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

Biology Paper 2H

**Mark scheme**

June 2020

Version: 1.1 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 Examiner.

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.

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# 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 not 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 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.

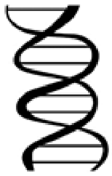
The exemplar materials used during standardisation will help. There will be an answer in the standardising materials which will correspond with each level of the mark scheme. This answer will have been awarded a mark by the Lead Examiner. You can compare the student's answer with the example to determine 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** |  | | 1 | AO2<br>4.6.1.3 |
| **01.2** | any **one** from:<br>• 2 strands / chains that are twisted / coiled / spiralled<br>• double helix<br>• (long) polymer | allow cross links between 2 strands / chains<br>allow reference to nucleotides or sugars, phosphates and bases | 1 | AO1<br>4.6.1.3 |
| **01.3** | | in this order only | | AO1<br>4.6.1.3 |
| | amino acids | | 1 | |
| | protein | allow polypeptide | 1 | |
| **01.4** | all the genetic material (of an organism) | allow DNA / genes for genetic material<br>ignore chromosomes | 1 | AO1<br>4.6.1.3 |
| **01.5** | tracing how aboriginal people spread across Australia | | 1 | AO2<br>4.6.1.3 |
| **01.6** | variation | ignore genetic/environmental | 1 | AO1<br>4.6.2.1 |

| | | | | |
|---|---|---|---|---|
| **01.7** | stronger / larger (shell)<br>(so) more likely to (survive and) breed<br>**or**<br>(so) more likely to (survive and) pass on genes<br>**OR**<br>(better) camouflaged (1)<br>(so) less likely to be eaten and will breed more (1) | | 1<br>1 | AO2<br>4.6.2.2 |
| **Total** | | | **9** | |

| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|
| **02.1** | any **four** from:<br>• (stimulus is) detected by the receptor<br>• (initiates) an electrical impulse<br>• (impulse) travels via the neurones<br>• sensory, relay and motor<br>• crosses synapses<br>• (crosses synapses) as a chemical | allow in this order only | 4 | AO1<br>AO2<br>4.5.2 |
| **02.2** | **Level 2:** The method would lead to the production of a valid outcome. All key steps are identified and logically sequenced. | | 3–4 | AO2 |
| | **Level 1:** The method would not lead to a valid outcome. Some relevant steps are identified, but links are not made clear. | | 1–2 | AO1 |
| | No relevant content | | 0 | 4.5.2<br>RPA 6 |
| | **Indicative content**<br>• select at least 3 people<br>• do reaction time test at least 3 times using right hand<br>• details on how to do test in valid manner<br>• find a mean<br>• remove anomalous readings<br>• repeat for each person for left hand<br>• select people of same age<br>• select people of same gender<br>• same time of day<br>• other control such as amount of coffee, sleep.<br><br>To access level 2 the right hand and left hand of each person must be compared | | | |
| **02.3** | $\frac{(0.2 + 0.4 + 0.3 + 0.4 + 0.2 + 0.3)}{6}$<br>**or**<br>$\frac{1.8}{6}$ | | 1 | AO2<br>4.5.2<br>RPA 6 |
| | 0.3 | | 1 | |

| | | | | |
|---|---|---|---|---|
| **02.4** | reaction time | allow time | 1 | AO2<br>4.5.2<br>RPA 6 |
| **02.5** | students who play tennis (regularly) had shorter / faster (mean) reaction time(s) | | 1 | AO3<br>4.5.2<br>RPA 6 |
| **02.6** | any **one** from:<br>• overlap in times between two groups<br>• small difference in (mean) times<br>• small sample used | allow correctly described as comparative data<br>allow students who did not play tennis may have played other (ball) games | 1 | AO3<br>4.5.2<br>RPA 6 |
| **Total** | | | **13** | |

| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|
| **03.1** | the variety of all the different species (of organisms) on Earth<br>**or**<br>the variety of all the different species (of organisms) in a habitat / area / ecosystem | | 1 | AO1<br>4.7.3.1 |
| **03.2** | any **one** from: | | 1 | AO1<br>4.7.3.3 |
| | • compost | allow to improve soil (texture / drainage / quality)<br>allow to grow food / crops / plants<br>ignore farming unqualified<br>ignore as fertiliser | | |
| | • burning<br>**or**<br>as a fuel | | | |
| **03.3** | decay / burning of peat releases carbon dioxide (into the atmosphere) | do **not** accept peat bogs release carbon dioxide into the atmosphere | 1 | AO1<br>4.7.3.3<br>4.7.3.5 |
| | which is increasing global warming | allow a description of global warming or consequences<br><br>if no other mark awarded allow removal of a carbon sink / store for 1 mark | 1 | |

| | | | | |
|---|---|---|---|---|
| **03.4** | any **two** from:<br>• takes minerals from the soil as crops are harvested / removed<br>• leads to soil erosion<br>• farmers have to use fertilisers which pollute water / streams / lakes<br>• burning crop waste produces carbon dioxide<br>• using large farm machinery causes soil compaction | ignore nutrients<br>allow burning crop waste causes global warming<br>allow using large farm machinery releases carbon dioxide | 2 | AO3<br>4.7.3.2<br>4.7.3.3<br>4.7.3.5<br>4.7.3.6 |
| **03.5** | antibiotic passed into the environment in animal faeces / urine / sewage<br>**or**<br>antibiotic in animal faeces / urine / sewage flows into rivers | | 1 | AO2 |
| | bacteria in water / land become antibiotic resistant | allow named water or land pathogen such as typhoid / cholera / E coli | 1 | AO2 |
| | some of these bacteria are human pathogens | | 1 | AO3 |
| | (so) cause (human) diseases which now cannot be cured because they are antibiotic resistant | | 1 | AO3<br>4.6.3.4<br>4.7.3.2 |
| | | If no other marks awarded allow 1 mark for mention of antibiotics in milk / meat being consumed by humans. | | |
| **Total** | | | **10** | |

<table>
<tr><th>Question</th><th>Answers</th><th>Extra information</th><th>Mark</th><th>AO / Spec. Ref.</th></tr>
<tr><td><b>04.1</b></td><td>four daughter cells are formed<br>the parent cell divides twice</td><td></td><td>1<br>1</td><td>AO1<br>4.6.1.2</td></tr>
<tr><td><b>04.2</b></td><td>thyroid (gland)<br>adrenal (gland)<br>ovary / ovaries</td><td>in this order only</td><td>1<br>1<br>1</td><td>AO1<br>4.5.3.1</td></tr>
<tr><td><b>04.3</b></td><td colspan="2"><table>
<tr><th>Hormone</th><th>Name of gland which releases hormone</th><th>Target organ of hormone</th></tr>
<tr><td>Luteinising hormone (LH)</td><td>Pituitary gland</td><td><b>Ovary</b></td></tr>
<tr><td><b>Adrenaline</b></td><td>Adrenal gland</td><td><b>Heart / lungs / liver</b></td></tr>
<tr><td>Glucagon</td><td><b>Pancreas</b></td><td><b>Liver / muscle</b></td></tr>
</table></td><td>1<br>1<br>1</td><td>AO2<br>4.5.3.3<br>4.5.3.6<br>4.5.3.2</td></tr>
<tr><td><b>04.4</b></td><td>only need 1 parent plant<br>will produce (many genetically) identical plants</td><td>allow for <b>1</b> mark it is a faster process<br>allow for <b>1</b> mark will produce a large number of plants at one time<br>ignore clones unqualified</td><td>1<br>1</td><td>AO3<br>4.6.1.1</td></tr>
</table>

| | | | | |
|---|---|---|---|---|
| **04.5** | any **two** from:<br>• genetically identical so will all be susceptible to same diseases / pathogens<br>• no genetic variety for new colours / characteristics to offer customers<br>• no genetic variety leads to weaker / unhealthy plants (due to lack of evolution) | | 2 | AO3<br>4.6.1.1<br>4.6.2.2 |

| | | | |
|---|---|---|---|
| **Total** | | | **12** |

<table>
<tr><th>Question</th><th>Answers</th><th>Extra information</th><th>Mark</th><th>AO /<br>Spec. Ref.</th></tr>
<tr><td><b>05.1</b></td><td>(male gametes) X and Y<br>all offspring correct<br><table><tr><td></td><td></td><td colspan="2"><b>Female</b></td></tr><tr><td></td><td></td><td>X</td><td>X</td></tr><tr><td rowspan="2"><b>Male</b></td><td><b>X</b></td><td><b>XX</b></td><td><b>XX</b></td></tr><tr><td><b>Y</b></td><td><b>XY</b></td><td><b>XY</b></td></tr></table></td><td><br>allow correct offspring from incorrect gametes</td><td>1<br>1</td><td>AO1<br>AO2<br>4.6.1.6</td></tr>
<tr><td><b>05.2</b></td><td>It is (50%) chance if sperm cells which fertilised the egg has X (or Y) chromosome</td><td>allow each / every child / baby / pregnancy has a 50% chance of being male or female (so can be all same sex)</td><td>1</td><td>AO2<br>4.6.1.6<br>4.6.1.4</td></tr>
</table>

<table>
<tr><td><b>05.3</b></td><td>both parents shown as heterozygous</td><td></td><td>1</td><td>AO2</td></tr>
<tr><td></td><td>derivation correct to show 1 unaffected, 2 carriers and 1 affected offspring.<br><br><b>Woman</b><table><tr><td></td><td></td><td>T</td><td>t</td></tr><tr><td rowspan="2"><b>Man</b></td><td><b>T</b></td><td><b>TT</b></td><td><b>Tt</b></td></tr><tr><td><b>t</b></td><td><b>Tt</b></td><td><b>tt</b></td></tr></table></td><td>allow correct derivation from incorrect gametes</td><td>1</td><td>AO2</td></tr>
<tr><td></td><td><b>tt</b> identified as offspring with CF</td><td></td><td>1</td><td>AO2</td></tr>
<tr><td></td><td>correct ratio / probability from their derivations of <b>tt</b> e.g. 1:3, 1 in 4, 25%, 0.25</td><td></td><td>1</td><td>AO3<br><br>4.6.1.5<br>4.6.1.4</td></tr>
<tr><td><b>05.4</b></td><td>any <b>three</b> from:<ul><li>does not need IVF which is stressful / invasive</li><li>higher chance of successful pregnancy as risk of miscarriage is low compared to (30%) success rate of IVF</li><li>the test is freely available</li><li>the test can be carried out even once the mother is pregnant</li></ul></td><td>allow method 2 is not available to all couples who want it</td><td>3</td><td>AO3<br>4.5.3.5<br>4.6.1.5</td></tr>
</table>

| | | | | |
|---|---|---|---|---|
| **05.5** | any **one** from:<br>• child will (definitely) not have CF<br>• do not need to consider termination<br>• it is a way to have a child if couples are having fertility problems | | 1 | AO3<br>4.5.3.5<br>4.6.1.5 |
| **Total** | | | **11** | |

| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|
| **06.1** | archaea | allow archea or archaia as phonetic spelling | 1 | AO1<br>4.6.4 |
| **06.2** | horizontal line from –415 to –65 (labelled ammonites) | allow -410 to -420 for -415 (to -65)<br>allow oblique line | 1 | AO2<br>4.6.3.3 |
| **06.3** | ammonites = 350 (million years)<br>**and**<br>trilobites = 266 (million years) | allow range 345 to 355 | 1 | AO2<br>4.6.3.3 |
| | 84 million (years) or 84 000 000 | allow correct calculation from their answer for ammonites<br>allow answers in standard form | 1 | |
| **06.4** | 68 and 96 | allow +/- half a small square | 1 | AO2<br>4.6.3.3 |
| | [(96-68) ÷ 68] × 100 | | 1 | |
| | 41.17647…<br>**or**<br>41.2<br>**or**<br>41 | | 1 | |
| **Total** | | | **7** | |

| Question | Answers | Extra information | Mark | AO /<br>Spec. Ref. |
|---|---|---|---|---|
| **07.1** | **Level 2:** Scientifically relevant facts, events or processes are identified and given in detail to form an accurate account. | | 4–6 | AO1<br>4.7.3.4<br>4.7.3.5<br>4.7.1.2<br>4.7.3.6<br>4.7.2.2 |
| | **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><br>Reasons<br>• tropical rainforests cleared for land<br>• that land used to raise cattle, plant rice or plant crops such as coffee<br>• land cleared for mining<br>• that land used to grow biofuels or palm oil<br>• (temperate) forests cut down for wood for building / paper<br>• (temperate) forests cleared for farming (wheat / sheep)<br><br>Effects<br>• less trees to take in carbon dioxide for photosynthesis<br>• decay by microorganisms respiring releases carbon dioxide<br>• burning waste wood releases carbon dioxide<br>• build-up of carbon dioxide in atmosphere leads to greenhouse effect<br>• build-up of carbon dioxide in atmosphere leads to global warming<br>• consequences of global warming<br>• habitat loss<br>• leading to reduced biodiversity<br>• leading to soil erosion<br><br>Must consider both reasons and effects for Level 2. | | | |

| | | | | |
|---|---|---|---|---|
| **07.2** | (forests) involve gas exchange with the atmosphere | | 1 | AO1<br>4.4.1.2 |

| | | | | |
|---|---|---|---|---|
| **07.3** | (in forests) carbon dioxide is used and oxygen is released whereas in lungs it is oxygen used and carbon dioxide is released | allow gas exchange occurs by diffusion in the leaves of trees, but involves ventilation / breathing in the lungs of animals | 1 | AO1<br>4.4.2.1 |
| **Total** | | | **8** | |