# GCSE
# COMBINED SCIENCE: TRILOGY
# 8464/B/2H

Biology Paper 2H

**Mark scheme**

June 2019

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

Copyright © 2019 AQA and its licensors. All rights reserved.
AQA retains the copyright on all its publications. However, registered schools/colleges for AQA are permitted to copy material from this booklet for their own internal use, with the following important exception: AQA cannot give permission to schools/colleges to photocopy any material that is acknowledged to a third party even for internal use within the centre.

# 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
- the Assessment Objectives, level of demand 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 | 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

Marks should be awarded for each stage of the calculation completed correctly, as students are instructed to show their working. Full marks can, however, be given for a correct numerical answer, without any working shown.

## 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 Allow

In the mark scheme additional information, 'allow' is used to indicate creditworthy alternative answers.

### 3.9 Ignore

Ignore 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.

### 3.10 Do <u>not</u> accept

Do **not** accept means that this is a wrong answer which, even if the correct answer is given as well, will still mean that the mark is not awarded.

## 4. Level of response marking instructions

Extended response questions are marked on level of response mark schemes.

- Level of response mark schemes are broken down into levels, each of which has a descriptor.
- The descriptor for the level shows the average performance for the level.
- There are two or three marks in each level.

Before you apply the mark scheme to a student's answer, read through the answer and annotate it (as instructed) to show the qualities that are being looked for. You can then apply the mark scheme.

**Step 1: Determine a level**

Start at the lowest level of the mark scheme and use it as a ladder to see whether the answer meets the descriptor for that level. The descriptor for the level indicates the different qualities that might be seen in the student's answer for that level. If it meets the lowest level then go to the next one and decide if it meets this level, and so on, until you have a match between the level descriptor and the answer.

When assigning a level you should look at the overall quality of the answer. Do **not** look to penalise small and specific parts of the answer where the student has not performed quite as well as the rest. If the answer covers different aspects of different levels of the mark scheme you should use a best fit approach for defining the level.

Use the variability of the response to help decide the mark within the level, ie if the response is predominantly level 2 with a small amount of level 3 material it would be placed in level 2 but be awarded a mark near the top of the level because of the level 3 content.

**Step 2: Determine a mark**

Once you have assigned a level you need to decide on the mark. The descriptors on how to allocate marks can help with this.

The exemplar materials used during standardisation will help. There will be an answer in the standardising materials which will correspond with each level of the mark scheme. This answer will have been awarded a mark by the Lead Examiner. You can compare the student's answer with the example to determine if it is the same standard, better or worse than the example. You can then use this to allocate a mark for the answer based on the Lead Examiner's mark on the example.

You may well need to read back through the answer as you apply the mark scheme to clarify points and assure yourself that the level and the mark are appropriate.

Indicative content in the mark scheme is provided as a guide for examiners. It is not intended to be exhaustive and you must credit other valid points. Students do **not** have to cover all of the points mentioned in the indicative content to reach the highest level of the mark scheme.

You should ignore any irrelevant points made. However, full marks can be awarded only if there are no incorrect statements that contradict a correct response.

An answer which contains nothing of relevance to the question must be awarded no marks.

| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|
| **01.1** | hold a ruler (just) above the (open) hand of the other student<br><br>drop the ruler and other student catches it<br><br>record where the ruler is caught | ignore near the hand<br><br>do **not** accept give verbal signal<br><br>ignore timing | 1<br><br>1<br><br>1 | AO1<br>4.5.2 |
| **01.2** | 193.5 | | 1 | AO2<br>4.5.2 |
| **01.3** | to compare the effect of no caffeine | allow as a control (group)<br>allow to show the effect of caffeine<br><br>do **not** accept control variable | 1 | AO3<br>4.5.2 |
| **01.4** | 0.217 (s) | allow any value in the range 0.2150 to 0.2180 | 1 | AO2<br>4.5.2 |
| **01.5** | as mass of caffeine increases the decrease / change in reaction time increases | allow converse<br><br>ignore caffeine decreases reaction time<br><br>do **not** accept the greater the increase in reaction time the greater the mass of caffeine | 1 | AO3<br>4.5.2 |
| **01.6** | their reaction time was greater (after the drink) | allow converse<br><br>allow slower / longer for greater<br><br>do **not** accept anomalous result | 1 | AO3<br>4.5.2 |

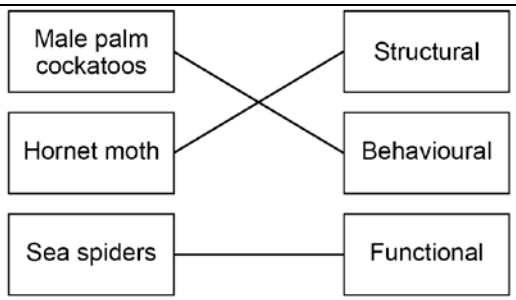
| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|
| **01.7** | 0.01(0) to 0.18(0)<br><br>**or**<br><br>0.18(0) to 0.01(0)<br><br>**or**<br><br>0.17(0) | allow values in range 0.008 to 0.012 **and** 0.178 to 0.182<br><br>allow correct calculation from values in range<br><br>if no values are given, allow answers in the range 0.166 to 0.174<br><br>allow 0.01 ≤ C ≤ 0.18<br><br>ignore units | 1 | AO2<br>4.5.2 |
| **01.8** | any **two** from:<br>• (same range of) age<br>• (same) sex / gender<br>• (same) height / weight / BMI<br>• all had no caffeine / medication / drugs earlier that day<br>• equally tired or (same) amount of sleep<br>• practice of the ruler drop test<br>• starting point of ruler / hand<br>• same point to take measurement above / below the thumb / finger<br>• using the same hand<br>• (same) number of students in each group | allow height ruler dropped from<br><br>do **not** accept volume / concentration of caffeine | 2 | AO3<br>4.5.2 |
| **01.9** | not automatic<br><br>(because) it involves the (conscious part of the) brain | allow it is a voluntary action<br><br>allow because it involves thinking / decision **or** conscious action | 1<br><br>1 | AO2<br>4.5.2 |
| **Total** | | | **13** | |

| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|
| **02.1** | methane | allow $CH_4$ **or** water (vapour) **or** $H_2O$<br><br>allow correct example such as CFCs, nitrous oxide, ozone | 1 | AO1<br>4.7.3.5 |
| **02.2** | any **two** from:<br>• ice caps melting<br>• rise in sea levels<br>• desertification<br>• extreme weather<br><br>• change in species distribution<br>• change in migration patterns<br>• loss of biodiversity<br><br>• coral bleaching<br>• crop failure **or** food insecurity<br>• loss of habitat qualified | ignore references to increased temperature and greenhouse gas / effect<br><br>allow storms **or** droughts **or** flooding<br><br>allow some species become extinct / endangered<br><br>allow correct examples such as polar bears losing ice<br><br>ignore forest fires | 2 | AO1<br>4.7.3.5 |

| Question | Answers | Mark | AO/ Spec. Ref |
|---|---|---|---|
| **02.3** | **Level 2:** Scientifically relevant facts, events or processes are identified and given in detail to form an accurate account. | 4–6 | AO1<br>4.7.2.2<br>4.4.1.1<br><br>4.4.1.3<br>4.4.2.1 |
| | **Level 1:** Facts, events or processes are identified and simply stated but their relevance is not clear. | 1-3 | |
| | No relevant content | 0 | |
| | **Indicative content**<br>Photosynthesis<br>• (carbon dioxide is) taken in through stomata / leaves<br>• (carbon dioxide is) used in photosynthesis<br>• to make glucose / carbohydrate<br>• (glucose used) to make other carbon compounds or named example such as proteins, lipids<br>• (glucose) stored as starch<br><br>Feeding<br>• plants are eaten / consumed by animals<br>• which use the carbon compounds to make other carbon compounds<br><br>Decay<br>• when plants / animals die they are decomposed / decayed<br>• by microorganisms<br>• which use the carbon compounds to make other carbon compounds<br><br>Respiration<br>• plants / animals / microorganisms respire<br>• (respiration) releases carbon dioxide back into the atmosphere<br><br>Level 2 answers must consider photosynthesis and at least one other process in the carbon cycle.<br>Level 2 answers must include some accurate detail. | | |
| **Total** | | **9** | |

| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|
| **03.1** | vectors are used to insert genes into cells | | 1 | AO1 4.6.2.4 |
| | vectors are usually plasmids or viruses | | 1 | |
| **03.2** | wheat not affected by spraying / herbicide | allow only weeds affected / killed by spraying / herbicide | 1 | AO1 AO2 4.6.2.4 4.7.1.1 |
| | (so) wheat gets more light / water / nitrates / ions / minerals | allow less competition for light / water / nitrates / ions / minerals<br>ignore nutrients<br>ignore carbon dioxide<br>ignore space | 1 | 4.4.1.1 |
| | (so) more photosynthesis / glucose / proteins (for more yield) | idea of more needed at least once for mp 2 and 3 | 1 | |
| **03.3** | any **two** from:<br>• production of human insulin / medicines<br>• crops resistant to diseases / pests<br>• crops resistant to frost<br>• crops resistant to drought<br>• crops / foods with added nutrients<br>• plants / crops with more / bigger fruits **or** higher yield<br>• crops with improved taste<br>• crops with improved shelf life | allow examples such as potatoes resistant to blight<br>allow examples such as golden rice with vitamin A gene<br>allow examples such as larger tomatoes | 2 | AO1 4.6.2.4 |

| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|
| **03.4** | identify genes linked to (certain) disease<br><br>so can lead to better prevention / treatment of that disease<br><br>**or**<br><br>identify genes causing inherited disorders (1)<br><br>so may prevent children being born with the disorder by using IVF **or** gene therapy (1)<br><br>**or**<br><br>tracing human migration patterns from the past **or** evolution of humans (1)<br><br>so to better understand the ancient history of humans (1) | allow correctly named diseases such as cancer / diabetes | 1<br><br>1 | AO1<br>AO2<br>4.6.1.3 |
| **Total** | | | **9** | |

| Question | Answers | Extra information | Mark | AO / Spec. |
|---|---|---|---|---|
| **04.1** | <br>all correct for **2** marks<br>allow **1** mark for one or two correct line(s)<br><br>additional lines from a box on the left negates the mark for that box | | 2 | AO2<br>4.7.1.4 |
| **04.2** | any **four** from:<br><br>• growing on other plants means support to absorb more light (for photosynthesis)<br><br>• bright colours attract pollinators<br>**or**<br>bright colours attract insects to transfer pollen<br><br>• large quantities of pollen (increases the likelihood of pollen transfer) and so more seeds / reproduction<br><br>• tiny / light seeds will travel long distances to grow in new areas<br><br>• many seeds mean many new plants so will out-compete other species | allow to obtain water / minerals / ions / glucose from the other plant<br>ignore nutrients<br><br>allow fertilisation for transfer of pollen<br><br>allow tiny / light seeds will travel away from competitors<br><br>allow many seeds so more (orchids) will survive | 4 | AO2<br>4.7.1.4<br>4.7.1.1<br>4.4.1.1 |

| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|
| **04.3** | any **four** from:<br><br>• mutations for purple flower (in ancestral species)<br><br>• isolation **or** change in environment e.g. area had more insects<br><br>• (plants with purple flowers) survive and breed<br><br>• (plants with purple flowers) pass on allele / gene / DNA / mutation<br><br>• until they were so different they could no longer interbreed (with the ancestral species) | <br><br>allow genetic variation gives purple flowers<br><br>allow purple orchid more suited to a new environment<br><br><br><br>allow genetic material for allele<br><br><br>allow breed successfully for interbreed | 4 | AO2<br>4.7.1.4<br>4.7.1.1<br>4.4.1.1 |
| **04.4** | species **D**<br><br>because it has the lowest number of amino acids different (in the sequence)<br><br>**or**<br><br>because it has the lowest number of differences in the sequence<br><br>**or**<br><br>only one / sixth amino acid is different | must be an attempt at an explanation to gain this mark<br><br>allow because it has the highest number of amino acids which are the same (in the sequence)<br><br>allow because it has only one difference in the sequence<br><br>allow only the glycine / gly has been changed to tyrosine / tyr | 1<br><br>1 | AO3<br>4.6.4<br>4.6.1.3<br>4.6.1.4 |
| **Total** | | | **12** | |

| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|
| **05.1** | repeat for another ten quadrats<br><br>use a random method to place the quadrats | | 1<br><br>1 | AO3<br>4.7.2.1 |
| **05.2** | | an answer of 4.8 x $10^5$ scores **5** marks<br><br>an answer of 481 766.4 **or** 481 766 **or** 480 000 scores **4** marks<br><br>an answer of 15 744 × 4 × 7.65 scores **3** marks<br><br>an answer of 15 744 ($m^2$) scores **2** marks | | AO2<br>4.7.2.1 |
| | (area of field =) 62 × 164 + 164 × 68 ÷ 2 **or** equivalent | | 1 | |
| | 15 744 ($m^2$) | | 1 | |
| | 15 744 × 4 × 7.65 | allow use of incorrect area<br><br>allow $\frac{7.65}{0.25}$ × 15744 | 1 | |
| | 481 766.4 | allow 481 766 **or** 480 000 | 1 | |
| | $4.8 \times 10^5$ | allow incorrect calculation expressed correctly | 1 | |

| Question | Answers | Mark | AO/ Spec. Ref |
|---|---|---|---|
| **05.3** | **Level 3:** Relevant points (reasons / causes) are identified, given in detail and logically linked to form a clear account. | 5–6 | AO3 |
| | **Level 2:** Relevant points (reasons / causes) are identified, and there are attempts at logical linking. The resulting account is not fully clear. | 3-4 | AO2 |
| | **Level 1:** Points are identified and stated simply, but their relevance is not clear and there is no attempt at logical linking. | 1–2 | AO1 |
| | No relevant content | 0 | |
| | **Indicative content**<br>• trees over / in field<br>• (which) reduce light for photosynthesis<br>• (so) fewer daisies there<br><br>• trees over / in field<br>• (which) take water / nitrates / ions from the soil<br>• (so) fewer daisies there<br><br>• trampling on sports pitches<br>• (will) kill plants<br>• (so) fewer daisies there<br><br>• competition from plants / grasses on field<br>• (will) use up water / nitrates / ions / space<br>• (so) fewer daisies there<br><br>• gardener may water / fertilise / mow field<br>• (which provides) more water / nitrates / ions<br>• (so) more / fewer daises grow there<br><br>• more insects / disease / animals in some areas<br>• (may) eat / kill plants<br>• (so) fewer daisies there<br><br>• school buildings<br>• (which) reduce light for photosynthesis<br>• (so) fewer daisies near school<br><br>• pollution / toxins from vehicles on roads<br>• (which will) reduce growth<br>• (so) fewer daisies near roads<br><br>• wrong pH **or** lack of ions **or** poor drainage **or** poor / wet / dry soil in some areas<br>• (which will) slow growth<br>• (so) fewer daisies there<br>Level 3 answers must refer to several factors in accurate detail | | 4.7.1.1<br>4.7.1.2<br>4.7.1.3<br>4.4.1.1 |
| **Total** | | **13** | |

| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|
| **06.1** | regulation / control / maintenance of internal conditions (of a cell / body)<br><br>for optimum (cell / enzyme activity) | allow keeping the internal conditions (of a cell / body) the same<br><br>allow description of optimum functioning (of cell / body) | 1<br><br>1 | AO1<br>4.5.1 |
| **06.2** | glucagon | correct spelling only | 1 | AO1<br>4.5.3.2 |
| **06.3** | any **two** from:<br>• fasting blood glucose is higher than normal range<br>• reached a very high concentration after glucose drink<br>• did not return to normal after 3 hours<br>**or**<br>fell slowly after reaching peak.<br><br>use of correct data in comparison to normal ranges given for any of the above points | <br><br>allow ± half a small square for values quoted from the graph<br><br>ignore references to person A | 2<br><br>1 | AO3<br>4.5.3.2 |
| **06.4** | (person A has Type) 2 (pancreas) producing (lots of) insulin but body cells cannot respond to it.<br><br>(person B has Type) I (pancreas) not producing enough insulin (to control concentration of glucose in the blood) | type of diabetes must be correct<br><br>allow cells becoming resistant to insulin for respond to insulin.<br>do **not** accept the person has become resistant to insulin | 1<br><br>1 | AO3<br>4.5.3.2 |

| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|
| **06.5** | starving children have used up their glycogen stores | allow starving children have no / low glycogen stores | 1 | AO1<br>AO2<br>4.4.2.1 |
| | (so) would need (liver enzyme) to release glucose from fats | | 1 | 4.5.3.2 |
| | as enzyme is stopped from working they get low / no glucose | allow no working enzyme leads to hypoglycaemia | 1 | |
| | (cell) respiration is insufficient (so they die) | allow starving children use proteins to release energy (which leads to death) | 1 | |
| | children that are not starving have glycogen stores in liver / muscle | | 1 | |
| | (so) glucagon will continue to release glucose (into the blood for them) | | 1 | |
| **Total** | | | **14** | |