
GCSE

COMBINED SCIENCE: SYNERGY

8465/4F: Paper 4 – Physical sciences (Foundation tier)

Report on the Examination

8465

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General

Questions 09, 10 and 11 were common with the Higher tier paper.

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.

Question 1 (Low demand)

- 01.1** This question required students to fill in a table with ticks or crosses as appropriate. Nearly one fifth of students did not attempt to answer it. More than half of the students who attempted it failed to score any marks. The topic of reactivity of metals, and displacement reactions appeared to be challenging
- 01.2** More than half were able to complete the equation correctly. Incorrect answers gave the second reactant as either just copper or just sulfate. Other answers included reactants or products such as sulfuric acid, oxygen, carbon dioxide, etc.
- 01.3** Around half gave the correct answer (alkaline). The majority of incorrect answers were for 'acidic'.
- 01.4** Around half gave the correct answer (hydrogen). The majority of incorrect answers were for 'carbon dioxide'.
- 01.5** Nearly two-thirds of students scored a mark, with 'fizzing' and 'bubbles' being the most common observations. A few did not specify an observation, but just said 'it reacts'.
- 01.6** Around half gave the correct answer (less reactive). The majority of incorrect answers were for 'more reactive'.
- 01.7** Slightly fewer than half gave the correct answer (Mg^{2+}). The majority of incorrect answers were for Mg^+ .

Question 2 (Low demand)

- 02.1** Nearly three-quarters of students were able to give a suitable factor – air resistance and how far the spring is stretched were the two most common answers.
- 02.2** Nearly one-tenth of students did not attempt this calculation, but nearly three-quarters were able to perform the calculation correctly. The main error was failing to square the value for extension.

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- 02.3** Around two-thirds gave the correct answer (linear relationship). The majority of incorrect responses were for 'inversely proportional'.
- 02.4** Answers were fairly evenly divided between 34cm (correct) and 40cm (incorrect). Around one fifth of students gained the second mark – many either did not give a reason or had difficulty in expressing that the line starts to curve.
- 02.5** Around half of the students failed to gain any marks. The question asked what happened to the spring as the force decreased. Many answers said 'the force decreased'. A lot of students didn't appear to understand the graph, saying that the extension increased. A few stated that the extension decreased, a few stated that it ended up with an extension of 2.5cm, but hardly any said both of these.

Question 3 (Low and standard demand)

- 03.1** The correct answer (gas) was given by around 60% of students. 'Liquid' and 'aqueous' were the most common incorrect answers.
- 03.2** Around one tenth of students did not give an answer, but more than half gave the correct answer.
- 03.3** Around one third of students correctly stated that there were 6 atoms. The most common incorrect answer was '4 atoms'.
- 03.4** Nearly two thirds of students gave the correct answer of 'same rate'. Incorrect answers were fairly evenly divided between the other two responses.
- 03.5** Around half gave the correct answer (none escape). The most common incorrect answer was 'only ammonia and hydrogen chloride escape'.
- 03.6** The most common response was the third box (incorrect) with 6 electrons in the outer shell. Around 30% gave the correct response, which had 8 electrons in the outer shell.
- 03.7** Around one third of students did not attempt this calculation. Of those who made an attempt, many did not appear to realise they needed to work out what percentage 14 was out of 17 and added, subtracted or multiplied combinations of numbers. The few who did a correct calculation often did not give the answer to 2 significant figures.
- 03.8** Around one third gave the correct answer (bond). Some tried to describe it without using the word 'bond', eg the connection between N and H, etc. A significant number of answers referred to something unconnected to chemistry, eg 'minus sign', 'hyphen', etc.
- 03.9** Almost half of students gave the correct response of 'molecule'. The other two responses were fairly evenly divided.

Question 4 (Low demand)

- 04.1** Around two-thirds gave the correct answer (battery). The two incorrect words, 'cell' and 'fuse' had similar numbers of responses.
- 04.2** Fewer than half gave the correct response (decreases). The majority of answers given were 'increases'.
- 04.3** Around half of the students gained one mark, usually for saying that the line passed through most of the points, some for saying that the trend was a curve, but few said both things. A few stated that student B's line was actually incorrect because a best fit line should be straight.
- 04.4** Around one-third gave the correct response (random error). The most common answer was 'systematic error'.
- 04.5** Around 10% of students did not attempt this calculation. Around 80% performed the calculation correctly to score both marks. Incorrect answers tended to multiply the two numbers.
- 04.6** Fewer than 20% gained all 3 marks, or even 2 marks. However, around 40% gained 1 mark, either for stating that the resistance was the dependent variable or that the temperature was the control variable.

Question 5 (Low and standard demand)

- 05.1** More than half were able to perform this calculation correctly. The two main errors were:
- getting the numbers the wrong way round
 - cubing the 0.4 value.
- 05.2** Fewer than one-tenth of responses were correct. Students did not seem familiar with the term 'solute', many appearing to think it was the same as 'solution'.
- 05.3** Nearly one-third of students did not attempt this extended response question. Of those who made an attempt, around 5% gained a Level 3 response (5 or 6 marks) for describing a procedure which would lead to a valid outcome, ie determining which solution had the greater concentration. Common errors were:
- weighing solid sugar and making up the solutions
 - comparing the times to evaporate
 - not explaining how the concentrations could be compared.
- 05.4** Around two-thirds of responses were correct (0.01g). The most common incorrect answer was 0.10g.

Question 6 (Low and standard demand)

- 06.1** Around one fifth of students gave the correct response (potential difference).
- 06.2** Around one fifth of students correctly identified the insulation colours of two or three of the wires. Around one third identified one of the colours correctly, and around two fifths failed to score a mark.
- 06.3** Fewer than three quarters of students chose the correct equation, despite having been given the sheet of equations.
- 06.4** Around 15% of students did not attempt the calculation. However, more than half were able to perform the calculation correctly to score all 3 marks. The main error was multiplying the two numbers instead of dividing.

Question 7 (Low and standard demand)

- 07.1** Around 80% gave the correct answer (a large proportion ... is usefully transferred). The other two answers both had similar numbers of responses.
- 07.2** Around two thirds gained the mark for this question. Incorrect answers included that light would be given off so you would be able to see better, and that the temperature would decrease.
- 07.3** About one tenth of students did not attempt the calculation. However, around 80% scored both marks. Incorrect answers usually involved dividing the two numbers instead of multiplying.
- 07.4** Around one quarter of students did not attempt this extended response question. Of those who did, fewer than 5% gave a Level 2 answer (3 or 4 marks). Students generally appeared to find the table confusing, and thought that the 'minimum current needed to cause pain' values were an indication of the level of pain. Hence, they stated incorrectly, a 10 000Hz supply was worse because it caused a higher level of pain.

Question 8 (Low and standard demand)

- 08.1** Around one quarter chose the correct answer (length of card and time). The most common answer was 'mass and time'.
- 08.2** More than three quarters correctly performed the calculation to score both marks. The main errors were multiplying the two numbers, or using the value for mass rather than one of the other quantities.
- 08.3** Fewer than 1% of students were able to state that force and acceleration were directly proportional because the graph was a straight line through the origin. About half of the answers stated that as the force increased, the acceleration also increased, which enabled them to score one mark.
- 08.4** Around three quarters of students were able to perform the calculation correctly.
- 08.5** Around half of students correctly identified that the friction would be greater. The other two answers both had a similar number of responses.

Question 9 (Standard demand)

- 09.1** Around 15% of students gained the mark. Many students who obviously understood the concept, incorrectly used 'the time it takes...' or 'how long...'.
- 09.2** Around 15% did not attempt to write down the equation, despite having been given the Physics Equations Sheet. However, nearly 75% gained the mark. Some chose the wrong equation, usually for gravitational potential energy. Some re-arranged the correct equation incorrectly – probably thinking that as gravitational field strength was mentioned first, they needed to rearrange it accordingly.
- 09.3** Around 15% did not attempt this calculation. Around 60% performed the calculation correctly, scoring all 3 marks. The most common mistake was multiplying the two numbers instead of dividing.
- 09.4** Around 20% of students did not attempt this calculation. A similar percentage gained all three marks. It appeared that many students did not know how to calculate a percentage. Many multiplied 0.5×35 to get a rather large reaction time of 17.5 seconds.
- 09.5** Fewer than 10% of students gained a Level 2 score (3 or 4 marks) for this extended response question. Most answers just made a comment that using a mobile phone increases reaction time. Very few compared the increase with that caused by alcohol. Very few answers referred to the illegality aspect. Quite a common mistake seemed to be thinking that the question was referring to using a mobile phone whilst over the legal alcohol limit.

Question 10 (Standard demand)

- 10.1** More than one tenth of students did not attempt this question. Around two fifths gave the correct answer of 36 cm³. Common incorrect answers were 64 (100 – 36) and 44 (counting up from 40). However, there were also many random answers that did not seem to have any connection to the diagram.
- 10.2** Almost one quarter of students did not attempt this question. A further on-quarter gained one mark, usually for saying that the gas would escape. Few gained both marks.
- 10.3** Around two fifths of students gave the correct answer of 80 seconds. The most common answer was 100 seconds (last point on the graph).
- 10.4** Just over half of students gave the correct response (higher gradient). The other two answers both had a similar number of responses.
- 10.5** The test for hydrogen gas did not seem to be well known, as around two fifths of students did not attempt this question. Around 10% scored both marks. The few who knew it was the ‘squeaky pop’ test often failed to describe what needed to be done to get the squeaky pop. Many students did not seem to understand the question and tried to describe something about the experiment or results in the previous parts of the question.

Question 11 (Standard demand)

- 11.1** Around one quarter of students gained one mark, for saying that the compass would be placed near the magnet, but very few were able to describe what observations would identify the poles. A few students made correct statements relating to properties of magnets, e.g. opposite poles attract, but did not apply it to the question.
- 11.2** Around one third of students drew a correct diagram. Many drew the two circles but with incorrect arrows or no arrows. There were a number of random shaped fields drawn.
- 11.3** Nearly half of students did not attempt this question. Of those who put N and S labels, many were in apparently random places and some were at the two ends of the iron core but the wrong way round. Around one tenth of students scored the mark for correct labelling.
- 11.4** Around 75% of students gave the correct equation. Some chose a completely different equation. A few tried to rearrange in terms of acceleration, but did so incorrectly.
- 11.5** Around one fifth of students scored all three marks for this calculation. A further similar number scored two marks for substituting correctly into the equation, and rearranging, but were unable to deal correctly with the powers of ten in the given values.
- 11.6** Fewer than 5% of students linked the increased force on the paper clip to its increased acceleration. However, many answers did not refer to acceleration, or if they did, just stated ‘the acceleration changes...’. Common answers included ‘the magnet gets stronger’ and ‘the paper clip goes faster’ – these did not gain any marks.

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.