

GCSE
COMBINED SCIENCE:
SYNERGY

8465/4F: Physical sciences Foundation
Report on the Examination

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General

There were ten questions on the paper with questions 8–10 being common with the Higher tier. A wide range of marks was obtained by students. However, there were a number of questions that were not attempted by a significant number of students.

For multiple-choice questions which required two boxes to be ticked, it was not uncommon to see only one box ticked. In general, students found the ‘extended response’ questions difficult with very few marks being awarded at the top levels.

Students generally demonstrated competence in the questions involving mathematical skills. Low demand calculation questions were well answered, where the equation is always given and students will not be required to rearrange the equation. At standard demand, students are expected to be able to either rearrange an equation or convert a unit, so it is beneficial for students to be able to quickly identify if the units given in a question are correct for the use in the equation.

Levels of demand

Questions are set at two levels of demand on this paper:

- **low demand** questions are targeted at students working at grades 1–3
- **standard demand** questions are targeted at students working at grades 4–5.

A student’s final grade, however, is based on their attainment across the qualification as a whole, not just on questions that may have been targeted at the level at which they are working.

Question 1 (low demand)

01.1 71% of students identified the correct force.

01.2 43% of students identified the correct name for the velocity. ‘Resultant velocity’ was a common incorrect choice.

01.3 90% of students scored two marks for this calculation.

01.4 87% of students scored two marks. There was some evidence of the lack of calculator however, as a noticeable number either didn’t attempt the calculation or showed long multiplication working.

01.5 73% of students identified why the velocity decreases when the parachute opens.

Question 2 (low & standard demand)

02.1 35% of students scored three marks, 36% of students scored two marks and 25% of students scored one mark. The most commonly awarded mark was given for stating that there was less wasted ‘energy’ when the temperature of the cables was lower.

- 02.2** 23% of students identified the frequency of the mains supply correctly. 230 Hz was a common incorrect choice.
- 02.3** 63% of students were successful in calculating the missing percentage.
- 02.4** 9% of students scored two marks and 30% of students scored one mark. 10% of students did not attempt this question.

There were many insufficient responses to do with harming/damaging the environment. Air pollution was another common insufficient answer seen. Damage the ozone layer negated the second marking point.

A number of students misunderstood the word natural and thought it referred to some naturally occurring proportion of the atmosphere, they usually scored zero for adding nothing appropriate to their answer.

- 02.5** As the wind turbine was not being compared to another energy resource, a large list of advantages and disadvantages was allowed. Common insufficient answers included:
- good for the environment
 - takes up lots of space
 - natural resource
 - expensive to build
 - weather dependent.

15% of students scored two marks and 43% of students scored one mark.

- 02.6** 34% of students scored two marks for calculating the mean. 20% of students scored one mark, usually because they included the anomalous value. An answer of 0.22 scored zero marks as it is not rounded to the correct value, 0.23.
- 02.7** 38% of students answered this question correctly. ‘Systematic error’ was a common incorrect answer.
- 02.8** 3% of students scored two marks, and 74% of students scored one mark.

Many students scored the first marking point. Most did not explain how the results would be improved (the second marking point), concessions allowed for how ensuring a control variable was constant would affect wind speed or wind turbine speed or the p.d. output.

Question 3 (low & standard demand)

- 03.1** 16% of students scored two marks, whereas 58% of students scored one mark. Many students scored a mark for the answer of 800 mg. Most students appeared to struggle with the conversion, many believing there were 100 mg in 1 g. A minority number of students scored one mark for correctly converting an incorrect mass in mg.

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- 03.2** 43% of students identified carbon dioxide as the gas produced when calcium carbonate reacts with hydrochloric acid.
- 03.3** 57% of students were able to identify the number of atoms present in the formula.
- 03.4** In this multiple-choice question asking for changes to improve accuracy, a quarter of the students scored two marks and half of the students scored one mark.
- 03.5** 13% of students scored two marks and 55% of students scored one mark. Some students chose both dependent and independent variable. A number of students failed to follow the rubric and only ticked one box.

Question 4 (low & standard demand)

- 04.1** 58% of students were able to identify the renewable resource.
- 04.2** 37% of students were able to suggest a reason why aluminium is produced in Iceland.
- 04.3** Students found it very difficult to balance the symbol equation, with 15% of students scoring both marks. The mark for balancing the number of aluminium atoms was scored more often than the corresponding mark for oxygen. 22% of students didn't attempt this question.
- 04.4** 31% of students were able to identify the type of reaction taking place. A commonly chosen incorrect response was combustion.
- 04.5** 22% of students scored two marks and 22% of students scored one mark. 20% of students did not attempt this question.

A common incorrect response was stating that aluminium ions were negative which negated both marking points. Some students referred to a *magnetic* attraction. This did not score the mark for the idea of attraction between opposite charges. Some students seemed to misinterpret the question and referred to what happens to the ions when they reach the electrode, for example, so that the ions can gain electrons and become atoms.

- 04.6** 41% of students were able to identify the number of electrons an aluminium ion would gain.
- 04.7** Half the students were able to complete the word equation correctly. The correct formula for carbon dioxide was allowed but responses such as CO₂ and CO² were insufficient to score the mark, as was carbon oxide.
- 04.8** 79% of students scored no marks whilst 19% did not attempt the question. Very few students answered that the carbon electrodes would need to be replaced because they react to produce a gas. 'Used up' was the most commonly seen creditworthy response.
- 04.9** 29% of students didn't attempt this question. Students found this question difficult, with many students failing to score marks. Common responses that were creditworthy referred to the electrodes not melting or not reacting.

Question 5 (low demand)

- 05.1** 59% of students identified the correct circuit.
- 05.2** 40% of the students identified both components; 45% of students identified one component.
- 05.3** 60% of students identified why the current should be switched off between readings.
- 05.4** 66% of students scored all three marks for plotting the graph and drawing the line of best fit. Some students forgot to include the line of best fit. Few students made plotting errors.
- 05.5** A quarter of students answered this question correctly. The most common correct answer stated that the line of best fit is straight.
- 05.6** 37% of students identified that the resistance would be lower with the resistors in parallel.

Question 6 (low demand)

- 06.1** 53% of students were able to identify how this was shown to be a reversible reaction. An answer of 'the arrows' was insufficient. 14% of students didn't attempt the question.
- 06.2** The mark for the mass of anhydrous copper sulfate was scored more often than the mark for the mass of water. Many students mistakenly thought that the mass of water was 0.0 g.
17% of students achieved full marks and 23% of students didn't attempt this question.
- 06.3** 71% of students identified why the student heated the test tube to constant mass.
- 06.4** 69% of students were able to define an exothermic reaction.
- 06.5** 88% of students were able to correctly read the thermometer scale.
- 06.6** 46% of students were able to give the correct temperature change.

Question 7 (low & standard demand)

- 07.1** 79% of students gave the name of a suitable piece of apparatus to measure the horizontal distance travelled by the ball. Metre ruler or ruler were both creditworthy. Measuring stick was insufficient.
- 07.2** 54% of students scored this mark. Pulling it (the elastic band) back further was a very common creditworthy response. Changing the elastic band was insufficient to score the mark as the question implied using this elastic band.
- 07.3** The distance from the edge of the bench wasn't creditworthy as a control variable, as this would vary depending on the launch speed. Most students who scored a mark did so for stating 'the metal ball' or a property of the ball such as its mass. 55% of student scored this mark.

- 07.4** 47% of students scored both marks. All the hazards and precautions on the mark scheme were well represented. Some students incorrectly thought that the hazard and precaution were to do with control variables, e.g. use the same bench each time, scoring zero marks.
- 07.5** 78% of students identified the correct range from the graph.
- 07.6** 64% of students correctly predicted the horizontal distance travelled for the given launch speed.
- 07.7** 4% of students recalled the equation correctly. Students usually missed the 0.5 or the squared term.
- 07.8** 17% of students did not attempt this calculation. 1% of students scored three marks, and 2% of students scored two marks. 14% of students scored one mark, usually for giving an incorrect answer to two significant figures using the data provided in the question.

Question 8 (standard demand)

- 08.1** 46% of students recalled the equation correctly. The quantities in the question are listed alphabetically, there is no need for students to recall the equation in this order. Any correct rearrangement is creditworthy.
- 08.2** Half of the students scored three marks on this calculation, despite 46% of students recalling the equation correctly in the previous question. A common mistake was to complete a spurious conversion after correctly calculating the force; this scored the first two marks only.
- 08.3** 42% of students recalled the equation correctly. A fairly common correct rearrangement was: $\text{time} = \frac{\text{work done}}{\text{power}}$
- 08.4** 29% of students scored three marks, which would most likely be for the numerical answer of 50. 21% of students scored all four marks.

Incorrect units like m/s, J or W were often seen. Students who calculated a time in minutes (0.83) and then stated the unit as minutes scored all four marks.

Question 9 (standard demand)

- 09.1** 18% of students scored two marks and 61% of students scored one mark.
- 09.2** 31% of students did not attempt this question. Rounding numbers eg 10 not 9.8 was a common incorrect response. Less than 1% of students scored three or four marks. About 7% scored two marks and around 23% scored one mark.

- 09.3** 10% of students recalled this equation correctly. 29% of students did not attempt the question.

When the quantities are given they should be put into the equation as stated, not abbreviated. Many students had the word 'total' on the top and bottom of the equation, which was not creditworthy.

- 09.4** The conversion of 15% to 0.15 was a mark that many individuals scored even if they couldn't recall or use the efficiency equation. 9% of students scored four marks, 11% scored one mark and 51% scored zero. 26% of students did not attempt the question.

Question 10 (standard demand)

- 10.1** Students found this question very difficult with 4% answering the question correctly. Most students just repeated the stem of the question, saying to show it is recyclable, rather than *how* it is recycled or to identify the type of plastic in the bottle.

- 10.2** 34% of students who attempted the calculation scored two marks for an answer of 35 000 000. 18% of students scored three marks.

The idea of giving an answer in standard form confused a number of students, who gave the answer as 35×10^6 , which is not standard form. 18% of students appeared not to know how to start the calculation of the percentage and left the question blank.

- 10.3** Few students attempted to draw an overall conclusion or judgement as to which material was best, thus limiting their answers to Level 2 in this extended response question. Consequently, although 58% of students achieved at least a Level 2 mark, relatively few achieved a Level 3 mark.

To reach Level 3, students needed to make comparisons, include a calculation, and a judgement on which material was better. Most students made direct comparisons using the information in the table, which enabled them to reach Level 2. However, students were not always clear in describing the energy used in the two stages of the Life Cycle Assessment.

The mean score for the question was 2.5 and it differentiated well between higher-attaining students. 2% of students scored 6 marks. 23% of students did not attempt the question.

Use of statistics

Statistics used in this report may be taken from incomplete processing data. However, this data still gives a true account on how students have performed for each question.

Mark Ranges and Award of Grades

Grade boundaries and cumulative percentage grades are available on the [Results Statistics](#) page of the AQA Website.