list-style-type: none"> • decreased biodiversity • loss of habitats • increased carbon dioxide (concentration) • global warming | allow effects of global warming eg flooding / rise in sea level allow soil erosion | 2 | AO3 3.4.1c 3.4.2a/b/c |
| Total | | | 6 | |

| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|-----------------|---|---|----------|--------------------|
| 5(a) | (diaphragm) down or (becomes) flattened | do not allow up / in / expands ignore out ignore reference to contraction | 1 | AO1 3.1.2c |
| | (volume) increases | | 1 | |
| 5(b)(i) | (healthy alveolus has a) larger surface area | allow larger SA:Volume ratio accept converse for alveoli from person with emphysema allow walls between alveoli disintegrate or fluid accumulation in alveoli | 1 | AO2 3.1.1h/k |
| 5(b)(ii) | less oxygen into the blood / muscles | less only needed once | 1 | AO2 |
| | (so) less respiration | ignore ref. to anaerobic respiration | 1 | 3.1.1h/k 3.1.2b |
| | (and therefore) less energy is released (for exercise) | do not allow energy is produced / made do not allow energy for respiration | 1 | |
| Total | | | 6 | |

| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|-----------------|---|--|----------|-----------------|
| 6(a)(i) | doesn't have valves | allow veins have valves | 1 | AO1 3.2.1e |
| | has a thicker wall or thicker layer of muscle | allow has a smaller lumen ignore references to elastic (in walls) | 1 | |
| 6(a)(ii) | any two from: <ul style="list-style-type: none"> • (artery has) more oxygen • (artery has) more glucose • (artery has) less carbon dioxide • (artery has) less lactic acid | ignore reference to pressure accept converse for veins if veins is clearly stated allow (artery has) more amino acids / fatty acids ignore urea | 2 | AO1 3.2.1g |
| 6(b) | any two from: <ul style="list-style-type: none"> • no rejection • abundant supply • low risk of infection • longer shelf life | ignore side effects allow no tissue matching required allow named example ie HIV, CJD allow less space needed for storage | 2 | AO2/3 3.2 |
| Total | | | 6 | |

| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|--------------|--|--|----------|-----------------|
| 7 | blood vessels supplying skin | ignore hair erection | 1 | AO1 3.3.2e |
| | constrict | allow vasoconstriction do not allow capillaries /veins constricting do not allow moving blood vessel | 1 | |
| | less blood flow (to / through capillaries / to skin) | allow blood flows further away from skin surface | 1 | |
| | so less energy is lost (to the surroundings) | allow less heat is lost | 1 | |
| | 'shivering' by <u>muscle</u> (contraction) | allow <u>muscles</u> contract (and relax) rapidly | 1 | |
| | releasing energy or respiring (more) | allow 'heat produced' do not allow energy produced / made do not allow energy for respiration allow sweating stops / reduces | 1 | |
| Total | | | 6 | |

| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|-----------------|---|--|----------|------------------|
| 8(a) | immune system | allow white blood cells / lymphocytes | 1 | AO1 3.3.1g/h |
| | produces antibodies | ignore phagocytes | 1 | |
| | (which) attack the antigens on the transplanted organ / pancreas | allow transplanted organs have foreign antigens at start of explanation and linked to attacking the organ | 1 | |
| 8(b)(i) | change / rise detected by the sensor | max 2 if no ref. to artificial pancreas | 1 | AO1/2 3.3.3/a |
| | information used to calculate how much insulin she is going to need (bring her blood glucose back to normal) | | 1 | |
| | (pump delivers) insulin into the blood | 1 | | |
| | (causing) glucose to move into cells | allow (liver) converts glucose to glycogen | 1 | |
| 8(b)(ii) | <p>any one from:</p> <ul style="list-style-type: none"> it is more accurate or less chance of human error (glucose) level will remain more stable or no big rises and falls in blood sugar levels you don't forget to test and / or inject insulin if ill or in coma insulin is still injected | ignore continuous and automatic unqualified | 1 | AO3 3.3.3 |
| Total | | | 8 | |

| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|--------------|--|--|----------|------------------|
| 9(a)(i) | fewer cows | | 1 | AO2/3 |
| | any one from: <ul style="list-style-type: none"> less methane less CO₂ in the atmosphere because of less deforestation or less plants consumed. | do not allow CH ⁴ allow less CO ₂ released into the atmosphere because less fuel used e.g. to heat cowsheds or to transport meat do not allow CO ² | 1 | 3.4.2c 3.4.3a |
| 9(a)(ii) | any two from: <ul style="list-style-type: none"> could be mass produced to feed an increasing population disease free meat no / low fat no harm to animals or less intensive farming antibiotic free meat more land available for farming crops | allow (may be) suitable for vegetarians allow no energy loss along a food chain | 2 | AO3 3.4.4a/b |
| 9(b) | fungus / <i>Fusarium</i> | ignore stirring / mixing and temperature | 1 | AO1 3.4.4d |
| | with <u>glucose</u> (syrup) | | 1 | |
| | in aerobic conditions or in presence of oxygen | ignore air | 1 | |
| | mycoprotein is harvested / purified | allow ammonia added (as source of nitrogen) | 1 | |
| Total | | | 8 | |