# GCSE

## COMBINED SCIENCE: TRILOGY

### Higher Tier Biology Paper 1

**Mark scheme** Practice Paper Series – Set 2 SGC/S2/B/1H

Version 1.1 - reviewed 26 October 2026

This mark scheme is an original resource written for sciencegcse.co.uk to accompany the Set 2 practice paper SGC/S2/B/1H. It is not an AQA mark scheme and has not been produced or endorsed by AQA. It follows the structure and conventions of AQA GCSE science mark schemes so that students and teachers can mark the practice paper in the same way that a real paper is marked.

Marking should be carried out using the Information to Examiners on the following pages. The paper has not been standardised, so raw marks should not be converted into grades using any published grade boundaries.

Specification references are to the AQA GCSE Combined Science: Trilogy (8464) specification, Biology section 4.1–4.4. AO = assessment objective; WS = working scientifically; MS = mathematical skills; RP = required practical.

# 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 answer(s) expected, including alternative acceptable wording, in the **Answers** column
- guidance on which answers are and are not creditworthy in the **Extra information** column
- the assessment objective (AO) and specification reference for each marking point.

Award marks positively. Do not deduct marks for incorrect additional material unless it contradicts a correct answer (see 3.1). Marks are awarded for what the student has written, not for what they might have meant.

## 2. Emboldening and underlining

2.1 Where a list of acceptable answers is given and more than one mark is available, **any two from** (or similar) is used, followed by the acceptable answers.

2.2 A bold **and** indicates that both parts of the answer are needed to gain the mark.

2.3 Alternative answers acceptable for the same mark are separated by **or**. Different words that are acceptable within a marking point are separated by a forward slash (/).

2.4 Words in bold in the Answers column are the essential words that must be present, or their equivalent, for the mark to be awarded.

## 3. Marking points

**3.1 Marking of lists**
When a fixed number of responses is requested but extra responses are given, consider the whole list. Each incorrect response or contradiction cancels one otherwise available correct response, up to the mark limit; the score cannot fall below zero. Neutral material identified by **ignore** does not cancel a correct response. Do not apply this rule as a penalty for extra relevant detail in an extended answer.

**3.2 Marking procedure for calculations**
A correct final answer can receive the marks indicated in the question-specific scheme without every intermediate step being written. Do not award full marks if the working shown contradicts that answer. Where the question specifically requires a method, demonstration or working, apply that requirement. Credit correct stages when the final answer is wrong, including consequential steps where permitted. A printed unit may only be replaced by another unit when the numerical value is converted consistently.

**3.3 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.

**3.4 Errors carried forward**
Use an earlier incorrect value in a later part where ECF is allowed by the question-specific scheme. Within a calculation, credit later correct stages that use an earlier incorrect value consistently, subject to any stated limits. Do not repeatedly penalise the same error.

**3.5 Phonetic spelling**
Accept a misspelling when the intended scientific term is clear, including when a term is being recalled. Do not accept wording that could instead name a different scientific term.

**3.6 Brackets**
Words shown in brackets in the Answers column are not required to gain the mark but help to set the context.

**3.7 Allow**
Answers that are acceptable but which would not normally be expected are shown as **allow**.

**3.8 Ignore**
Statements shown as **ignore** are neither creditworthy nor penalised. Mark the rest of the answer normally.

**3.9 Do not accept**
Statements shown as **do not accept** are incorrect and, where they contradict or replace the expected answer, mean the mark is not awarded.

## 4. Level of response marking instructions

Extended-response questions (question 06.4 in this paper) are marked using a level of response mark scheme. The scheme has three levels, each covering two marks, plus a level descriptor and indicative content.

**Step 1 – Determine a level.** Read the whole answer and decide which level descriptor best fits it. Use a 'best-fit' approach: an answer does not need to meet every part of a descriptor to be placed in that level, and a weak part of the answer need not prevent it from reaching the higher level if the overall quality matches the descriptor.

**Step 2 – Determine a mark within the level.** Award the higher mark in the level if the answer meets the descriptor fully and the points made are well linked; award the lower mark if the answer only just meets the descriptor or contains minor errors or omissions.

The indicative content is not a checklist: students need not include every point to reach the top level, and other relevant, correct points should be credited. An answer that lists points without linking them into a coherent answer should be placed in a lower level than one that develops and connects them.

| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|
| **01.1** | (the pondweed) **photosynthesised faster than it respired** | allow the pondweed photosynthesised (in the light) for this mark | 1 | AO2<br>4.4.1.1<br>4.4.2.1 |
| | so the concentration of **carbon dioxide decreased** | allow carbon dioxide was used up / taken in | 1 | AO2<br>4.4.1.1<br>4.4.2.1 |
| **01.2** | **no light** so no photosynthesis | | 1 | AO2<br>4.4.1.1<br>4.4.2.1 |
| | **respiration released carbon dioxide** so its concentration increased | | 1 | AO2<br>4.4.1.1<br>4.4.2.1 |
| **01.3** | (as a control) to show that the colour change was caused by the pondweed | allow to show that the indicator does not change colour on its own (in the light)<br>ignore to make it a fair test | 1 | AO3<br>4.4.1.2<br>WS 2.2 |
| **01.4** | any **one** from:<br>• temperature<br>• type / species of pondweed<br>• distance from the lamp<br>• size of the tubes | ignore mass of pondweed, volume of indicator and time (these are given in the question)<br>ignore amount of light | 1 | AO2<br>4.4.1.2<br>WS 2.2 |
| **01.5** | any **one** from:<br>• place the tubes in a water bath / tank of water (at a constant temperature)<br>• put a (glass) tank / beaker of water between the lamp and the tubes<br>• use an LED lamp | allow use a heat shield<br>allow move the lamp further away | 1 | AO3<br>4.4.1.2<br>WS 2.7 |
| **01.6** | any **two** from:<br>• converted into starch (for storage)<br>• used to make cellulose (for cell walls)<br>• used to make amino acids / proteins<br>• converted into fats / oils / lipids (for storage) | ignore energy | 2 | AO1<br>4.4.1.3 |
| | | **Total** | **9** | |
| **02.1** | to check that the drug is **safe** / not toxic | | 1 | AO1<br>4.3.1.9 |
| | to check that the drug **works** / is effective | allow to find a suitable dose | 1 | AO1<br>4.3.1.9 |
| **02.2** | neither the patients **nor** the doctors know who is given the drug (or the placebo) | | 1 | AO1<br>4.3.1.9 |
| | so that the results are not **biased** (by the patients' expectations or the doctors' judgements) | allow so that the results are valid / fair | 1 | AO1<br>4.3.1.9 |

| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|
| **02.3** | 4.5 | 18 ÷ 4 | 1 | AO2<br>4.3.1.9<br>MS 1c |
| **02.4** | **for:** the decrease in blood pressure was much greater than with the placebo (18 compared with 4 mmHg) | allow large number of patients / double-blind so the results are valid | 1 | AO3<br>4.3.1.9<br>WS 1.4 |
| | **against:** a higher percentage of patients had side effects (12% compared with 9%) | allow long-term effects are not known (the trial lasted only 8 weeks) | 1 | AO3<br>4.3.1.9<br>WS 1.4 |
| | | **Total** | **7** | |
| **03.1** | a **mosquito** (vector) feeds on / bites an infected person and takes in the protist | allow mosquito is the vector | 1 | AO1<br>4.3.1.5 |
| | the mosquito bites another person and passes the protist into their **blood** | | 1 | AO1<br>4.3.1.5 |
| **03.2** | any **two** from:<br>• use (insecticide-treated) mosquito nets / bed nets<br>• spray insecticide<br>• remove / drain standing water (where mosquitoes breed)<br>• use insect repellent<br>• take antimalarial drugs<br>• vaccination | | 2 | AO1<br>4.3.1.5 |
| **03.3** | 250 − 70 = 180 | an answer of 72 (%) scores **2** marks | 1 | AO2<br>4.3.1.5<br>MS 1c, 2c |
| | 180 ÷ 250 × 100 = **72** (%) | allow 1 mark for 28 (%) | 1 | AO2<br>4.3.1.5<br>MS 1c, 2c |
| **03.4** | half of 250 is 125 (cases per 1000 people) | | 1 | AO3<br>4.3.1.5<br>MS 2c |
| | yes (the target was met) because there were 100 cases (per 1000 people) in 2020, which is less than 125 | the conclusion must be supported by data for this mark | 1 | AO3<br>4.3.1.5<br>MS 2c |
| | | **Total** | **8** | |
| **04.1** | mitochondrion | allow mitochondria | 1 | AO1<br>4.1.1.2 |
| **04.2** | (electron microscopes have a) higher **resolution** | allow higher magnification<br>allow can see smaller structures (such as ribosomes) / more detail<br>ignore clearer | 1 | AO1<br>4.1.1.5 |

| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|
| **04.3** | 36 ÷ 12 000 = 0.003 (mm) | an answer of 3 (µm) scores **2** marks | 1 | AO2<br>4.1.1.5<br>MS 1a, 3c |
| | 0.003 × 1000 = **3** (µm) | allow 1 mark for 0.003 as the final answer | 1 | AO2<br>4.1.1.5<br>MS 1a, 3c |
| **04.4** | $3 \times 10^{-6}$ (m) | allow an answer consistent with the student's answer to 04.3, correctly converted and in standard form | 1 | AO2<br>4.1.1.5<br>MS 1b (HT) |
| **04.5** | heart muscle cells need a lot of **energy** (to contract continuously) | | 1 | AO2<br>4.1.1.2<br>4.4.2.1 |
| | X / mitochondria are where **aerobic respiration** takes place, which releases energy | do not accept produce / make energy | 1 | AO2<br>4.1.1.2<br>4.4.2.1 |
| **04.6** | any **two** from:<br>• cell membrane<br>• cytoplasm<br>• ribosomes | allow DNA / genetic material<br>ignore cell wall, nucleus, plasmids, mitochondria | 2 | AO1<br>4.1.1.1 |
| | | **Total** | **9** | |
| **05.1** | ethanol **and** carbon dioxide | either order<br>allow alcohol for ethanol<br>allow $CO_2$ | 1 | AO1<br>4.4.2.1 |
| **05.2** | to keep the temperature constant (because temperature affects the rate of respiration) | allow so that temperature is a control variable<br>ignore to make it a fair test unqualified | 1 | AO2<br>4.4.2.1<br>WS 2.2 |
| **05.3** | (23.5 + 24.8 + 23.7) ÷ 3 = 24.0 ($cm^3$) | an answer of 2.4 scores **2** marks | 1 | AO2<br>4.4.2.1<br>MS 2b |
| | 24.0 ÷ 10 = **2.4** ($cm^3$ per minute) | allow 1 mark for 24 ($cm^3$) as the final answer | 1 | AO2<br>4.4.2.1<br>MS 2b |
| **05.4** | yeast does not have the **enzyme** to break down / use lactose | allow lactose cannot be absorbed by yeast cells | 1 | AO3<br>4.4.2.1 |
| **05.5** | yes, because every result for glucose is higher than every result for sucrose | allow the ranges do not overlap / the results are repeatable | 1 | AO3<br>4.4.2.1<br>WS 3.5 |
| | but only one temperature / concentration / time was tested | allow any sensible limitation, e.g. only one type of yeast | 1 | AO3<br>4.4.2.1<br>WS 3.5 |

<table>
<tr><th>Question</th><th>Answers</th><th>Extra information</th><th>Mark</th><th>AO / Spec. Ref.</th></tr>
<tr><td>05.6</td><td>any two from:<ul><li>glucose converted into glycogen (for storage)</li><li>fatty acids and glycerol combined to make lipids</li><li>amino acids joined to make proteins</li><li>excess amino acids / proteins broken down to form urea</li></ul></td><td>ignore respiration<br>ignore examples from plants, such as starch or cellulose</td><td>2</td><td>AO1<br>4.4.2.3</td></tr>
<tr><td colspan="3">Total</td><td>9</td><td></td></tr>
<tr><td>06.1</td><td>fatty acids and glycerol</td><td>either order</td><td>1</td><td>AO1<br>4.2.2.1</td></tr>
<tr><td>06.2</td><td>lipase broke down the fat (in the milk) into fatty acids (and glycerol)</td><td></td><td>1</td><td>AO2<br>4.2.2.1</td></tr>
<tr><td></td><td>the fatty acids lowered the pH (below 8)</td><td>allow the fatty acids neutralised the sodium carbonate / alkali</td><td>1</td><td>AO2<br>4.2.2.1</td></tr>
<tr><td>06.3</td><td>bile emulsifies the fat / breaks the fat into small droplets</td><td>ignore bile breaks down / digests fat</td><td>1</td><td>AO1<br>4.2.2.1</td></tr>
<tr><td></td><td>increasing the surface area for lipase to act on, so the fat is digested faster</td><td>ignore bile is alkaline / provides the optimum pH (the starting pH was the same)</td><td>1</td><td>AO1<br>4.2.2.1</td></tr>
<tr><td>06.4</td><td colspan="2"><table>
<tr><td>Level 3<br>(5–6 marks)</td><td>A coherent and detailed plan covering the independent, dependent and control variables, which would produce valid results. The steps are in a logical order.</td></tr>
<tr><td>Level 2<br>(3–4 marks)</td><td>A plan that describes how the bile concentration would be changed and how the rate would be measured, but some detail is missing or the order is not fully logical.</td></tr>
<tr><td>Level 1<br>(1–2 marks)</td><td>Simple statements about the method, for example adding bile or timing the colour change. A plan is not clear.</td></tr>
<tr><td>0 marks</td><td>No relevant content.</td></tr>
</table></td><td>6</td><td>AO2<br>4.2.2.1<br>WS 2.2</td></tr>
</table>

| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|
| | **Indicative content**<br>• make a range of bile concentrations, for example 0, 1, 2, 3, 4 and 5%, by diluting bile with distilled water<br>• use the same volume of bile solution each time; the 0% tube (water) is the control<br>• put the milk, sodium carbonate solution and indicator in a test tube and the lipase in another<br>• keep all the tubes in a water bath at the same temperature, for example 35 °C, until they reach it<br>• add the bile solution and the lipase, mix and start a stopwatch<br>• time how long it takes for the pink colour to disappear<br>• use the same volume and concentration of milk, sodium carbonate, indicator and lipase each time<br>• keep the total volume and starting pH the same; check the pH before adding lipase<br>• judge the end point against a white background / compare with a colour standard<br>• repeat at each concentration and calculate a mean (ignoring anomalous results)<br>• a shorter time means a faster rate (rate = 1 ÷ time)<br>To reach Level 3 the plan must include a range of bile concentrations, a way of keeping the temperature constant, the measurement of the time for the colour to disappear and at least two other control variables. | | | |
| | | **Total** | **11** | |
| **07.1** | a pair of distances is identified where the distance doubles, e.g. 10 to 20 cm | allow 15 to 30 cm or 20 to 40 cm<br>alternative: calculate rate × distance$^2$ at two distances for this mark | 1 | AO2<br>4.4.1.2<br>MS 3a (HT) |
| | the rate falls to a quarter for that pair, e.g. 64 to 16 bubbles per minute, as predicted by the inverse-square relationship | allow 28 to 7 or 16 to 4 for the corresponding pair<br>alternative: show that the two products are approximately equal (about 6400)<br>a complete numerical demonstration with one suitable pair scores **2** marks | 1 | AO2<br>4.4.1.2<br>MS 3a (HT) |
| **07.2** | as the distance increases the **light intensity** decreases | | 1 | AO1<br>4.4.1.2 |
| | light is the **limiting factor**, so less energy is available for photosynthesis | allow less light is absorbed by the chlorophyll | 1 | AO1<br>4.4.1.2 |
| **07.3** | at 15 °C, **temperature** is the limiting factor | | 1 | AO3<br>4.4.1.2 (HT)<br>WS 3.5 |

| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|
| | the enzymes that control photosynthesis work **slowly** at 15 °C, so extra carbon dioxide cannot be used much faster | allow increasing the temperature to 25 °C as well as the carbon dioxide gives a much larger increase | 1 | AO3<br>4.4.1.2 (HT)<br>WS 3.5 |
| **07.4** | extra profit calculated for D: (9.0 − 4.0) × 20 − 55 = £45 | allow B = −£7 and C = £0 calculated | 1 | AO2<br>4.4.1.2 (HT)<br>MS 1a, 2c |
| | condition D (with correct supporting calculation) | D with no working scores 0 | 1 | AO2<br>4.4.1.2 (HT)<br>MS 1a, 2c |
| **07.5** | any **one** from:<br>• heating the greenhouse would cost more in winter (because it is colder outside)<br>• light intensity is lower in winter, so light would limit the rate and the extra heat and carbon dioxide would not increase it much | | 1 | AO3<br>4.4.1.2 (HT) |
| | | **Total** | **9** | |
| **08.1** | pulmonary artery | | 1 | AO1<br>4.2.2.2 |
| **08.2** | (vena cava →) **right atrium → right ventricle** | allow atrium → ventricle on the right side | 1 | AO1<br>4.2.2.2 |
| | (right ventricle →) **pulmonary artery** (→ lungs), passing through valves | | 1 | AO1<br>4.2.2.2 |
| **08.3** | the left ventricle pumps blood all around the **body** | allow the right ventricle pumps blood only to the lungs | 1 | AO1<br>4.2.2.2 |
| | so it needs to produce a **higher pressure** | allow needs more force / stronger contraction | 1 | AO1<br>4.2.2.2 |
| **08.4** | a mechanical valve lasts more than 25 years, so the 35-year-old will need fewer replacement operations | | 1 | AO3<br>4.2.2.4<br>WS 1.4 |
| | a biological valve (10 to 15 years) is likely to last for the rest of the 75-year-old's life | | 1 | AO3<br>4.2.2.4<br>WS 1.4 |
| | so the older patient avoids taking anticoagulants for life and the risk of bleeding | allow older patients are at greater risk from bleeding / from more surgery | 1 | AO3<br>4.2.2.4<br>WS 1.4 |
| | | **Total** | **8** | |
| | | **TOTAL FOR PAPER** | **70** | |