



GCSE

COMBINED SCIENCE: SYNERGY

8465/3F Physical Sciences
Report on the Examination

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General

There were 10 questions on this paper. Questions 8, 9 and 10 were common with the Higher tier.

Questions 2, 5, 7 and 9 were predominantly physics content and the others chemistry.

This paper also contained items targeting mathematical and practical skills. Some students made good use of the Equations sheet with this paper.

Students should be advised to clearly show the method of their working when completing calculations, even simple ones that are easily done on a calculator. It can be difficult for examiners to credit responses if they cannot clearly follow the method the student has used.

Two required practicals were targeted in this paper, RPA21 in Q3 and RPA17 in Q10. Many students seemed unfamiliar with laboratory techniques, equipment and methods.

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.

The questions are designed to increase from low demand to standard demand through the paper.

A student's final grade is based on their attainment across the qualification as a whole.

Items

Question 1 (low demand)

1.1 Nearly half of students gained a mark, with 7 being the most frequently chosen distractor.

1.2 Two thirds of students knew blue was the colour of universal indicator in alkaline solution. Red was the most common incorrect response.

1.3 Students were unfamiliar with pH probe with a third not attempting this and hardly any gaining a mark.

1.4 About half of students knew that H^+ was the ion produced by acids with OH^- being the most common incorrect response.

1.5 More than two thirds of students knew this reaction was a neutralisation. Combustion was the most common distractor.

1.6 A third of students were able to determine the number of atoms present. Nearly two thirds of students responded 6, presumably adding 2 and 4 together.

1.7 About two thirds of students scored both marks for this calculation with the equation given. Incorrect responses included multiplying the values or inverting the division.

Question 2 (low demand)

- 2.1 About three quarters of students knew an advantage of generating electricity using nuclear power.
- 2.2 Roughly half of students knew how a step up transformer affected the potential difference.
- 2.3 Only about a quarter of students knew that step up transformers decrease the current. The majority of others thought that the current increases.
- 2.4 Less than a third of students knew how step up transformers affected the energy transferred.
- 2.5 Over four fifths of students scored both marks for this calculation with the equation given.
- 2.6 About two thirds of students gained both marks for the percentage calculation. Students who did not show their working potentially missed the 'allow' mark being awarded.

Question 3 (low demand)

- 3.1 About two thirds of students named 'battery'. Incorrect responses included 'cell' and other components.
- 3.2 'Copper sulphate solution' was the most common 1 mark answer. Incorrect suggestions for the electrode included magnet, metal bar, a named metal and battery. Over half of students scored 0 marks or did not attempt the question.
- 3.3 About three fifths of students knew ions carry the charge. Incorrect responses were fairly evenly spread between 'atoms' and 'molecules'.
- 3.4 Over half of students scored both marks. Students not showing their working were potentially not credited for a correct method with a wrong answer. Some students divided 0.52 by 2 instead of 20.
- 3.5 Roughly three fifths of students gained both marks for calculating the mean.
- 3.6 Over three quarters of students identified the correct change in mass. 0.001 g was the most common distractor.

Question 4 (low demand)

- 4.1 About three fifths of students knew diamond is a form of carbon. 'Silicon' was the most common distractor.
- 4.2 About a third of students identified conducts electricity as a property of graphite. A low melting point was the most popular distractor.
- 4.3 About a third of students identified C_{60} as the formula of buckminsterfullerene. C_{12} was the most popular distractor.

4.4 Nearly two thirds of students scored this mark. Students often did not gain credit as the numbers were not subscripts. Some wrote 'H' and 'C' on the lines.

4.5 Roughly an eighth of students gained 2 marks and two thirds gained 1 mark. 'Covalent' was the most well-known correct answer.

4.6 Over half of students gained 3 marks for using the pie chart to calculate percentages. 92% was usually calculated correctly for 1 mark. Some did not recognise that 92% then needed to be subtracted from 100 for the next step. Some used the 3:1 ratio incorrectly and split 8% into 5 and 3, rather than 6 and 2.

4.7 Nearly two fifths of students gained both marks and a similar number were not able to give a correct response.

4.8 Nearly four fifths of students knew that boiling point was the required property.

4.9 About half of students correctly named cracking as the type of reaction. Oxidation was the most common distractor.

Question 5 (low/standard demand)

5.1 Only about a quarter of students gained this mark, with nearly half of all students incorrectly responding the potential difference varies.

5.2 About a third of students knew that the mains potential difference in the UK is 230V. 50V was the most common incorrect response.

5.3 A third of students gained both marks. About half scored 1 mark, mainly for a correct line from the live wire.

5.4 Nearly three quarters of students gained both marks for saying what the switches did.

5.5 Over four fifths of students correctly identified this equation with many writing power as the subject.

5.6 The vast majority of students did not convert time into seconds. Therefore, an answer of 240J was very common and received 2 marks providing working was shown. Despite most students giving the right equation for 5.5, nearly a fifth did not attempt this calculation.

Question 6 (low/standard demand)

6.1 About two fifths of students correctly identified (g) as the state symbol with (aq) being the most common distractor.

6.2 The majority of students knew the test for hydrogen.

6.3 Ca^+ was the most common response and only about a third of students scored a mark.

6.4 Two thirds of students identified the trend although some students suggested a value or a product.

6.5 Many students either did not label the y -axis, or gave a response of 'y-axis'. Most of the students that attempted this item plotted the points within the tolerance. They also drew an accurate straight line of best fit with a ruler.

6.6 Despite the line of best fit often drawn correctly, students were less successful at predicting the mass by extrapolation. Less than two fifths gained credit. They often did not identify 1.25g correctly on the x -axis, for instance using 1.125g instead. Answers were regularly supported with working on the graph.

6.7 Less than a quarter of students gained 2 marks for the calculation of the relative formula mass of calcium carbonate.

Common errors were:

- $40 + 35.5 = 75.5$
- $40 \times 35.5 = 1420$

Question 7 (low/standard demand)

7.1 Nearly three quarters of students used the given equation correctly to gain 2 marks. It was encouraging to see most included their working. A frequent error was to multiply 200 by 2 rather than square 200.

7.2 About four fifths of students used the given equation correctly to gain 2 marks and also included their working.

7.3 Just under half of students gained both marks. Some noted that they did not have a ruler, which may account for some of the blank responses. A common answer of 47.5 km was obtained by measuring $6.0 + 3.5 = 9.5$ cm instead of $6.1 + 3.5 = 9.6$ cm. For the compensation mark, students had to indicate how they had obtained their measured distance.

7.4 Less than a fifth of students knew the angle of displacement. The vast majority of students responded 90° .

7.5 About four fifths of students could write down the correct equation.

7.6 About two fifths of students gained all 3 marks. Nearly a fifth did not attempt this item. Those students who did not score any marks often incorrectly substituted into the equation and/or rearranged the equation incorrectly.

Question 8 (standard demand)

8.1 Just over two thirds of students gained 1 mark, usually for a response of lithium rather than Li

Common incorrect responses were:

- hydrogen
- helium.

8.2 Less than a fifth of students were able to show that lithium forms a positive ion with most others showing no understanding of ion formation.

8.3 Less than a tenth of students knew that a mixture of metals is an alloy. Copper sulphate was a common incorrect response and some gave the insufficient response bronze.

8.4 A third of students did not attempt this item. About an eighth gained 3 marks.

Common errors included:

- misreading the percentage of copper as 58%.
- dividing their percentage by 20.

8.5 Very few students gained any credit for the explanation as to why an alloy is harder than pure copper. Some did refer to the different atom sizes for 1 mark. Others assumed that metal X was just a harder metal than copper.

8.6 Very few students obtained 1 mark and those that did mainly responded in terms of strong bonds.

Incorrect responses included copper being:

- soft.
- a metal.
- a good conductor of electricity.

8.7 A fifth of students did not attempt this question and three quarters got 0 marks. Insufficient responses such as 'copper is a metal' were common.

Question 9 (standard demand)

9.1 Over four fifths of students identified the correct equation.

9.2 A fifth of students did not attempt this item. Less than a tenth gained 3 marks. Some correctly read $v = 24$ m/s from the graph but couldn't substitute into, or rearrange, the correct equation. Many used $v = 6.0$ which was the value given for time so gained no credit.

When asked to use a figure, students could benefit by showing their method on the figure.

9.3 Over half of students scored 1 mark. The most common incorrect response was 'gravitational potential energy is transferred to kinetic energy'.

9.4 Less than a fifth of students gained any credit and hardly any were awarded both marks.

For the first marking point, friction or lubrication needed to be linked to the brakes and many students omitted this. Unscientific terms such as 'slippy' were not credited.

Incorrect responses for the second marking point included saying 'takes longer to stop' which could mean time rather than distance. 'Stops more slowly' was another incorrect way students expressed what happened to the carriage.

9.5 The definition of thermal conductivity was not well known. About an eighth of students scored 1 mark for good conductor, but the rate of energy transfer was rarely seen. Many students described it as 'withstanding high temperatures' or 'helping the brakes work better'.

Question 10 (standard demand)

10.1 Students found this question difficult and appeared unfamiliar with the products of this reaction. A wide variety of compounds and elements were seen in responses. A quarter did not attempt this item and over half of those who did, did not achieve a mark.

10.2 Descriptions of the salt preparation method were generally insufficient to score highly. About two fifths made no attempt, one fifth got 0 marks, and only 10% of students exceeded level 1, with just over 20% gaining either 1 or 2 marks.

Common errors were:

- starting with calcium chloride.
- assuming that calcium chloride is a liquid or a solution.
- not adding an excess of the calcium carbonate.
- not filtering the mixture.
- describing filtration as going through a funnel without the paper.
- just leaving the 'solution' on the side.
- not identifying suitable containers eg using a petri dish on top of a flame.
- strongly heating with a Bunsen burner rather than using an electric heater or a water bath.
- heating to dryness.

Mark Ranges and Award of Grades

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