

GCSE

COMBINED SCIENCE: SYNERGY

8465/3F: Paper 3 – Physical sciences (Foundation tier)

Report on the Examination

8465

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General

There were 9 questions on this Foundation tier paper. Questions 08 and 09 were common with the Higher tier. The questions are designed to increase from low demand to standard demand through the paper.

Questions 03, 06 and 09 were predominantly set on physics content with the others being set on chemistry.

This paper also contained items targeting mathematical and practical skills.

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.

Some students did not make good use of the Physics Equations Sheet supplied with this paper.

Many students seemed unfamiliar with laboratory techniques and equipment. Question 07 was mainly a working scientifically question. Questions 05.6 and 05.7 were the only items assessing Required Practical Activities in this 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** Nearly three quarter of students answered hydrogen. Common incorrect responses included hydro and water.
- 01.2** More than a third of students knew that the maximum number of bonds was 4. The majority of incorrect responses were either 2 or 6.
- 01.3** About a third of students knew plankton was the ancient biomass with the majority of incorrect responses being 'methane'.
- 01.4** Roughly two thirds of students knew hydrocarbons were separated using boiling points..
- 01.5** Over half of students named a correct fuel, mainly petrol and diesel. Incorrect responses often included references to fossil fuels or carbon dioxide.
- 01.6** About a quarter of students gained 2 marks. Nearly two thirds gained 1 mark, usually for carbon dioxide.
- 01.7** Just under half of students knew the relationship between size of molecules and viscosity.

Question 2 (Low demand)

- 02.1** Whilst roughly a third of students correctly identified H^+ , Na^+ was the most common response.
- 02.2** Well over half of students got this mark with 'iodine solution' the most common incorrect response.
- 02.3** Nearly two thirds of students correctly referred to eye protection. Glasses with no reference to safety, and wearing gloves were insufficient for a mark.
- 02.4** Over two thirds of students identified sodium sulfate as the salt produced.
- 02.5** Less than a third of students identified water as the other product with both of the other distractors seen more often.
- 02.6** About a quarter of students were able to identify the pH of the solutions and were awarded 2 marks. Just under half did not gain a mark.
- 02.7** Less than half of students correctly identified the reaction as neutralisation with combustion being a very commonly chosen distractor.

Question 3 (Low demand)

- 03.1** About a fifth of students gained 3 marks and nearly half gained 1 mark. Nearly a third of students scored 0. Students generally chose to use all 3 answers from the box.
- 03.2** The majority of students were able to use the provided equation and gain 2 marks for this calculation. Many students did not show their working but should be encouraged to do so.
- 03.3** Nearly three quarters of students were able to identify the graph showing alternating current.
- 03.4** Only a third of students were able to identify the graph for a diode. The graph for a filament lamp was selected by over half the students.
- 03.5** Whilst the majority of students got credit for the calculation, only a tenth got full marks by also identifying coulombs as the correct unit. The distractors amps, ohms and volts appeared equally.
- 03.6** The vast majority of students got full credit and showed their working for this calculation with a given equation.

Question 4 (Low and standard demand)

- 04.1** About two thirds of students correctly balanced this equation.
- 04.2** Less than two fifths of students did the correct calculation with various arrangements of the numbers 10, 40 and 56 used in incorrect responses.
- 04.3** Only about a third of students got a mark. Incorrect responses generally referred to the line of best fit not going through the point, rather than realising the point was avoided when the line was drawn. It was insufficient just to say that the point was the odd one out.
- 04.4** About two thirds of students gave the correct pattern. A common error was not writing 'oxide'.
- 04.5** Less than half of students scored both marks. Many students did not extend the line as instructed and just gave a value. 0.7 was a common incorrect reading from the graph.
- 04.6** Roughly two thirds of students correctly calculated the mean of the values in the table. Some students just gave a response of 0.5. Without any working no credit could be given for any correct steps in the method.
- 04.7** About two fifths of students identified the correct reaction profile. A similar number chose the endothermic profile and the remainder of students chose the middle one.
- 04.8** The definition of 'activation energy' was not well known. The vast majority of students gave incorrect responses or did not attempt the question.

Question 5 (Low and standard demand)

- 05.1** Just over half of students identified the reason why iron is extracted from carbon. The most common incorrect response was 'iron is more reactive than carbon'.
- 05.2** About two fifths of students identified the reactant that was reduced with the other responses fairly evenly distributed between the distractors.
- 05.3** The most common response was copper, closely followed by aluminium. Only about an eighth of students identified carbon as the positive electrode.
- 05.4** Very few students gave a correct reason for the use of large amounts of energy in electrolysis. Common incorrect responses included references to aluminium melting rather than the mixture or the reactivity of aluminium.
- 05.5** Knowledge of ions being free to move and carry charge was rarely demonstrated. The vast majority of students gained 0 marks or did not attempt to answer the question.
- 05.6** Only about 5% of students could define the word inert which is knowledge needed for the Required Practical Activity.
- Incorrect attempts included:
- inside
 - dead
 - small.
- 05.7** Less than a tenth of students were able to correctly complete the table. The third of students awarded 1 mark usually achieved this by naming copper as the product at the negative electrode. Liquid was a more common response than gas for the state of chlorine. Many students responded copper and gas but in the wrong positions in the table.

Question 6 (Low and standard demand)

- 06.1** Nearly three quarters of students gained 2 marks for this calculation using the given equation. The most common incorrect response was 270 which arose from using 1.5 not 1.5^2 in the equation.
- 06.2** The equation was on the Physics Equations Sheet but three tenths of students gave an incorrect response and just under 15% did not attempt the question.
- 06.3** About two thirds of students got the full 3 marks for multiplying the two numbers given. About a fifth got 0 marks, largely for using the calculation $\frac{0.8}{220} = 0.0036$.
- 06.4** Under half of students knew that the velocity decreased. A common incorrect response was that the velocity 'stopped'.
- 06.5** About half of students got 1 mark, mainly for 'kinetic energy decreases'. Under a third got both marks.

Question 7 (Low and standard demand)

This question assessed some chemistry practical skills and students did not perform well throughout the question.

07.1 Nearly three quarters of students incorrectly identified the distractor to stop carbon dioxide escaping as the reason for putting cotton wool in the conical flask.

07.2 Understanding of the term independent variable was poor with only about a tenth of students getting a mark.

Incorrect responses included:

- cotton wool
- balance
- lumps
- amount of calcium carbonate.

07.3 About a tenth of students gained a mark for naming a control variable. Volume of acid was the most common answer which was often written as 50 cm³ of acid.

Incorrect responses included:

- cotton wool
- conical flask
- time
- amount of acid.

Students should be encouraged to avoid the word amount and use more specific terms like volume and mass.

07.4 Nearly a third of students gained both marks for calculating the mean rate of reaction using a given equation. About an eighth of students gained 1 mark, mainly for calculating $\frac{0.09}{60}$ as 1.5. Well over 40% of students gained 0 marks often after selecting the wrong value from the table and 15% did not attempt the question.

07.5 Around three tenths of students got all 3 marks for correctly completing the bar chart. Four tenths got 2 marks, mainly for drawing the bars without labelling the y-axis correctly. Of the remaining students, half made no attempt at this question.

07.6 About a third of students gained 1 mark, usually for a description rather than the term 'categoric variable'.

07.7 Nearly two thirds of students identified the effect of size on the rate of reaction. The most common incorrect response was that the rate of reaction would increase.

07.8 Roughly three quarters of students were able to calculate the surface area correctly using the given equation.

07.9 Just under a third of students gained this mark, often with acceptable descriptions including uneven surfaces or edges. It was insufficient just to say that the lump was too difficult to measure.

Question 8 (Standard demand)

- 08.1** About a third of students identified why metals could be shaped. The other responses were fairly evenly distributed between the three distractors.
- 08.2** The vast majority of students gained no credit for an explanation as to how metals conduct electricity. Given the prompt, several referred to electrons and shells out of context. A third made no attempt to answer.
- 08.3** In this extended response question, the command word ‘compare’ required students to give both differences and similarities to gain a mark in level 2 (4-6). Nearly all students stayed in level 1 because only differences were given.

About a third of students gained just 1 mark. This was usually for saying that diamond is made of carbon atoms and sodium chloride is made of sodium ions and chloride ions. This information was in the diagram and students should be encouraged to add their own knowledge to information given in the question, tables and figures.

Half the students got no marks or made no attempt to answer.

- 08.4** Only a quarter of students gained both marks and a third did not attempt the question.

Common errors were:

- $12 + 1 = 13$
- $24 \times 4 = 96$
- $12 \times 12 = 144$.

- 08.5** About a tenth of students gained 2 or 3 marks. A fifth gained 1 mark, usually for saying that polythene molecules were larger. About a third of students got 0 marks and a third did not attempt the question.

Common errors were:

- not giving comparative answers
- using ‘it’ and ‘they’ and not referring to a particular molecule so answers were ambiguous
- using ‘more’ rather than ‘larger’ molecules
- references to surface area of molecules
- not describing intermolecular forces in terms of strength
- poor terminology such as a lack of clarity about which bonds are broken during melting.

Question 9 (Standard demand)

- 09.1** Very few students gained 2 marks and roughly a tenth of students got 1 mark. Mainly, horizontal arrows of varying lengths were drawn pointing either left or right. Very few touched the propellor.
- 09.2** About a tenth of students could identify all the quantities. Two thirds gained 1 mark, usually for the top pair of speed and velocity.

- 09.3** Although the equation was on the Physics Equations Sheet a rearrangement was required to answer the question. Roughly a third of students answered correctly, with a similar number of students responding $s = \frac{v}{t}$.
- 09.4** About a half of students gained 3 marks for calculating the time taken. The other half did not gain any marks, or did not attempt the question.
- 09.5** This extended response question required students to explain what happened to each force shown on the boat after the engine was switched off.

The most common force linked correctly to an explanation was the forward force. Understanding of water resistance, weight and upthrust in this context was poor.

Often, insufficient descriptions of motion were given which were not creditworthy.

About a tenth of students gained a level 2 mark and very few reached level 3. A fifth gained 1 mark and the rest had 0 marks or 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.