



GCSE

Combined Science: Synergy

8465/4F

Report on the examination

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Levels of demand

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

- **Low demand** questions are designed to broadly target grades 1–3.
- **Standard demand** questions are designed to broadly target 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.

Questions 8, 9 and 10 are common with questions 1, 2 and 3 on the higher tier. These questions are identical with each other and are targeted at standard demand.

Question 1 (low demand)

- 1.1** The vast majority of students chose the correct response, with the two incorrect answers being fairly evenly distributed.
- 1.2** Around three-quarters of students gained both marks by correctly calculating the percentage of electricity generated using wind. A number of students added up the given percentages correctly, but then subtracted this value from 360, presumably degrees in the pie chart.
- 1.3** The majority were able to perform the calculation correctly, although some students were careless writing the number of zeroes in their answer. A few divided the two values instead of multiplying them.
- 1.4** Around two-thirds of students chose the correct response. The majority of incorrect responses were 'wind turbines occupy large areas of land', with a few opting for 'wind turbines have no moving parts'.
- 1.5** A range of responses was seen, with around one-quarter of students gaining 2 marks. A further gained 1 mark, for citing either 'biofuel' or 'gas', often with 'nuclear'.
- 1.6** Nearly 10% of students did not attempt this question. Correct answers usually referred to global warming or climate change, with some citing an effect of this such as melting ice caps. Many students erroneously referred to damage to the ozone layer.

Question 2 (low demand)

- 2.1** Around 80% of students chose the correct response. The next most common answer was 'newton-metre,' but a fair number of students thought either a measuring cylinder or a stop clock could measure length.

- 2.2** Around half of students incorrectly opted for the resolution being 0.043s. Only around 10% chose the correct response of 0.001s.
- 2.3** Most students knew what was meant by the range, so they scored the mark. Incorrect answers tended to be either 2.22 to 2.18 (i.e. Test 1 to Test 3) or 2.22 to 2.24 (i.e. Test 1 to Mean).
- 2.4** About 10% of students did not attempt this question. Two-thirds of those who attempted it were able to arrive at the correct answer. Some students substituted values into the given equation correctly, scoring one mark, but then did the calculation in the wrong sequence (e.g. 2.242 divided by 2, then multiplied this answer by 0.98). Other students ignored the 'squared' on the numerator.
- 2.5** The correct response was chosen by around 60% of students, with the other two responses being fairly evenly distributed.
- 2.6** About 10% of students did not attempt to answer this question. The majority who attempted it were able to arrive at the correct answer. Some students selected a correct pair of values from the graph, scoring one mark, but then did the calculation incorrectly. Some students counted squares from the graph, rather than reading values from the axes.

Question 3 (low and standard demand)

- 3.1** About 10% of students did not attempt this question. Around 40% realized that oxygen was the gas involved in combustion. 'Carbon dioxide' was the most common incorrect answer, although a variety of other gases, liquids and solids were named.
- 3.2** Around 10% opted for the incorrect response 'copper reacts with water'. Of the remaining responses, slightly fewer students chose the correct answer 'copper can be shaped' than 'copper has a low melting point'.
- 3.3** It appeared that many students did not understand the term 'empirical formula'. Most students correctly stated 4 carbon atoms and 10 hydrogen atoms and were able to calculate the simplest ratio as 2:5. This enabled them to score 3 marks. However, very few then gave the empirical formula as C_2H_5 , instead reverting to the molecular formula of C_4H_{10} . When writing a formula, many students do not use subscripts, e.g. writing C_2H_5 or C_4H_{10} . Writing the numbers like this would negate the mark for any correct formula given.
- 3.4** Around 50% of students chose the correct response of 'covalent', with a further 30% choosing 'ionic'.
- 3.5** Approximately 40% of students chose the incorrect response of 'polymer', with the correct 'small molecule' being chosen by around 30%.
- 3.6** Q3.6 .4 Around 40% of students chose the incorrect response of 'ethane', with a further 30% correctly choosing 'propane'.

Question 4 (low demand)

- 4.1** Around 60% of students chose the correct response that the elastic potential energy decreases, with a further 25% saying that it increases.
- 4.2** Around 60% of students chose the correct response that the kinetic energy increases, with the other two responses being fairly evenly split.
- 4.3** Nearly two-thirds of students answered correctly. Of those who did not score the mark, the answer 'created' was far more common than 'destroyed'.
- 4.4** Whilst the majority of students were able to perform the calculation correctly, few chose the correct unit, with N/m^2 being most common.
- 4.5** Many students made a reasonably good attempt at drawing the graph, with around half scoring all three marks. Errors were mainly attempting to draw the line freehand or using too thick a line.
- 4.6** Around three-quarters of students gave the correct answer of 'increases'. Many students wrote 'decreases' and some gave values from the graph.
- 4.7** Around 50% of students chose the two correct responses, with a further 40% opting for one correct and one incorrect answer.

Question 5 (low and standard demand)

- 5.1** Answers were fairly evenly split between the correct 'cooler' and the incorrect 'warmer'.
- 5.2** Approximately 60% of students chose the correct response of 'condensing,' with 'melting' being the next most popular choice.
- 5.3** Around 50% chose the correct answer of 'increases', the most popular incorrect answer being 'decreases'.
- 5.4** Only about half of students chose the correct answer of 'decreases'. Of the incorrect choices, there were slightly more 'increases' than 'stays the same'.
- 5.5** Around one-fifth of students did not attempt this question. Very few gained both marks, although some gained one mark, usually for stating that there are more carbon atoms in a molecule of heavy fuel oil than in petrol. Many students did not refer to the data given, but gave answers such as 'it is cheaper', 'it is more environmentally friendly', etc.
- 5.6** Responses were fairly evenly spread between the correct 'polymerisation' and incorrect 'oxidation' with around 15% choosing 'decomposition'.

- 5.7** Very few students stated that the same number of bottles would be needed to transport the same volume. Many students correctly stated that the plastic bottles weighed less than the glass bottles, scoring one mark. Others were unable to score this mark, with answers such as 'they have different masses', or 'glass is 270 and plastic is 20', which did not give a clear enough comparison. Many students did not gain a mark as they did not refer to the information given, but gave answers such as 'glass is easier to break', plastic can be recycled', etc. Some students seemed to equate the word 'energy' with 'heat' and gave answers such as 'plastic is easier to melt', 'plastic is a better insulator'.
- 5.8** Around 40% of students scored both marks, usually for 'recycle' and 're-use'.

Question 6 (low and standard demand)

- 6.1** A large proportion of students, around 40%, did not attempt this question. Of those who did, very few scored more than 2 marks. It appeared that many students did not realise that they needed to describe a practical experiment using the circuit shown. Instead, students often wrote about drawing bar charts, working out ranges and means, and calculating resistance.
- 6.2** Responses were fairly evenly spread between the correct 'resistance ...increases' and incorrect 'resistance ...decreases' with around 15% choosing 'resistance...stays the same'.
- 6.3** Around one-quarter of students scored both marks, with a further 40% gaining one mark.

Question 7 (low and standard demand)

- 7.1** A large percentage, around 30%, did not attempt this question. Most of those who realized that a number was required before HCl correctly inserted '2', although 4 was also seen. Some students attempted to insert a chemical symbol or formula, with 'C', H' and 'H₂O' being fairly common.
- 7.2** Answers were fairly evenly spread between all three responses, with the correct answer being slightly more popular.
- 7.3** Whilst many students had the correct idea, not many scored the mark because their answers were absolute, e.g. 'to stop any gas from escaping' rather than 'to minimize the loss of gas'.
- 7.4** Many students had difficulty working out the volume of gas collected, and the time taken between 20 seconds and 60 seconds, with around 20% scoring all 5 marks. A large number took the values of volume and time from the last point shown on the graph, so were able to access some marks if they then carried out the calculation correctly with these values. Many chose the correct unit from the given options, although s/cm³ was also a popular choice.

- 7.5** Many students were able to state that the volume stayed constant after 80 seconds, but few gave an explanation. Only around 5% gained both marks, although approximately 50% scored one mark.
- 7.6** Around one-third of students did not attempt this question. Of those who did, the majority drew a line showing a slower initial rate of reaction. Only 5% gained both marks for a line showing a greater initial rate of reaction, levelling off at 50cm^3 . A further 11% gained one mark for showing a greater initial rate of reaction but often gave a greater total volume of gas produced.

Question 8 (standard demand)

- 8.1** Some students were able to score one mark for a statement meaning 'as force increases, extension increases' but not referring to a linear relationship. A few 'positive correlation' answers were seen, which did not gain the mark. However, it was pleasing to see a few students gaining both marks by referring to a directly proportional relationship.
- 8.2** Most students opted for the incorrect answer of spring A. Of those who chose spring C, many did not give an explanation. Of the answers given most explanations were too imprecise to gain the mark, e.g. 'it has the least extension' but without specifying 'for a given force'.
- 8.3** Many students chose the wrong equation, using $F = ke$ and using the given value of energy for F . Of those who chose the correct equation, some were able to substitute and rearrange correctly to get the correct answer, thus scoring 3 marks. However, many were unable to rearrange correctly. Not many gave the correct unit of N/m ; N/m^2 was the most popular choice.
- 8.4** Answers were fairly evenly spread between all three responses, with the incorrect answer 'work done is less than elastic potential energy stored' being slightly more popular.

Question 9 (standard demand)

- 9.1** Around one-fifth of students did not attempt this question. Not many gave the correct answer, indicating that they had neglected to use the instructions to refer to the given chart. Common incorrect answers were 'pH7 is neutral', 'they didn't repeat the experiment' and 'it is not accurate'.
- 9.2** A wide variety of answers were seen, encompassing many items of laboratory equipment. Acceptable answers were pH probe, pH meter and pH sensor, answers given by a minority of students. Common answers similar to this which did not score the mark were 'pH scale' and 'pH detector'.

- 9.3** Both 'neutralisation' and 'exothermic' were acceptable answers given by around 10% of the students. 'Chemical reaction' was a popular answer, along with 'fizzing' and 'bubbling'.
- 9.4** Around 35% of students did not attempt this question. Around one-quarter were able to calculate the relative formula mass correctly. Of those who did not score, the main mistakes were adding together the given relative atomic masses and multiplying the sum by 3, or multiplying the three given values together.
- 9.5** Around 30% of students chose the incorrect response of 'H⁺'. The other three responses were fairly evenly split, with slightly more students opting for the correct 'OH⁻'.
- 9.6** Many students did not attempt this question. Very few scored all 3 marks, although a fair number gained 2 marks for a correct calculation with an incorrect conversion of either the volume or the concentration, or no conversion at all.

Question 10 (standard demand)

- 10.1** Around 20% of students did not attempt this question. The majority of those who attempted it gave the correct answer. The most common error was to multiply the two values given. Some students thought that the area of 720 m² meant that they had to divide the power by 720².
- 10.2** Around 75% of students chose the correct equation. Given that students had access to the equations sheet, it was surprising that 25% chose an incorrect equation.
- 10.3** Around half of students gave the correct answer. The most common mistake was to divide the two values instead of multiplying. It would benefit students to substitute values directly into the given equation before attempting to rearrange, allowing them to gain a mark even if their rearrangement was subsequently incorrect. Some students did not pay attention to the number of zeroes in the given value of power, so 250 000 was sometimes written as 25 000 or 2 500 000.
- 10.4** Very few gave the correct answer of 14 hours. A fair number gave answers which indicated they were referring to electrical power. Those who gave a value of time often just read either the first 6 hours, or the last 8 hours.
- 10.5** Many students did not gain any marks because they just repeated, or re-phrased, the information given in the question. The question prompted students to use information from the graph; very few students referred to this, thus preventing them from gaining a mark in Level 2.

Mark Ranges and Award of Grades

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