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

Biology Paper 2F

**Mark scheme**

June 2021

Version: 1.0 Final Mark Scheme

2 1 6 G 8 4 6 4 B 2 F / M S

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 <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 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.

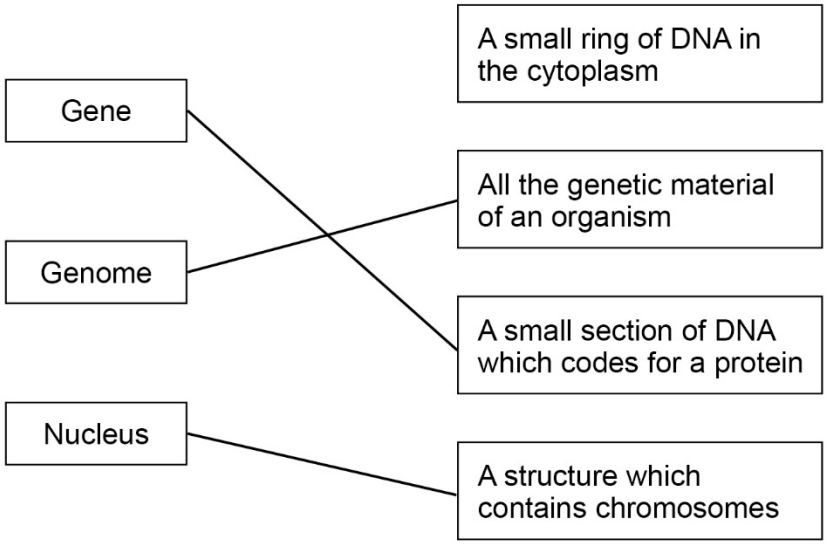
The exemplar materials used during standardisation will help. There will be an answer in the standardising materials which will correspond with each level of the mark scheme. This answer will have been awarded a mark by the Lead Examiner. You can compare the student's answer with the example to determine 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** | 23 | | 1 | AO1<br>4.6.1.2 |
| **01.2** | **Word** / **Meaning**<br><br><br>additional line from a box on the left negates the mark for that box | | 1<br>1<br>1 | AO1<br>4.6.1.4<br>4.6.1.3 |
| **01.3** | any **one** from:<br>• to survive<br>• so you do not eat the plants<br>• to stop you being harmed / poisoned | allow to protect them<br><br>allow stop you getting ill / dying | 1 | AO2<br>4.7.1.4 |
| **01.4** | heterozygous | | 1 | AO2<br>4.6.1.4 |
| **01.5** | tt | allow homozygous recessive | 1 | AO2<br>4.6.1.4 |

| | | | | |
|---|---|---|---|---|
| **01.6** | <table><tr><td></td><td></td><td colspan="2">Woman</td></tr><tr><td></td><td></td><td>T</td><td>t</td></tr><tr><td rowspan="2">Man</td><td>T</td><td>T T</td><td>Tt</td></tr><tr><td>t</td><td>Tt</td><td>tt</td></tr></table> | allow 1 or 2 genotypes correct for **1** mark | 2 | AO2<br>4.6.1.4 |
| **01.7** | 75% | allow **only** a probability consistent with student's derivation<br>if no answer to question **01.6** allow 75% | 1 | AO3<br>4.6.1.4 |
| **Total** | | | **10** | |

| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|
| **02.1** | the reaction time | | 1 | AO1<br>4.5.2<br>RPA6 |
| **02.2** | any **two** from:<br>• age<br>• sex<br>• previous intake of caffeine / coffee that day<br>• usual intake of caffeine / coffee (on previous days)<br>• concentration of caffeine / coffee<br>• volume of caffeine / coffee<br>• time of day<br>• amount / length of sleep<br>• health<br>• body mass<br>• same / type of reaction time program / software<br>• same keyboard<br>• prior experience with the reaction timer | allow gender<br><br>if neither given allow amount / mass of caffeine / drink **or** type / brand of coffee for **1** mark<br><br>allow fatigue<br>allow other drugs taken<br>allow (body) weight | 2 | AO1<br>4.5.2<br>RPA6 |
| **02.3** | any **one** from:<br>• (time) for the coffee / caffeine to work<br>• (time) for coffee / caffeine to be absorbed<br>• (time) for caffeine to reach the brain<br>• (time) for coffee / caffeine to get round the body | allow (time) for the coffee / caffeine to be digested<br>allow (time) for coffee to reach the brain | 1 | AO3<br>4.5.2<br>RPA6 |

| | | | | |
|---|---|---|---|---|
| **02.4** | eye | | 1 | AO2<br>4.5.2<br>RPA6 |
| **02.5** | muscle | | 1 | AO2<br>4.5.2<br>RPA6 |
| **02.6** | (reaction time is) decreased | allow reaction time is shorter<br>allow reactions are faster<br>allow (reaction) time is quicker | 1 | AO2<br>4.5.2<br>RPA6 |
| **02.7** | student 3 | | 1 | AO3<br>4.5.2<br>RPA6 |
| **02.8** | leave it out (and divide sum of the others by 4)<br>**or**<br>divide the sum of the others by 4 | ignore repeat the test | 1 | AO3<br>4.5.2<br>RPA6 |
| **Total** | | | **9** | |

| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|
| **03.1** | nut(s) → bird(s) → cat(s) | allow **1** mark for organisms in correct order (left to right) but arrows incorrect or missing<br><br>allow **2** marks for<br>cat(s) ← bird(s) ← nut(s)<br>do **not** accept<br>cat(s)bird(s) nut(s)<br>do **not** accept<br>cat(s) →bird(s) →nut(s) | 2 | AO2<br>4.7.2.1 |
| **03.2** | answer must be consistent with food chain given in question **03.1** | if no answer to question **03.1** allow bird(s) | 1 | AO2<br>4.7.2.1 |
| **03.3** | food<br><br>pathogens | | 1<br><br>1 | AO1<br>4.7.1.3 |
| **03.4** | 13.60 (mm) | allow 13.6 (mm) | 1 | AO2<br>4.6.2.2 |
| **03.5** | structural | | 1 | AO2<br>4.7.1.4 |
| **03.6** | variation<br><br>mutation<br><br>reproduction<br><br>generation | must be in this order | 1<br><br>1<br><br>1<br><br>1 | AO2<br>4.6.2.2 |

| | | | | |
|---|---|---|---|---|
| **03.7** | birds have a shorter life cycle than humans | | 1 | AO3<br>4.6.3.1<br>4.6.3.4 |
| **03.8** | bacteria can become resistant to antibiotics | | 1 | AO1<br>4.6.3.1<br>4.6.3.4 |
| **Total** | | | **13** | |

| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|
| **04.1** | Ourasphaira | | 1 | AO2<br>4.6.4 |
| **04.2** | decay | | 1 | AO2<br>4.6.3.2 |
| **04.3** | $8.9 \times 10^8$ years old | | 1 | AO2<br>4.6.3.2 |
| **04.4** | Carl Linnaeus | | 1 | AO1<br>4.6.4 |
| **04.5** | eukaryota | | 1 | AO1<br>4.6.4 |
| **04.6** | electron microscopes allow more detail to be seen inside cells | | 1 | AO1<br>4.6.4 |

| | | | | |
|---|---|---|---|---|
| **04.7** | any **two** from:<br>• drought<br>• ice age<br>• global warming | if none of these, allow climate change for 1 mark<br>ignore weather | 2 | AO1<br>4.6.3.3 |
| | • volcanic activity<br>• asteroid collision | if neither of these, allow catastrophic event **or** natural disaster for **1** mark | | |
| | • (new) predators | allow named example<br>allow hunters | | |
| | • (new) disease / pathogen | allow named example | | |
| | • competition for food | allow lack of food | | |
| | • competition for mates | allow lack of mates<br>ignore competition unqualified | | |
| | • lack of habitat **or** habitat change | ignore environment change<br>ignore isolation<br>ignore pollution | | |

| | | | |
|---|---|---|---|
| **Total** | | | **8** |

| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|
| **05.1** | any **one** from:<br>• less / decreased / reduced photosynthesis<br>• (more) burning / combustion (of wood)<br>• decomposition / decay (of wood) | allow burning / combustion (of fossil fuel in machinery) | 1 | AO1<br>4.7.3.4 |
| **05.2** | methane | allow water (vapour)<br><br>allow other correct greenhouse gases eg nitrous oxide(s), nitrogen oxide, ozone, hydrofluorocarbons, perfluorocarbons, sulfur hexafluoride | 1 | AO1<br>4.7.3.5 |
| **05.3** | any **two** from:<br>• respiration (by animals)<br>• fuel burnt / used for transport<br><br>• fuel burnt / used to heat / light buildings (in intensive farming)<br>• fuel burnt / used to process / cook (meat) | ignore burning / combustion unqualified | 2 | AO2<br>4.7.3.5<br>4.7.3.4<br>4.7.2.2 |

| Question | Answers | Mark | AO / Spec. Ref. |
|---|---|---|---|
| **05.4** | **Level 2:** Scientifically relevant features are identified; the way(s) in which they are similar / different is made clear and (where appropriate) the magnitude of the similarity / difference is noted. | 3–4 | AO3<br>4.7.3.5 |
| | **Level 1:** Relevant features are identified and differences noted. | 1–2 | |
| | **No relevant content** | 0 | |
| | **Indicative content**<br><br>General<br>• all diets cause carbon dioxide to be released<br><br>Typical diet<br>• releases more carbon dioxide than diet A **and** B<br>• releases 750 (kg per person per year) more carbon dioxide than diet A<br>• releases 1750 (kg per person per year) more carbon dioxide than diet B<br><br>Diet A<br>• releases less carbon dioxide than typical diet<br>• releases more carbon dioxide than diet B<br>• releases 1000 (kg per person per year) more carbon dioxide than diet B<br><br>comparisons can be given in terms of correct data or calculations or proportions for example, typical diet releases 8 times more carbon dioxide than diet B<br><br>For **Level 2** both comparison of all three diets **and** quoting data or calculation are required. | | |
| **Total** | | **8** | |

| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|
| **06.1** | endocrine (system) | ignore hormonal (system) | 1 | AO1<br>4.5.3.1 |
| **06.2** | D | | 1 | AO1<br>4.5.3.1<br>4.5.3.2 |
| **06.3** | A | | 1 | AO1<br>4.5.3.1 |
| **06.4** | (in / through / via) blood | allow (in / through / via) bloodstream<br>allow (in / through / via) plasma<br>allow (in / through / via) blood vessels **or** named blood vessel | 1 | AO1<br>4.5.3.1 |
| **06.5** | ovary / ovaries<br><br>testis / testes | in either order<br><br>allow testicle(s)<br><br>allow placenta<br><br>if no other mark awarded allow gonad(s) for **1** mark | 1<br><br>1 | AO1<br>4.5.3.1<br>4.5.3.3 |
| **06.6** | luteinising hormone (LH) | | 1 | AO2<br>4.5.3.3 |

| Question | Answers | Mark | AO / Spec. Ref. |
|---|---|---|---|
| 06.7 | **Level 3:** A judgement, strongly linked and logically supported by a sufficient range of correct reasons, is given. | 5–6 | AO3<br>4.5.3.4<br>4.3.1.9 |
| | **Level 2:** Some logically linked reasons are given. There may also be a simple judgement. | 3–4 | |
| | **Level 1:** Relevant points are made. They are not logically linked. | 1–2 | |
| | **No relevant content** | 0 | |
| | **Indicative content**<br><br>Advantages<br>• non-permanent like condom / diaphragm / IUDs / spermicides / abstinence **or** unlike surgical sterilisation<br>• longer lasting than condom / diaphragm / IUDs / spermicides<br>• no need to remember unlike oral contraceptive<br>• one injection rather than surgery for sterilisation<br>• surgery (for sterilisation) has risks, for example, infection<br>• no other method of long-lasting contraception (rather than sterilisation) relies on men<br><br>Disadvantages<br>• no protection from sexually transmitted diseases unlike barrier methods **or** named barrier method<br>• not as long lasting as (surgical) sterilisation<br>• at clinical / drug trial stage, so unknown side effects<br>• at clinical / drug trial stage, so unknown efficacy<br>• do not know how long it will last (as info only states 'up to 13 years')<br>• can stop taking a pill **or** using a condom if you change your mind / want to get pregnant, whereas have to wait 13 years with the injection<br>• (minor) risk of infection posed with an injection compared to no risk with the oral contraceptive<br><br>For **Level 3** references to advantages **and** disadvantages of the new drug compared to named existing methods are required. | | |
| **Total** | | **13** | |

| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|
| **07.1** | increases (from 2005) to 690 million **or** increases to 2008 | allow peak in 2008<br>allow peak at 690 million | 1 | AO2<br>4.7.3.1<br>4.7.3.6 |
| | decreases (from 2008) to 630 million | | 1 | |
| | | if no other mark awarded, allow overall increase from 470 million<br>**or**<br>overall increase to 630 million<br>**or**<br>(overall) increase of 160 million<br>**or**<br>increases to 690 and decreases to 630 (without units)<br>for **1** mark | | |
| **07.2** | $\frac{690(\text{million}) - 460(\text{million})}{690(\text{million})} \times 100$ | allow<br>$\frac{230(\text{million})}{690(\text{million})} \times 100$ | 1 | AO2<br>4.7.3.1<br>4.7.3.6 |
| | 33.3 (%) | ignore number of decimal places<br>allow calculated value from incorrect graph readings | 1 | |
| | 33 (%) | allow calculated answer correctly given to 2 significant figures | 1 | |
| **07.3** | compost | allow improving soil (texture / drainage / quality)<br>ignore farming unqualified<br>ignore as fertiliser | 1 | AO1<br>4.7.3.3 |
| | burning<br>**or**<br>as a fuel | | 1 | |

| | | | | |
|---|---|---|---|---|
| **07.4** | any **two** from:<br>• reduce pollution<br><br>• plant trees<br><br>• breeding programmes (for endangered species)<br><br>• rewilding / regeneration of habitats / hedgerows / meadows<br><br>• (reintroducing) wider field margins<br><br>• plant a variety of crops<br><br>• reduce use of pesticide / herbicide / insecticide | ignore references to carbon dioxide, greenhouse gases or global warming<br><br>allow reduce named example of pollution, eg smoke **or** acidic gases **or** sewage **or** fertiliser<br>allow reduce toxic waste dumping<br><br>allow afforestation<br>allow reforestation<br>ignore reduce / stop deforestation<br><br>allow planting wild flower seeds<br><br>allow reduce monoculture<br><br>ignore recycling<br>ignore protect / conserve habitat(s) / areas | 2 | AO1<br>4.7.3.1<br>4.7.3.2<br>4.7.3.4<br>4.7.3.6 |
| **Total** | | | **9** | |