



GCSE

CHEMISTRY

8462/2F: Paper 2 (Foundation tier)
Report on the Examination

8462
June 2022

Version: 1.0

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General

Questions 08, 09 and 10 were common to questions 01, 02 and 03 on the Higher tier paper.

The majority of students appeared to have sufficient time to complete the paper.

In general, the number of writing lines provided is an indication of the length of response expected, though students are of course free to use the blank pages at the back of the booklet if required.

Knowledge and understanding of how science works in everyday situations, including in the laboratory, were tested throughout this paper. This means that it was essential that students read and analysed the information provided, then read and understood the question before writing their response.

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.

Question 1 (Low demand)

- 01.1** Around 70% of the students gained 2 marks. The boiling point of pure water was slightly better known than its pH.
- 01.2** Under half of the students gained this mark, with universal indicator being the most common correct answer and pH scale the most common incorrect response.
- 01.3** Around 70% of the students gained two marks. Use of a thermometer was the most common incorrect response.
- 01.4** Very well answered, with nearly 90% of the students gaining both of the marks. the majority both obtaining the correct answer and showing their working.
- 01.5** This was also very well answered, with more than three-quarters of the students scoring both marks.
- 01.6** Nearly 50% of the students gained a mark for knowing the flame colour of sodium is yellow.
- 01.7** Knowing that the halide ion test produces a white precipitate gained a mark for over 50% of the students.

Question 2 (Low demand)

- 02.1** A large majority of the students put the fractions in the correct order.
- 02.2** Nearly 50% of the students gained two marks for correctly identifying the trend in both viscosity and flammability in the three crude oil fractions.
- 02.3** The bar chart was largely very well drawn with correct scales. More than 80% of students gained both marks.
- 02.4** Around a third of students answered correctly in terms of the proportion of kerosene in the fractions. Other students did not appear to understand the requirements of the question.
- 02.5** Nearly 40% of the students gained two marks for identifying the use of a catalyst or steam in cracking. Ozone was the most common incorrect response.
- 02.6** Most students could work out the number of hydrogen atoms but some did not write 24 as a subscript and therefore did not gain the mark.
- 02.7** More than 40% of the students gained the mark, but nearly half incorrectly suggested a double bond between two carbon atoms.
- 02.8** Only 20% of the students gained two marks, although carbon dioxide was often seen alongside an incorrect response, usually hydrogen.

Question 3 (Low and standard demand)

- 03.1** Just over half of the students correctly worked out the percentage of nitrogen.
- 03.2** Nearly 60% of the students gained two marks, with methane being well known but ammonia less so.
- 03.3** Photosynthesis was correctly identified by nearly 90% of the students.
- 03.4** Nearly 50% of the students gained two marks, with carbon dioxide dissolving in oceans better known than formation of sedimentary rocks.
- 03.5** Nearly four fifths of the students could correctly read the value from the graph.
- 03.6** Even though the numerical scale was increasing in the backwards direction, more than 90% of the students scored this mark.
- 03.7** Plankton was identified by nearly 60% of the students.
- 03.8** The answer required the idea of limited evidence or that it was billions (or millions) of years ago. Lack of proof or data or that it was a long time ago were insufficient. Just over 20% of the students answered this question correctly.

Question 4 (Low and standard demand)

- 04.1** Around 40% of students were able to complete the displayed structural formula. Others added double bonds or even extra atoms.
- 04.2** Over 70% of the students gained a mark for their knowledge of hand gels as a use of ethanol. A sizeable minority chose testing for hydrogen.
- 04.3** This was an extended response question on chromatography and was quite well answered, with most students gaining at least two marks. However access to level 2 was often restricted by missing out one or more of the key steps, without which the investigation would not work. Around a quarter of the students gained all four marks, and around one-third gained two.
- 04.4** Students found this question challenging, with fewer than 15% of students recognising that yeast must be added.
- 04.5** This was a more challenging calculation which also needed a unit conversion. About 25% students gained full marks, with just under half gaining at least 1 mark.
- 04.6** Many students answered in terms of petrol, which cannot possibly remove carbon dioxide from the atmosphere. Many answered in terms of E10 containing more ethanol, without going on to give a further explanation. The ideas of more sugar or plants being needed to carry out more photosynthesis to remove more carbon dioxide were needed. Only around 10% of the students gained all three marks.
- 04.7** Around 30% of the students realised that E10 produced less energy than E5.

Question 5 (Low and standard demand)

- 05.1** Nearly 40% of the students gained two marks, with many of the remainder reversing the correct responses.
- 05.2** Over 40% of the students knew that nitrogen and hydrogen are both gases. Roughly the same number incorrectly selected an option that stated one of these elements is a gas and the other a liquid.
- 05.3** Fewer than 20% of the students gained a mark. A large majority thought that the reversibility of the reaction was linked to 100% atom economy.
- 05.4** Both evaporated and filtered were often seen. There was no obvious pattern in the responses and over 30% of the students gained both of the marks.
- 05.5** Around one-third of students obtained all three marks.
Over 50% of students plotted the points correctly but did not obtain the line of best fit mark. Common mistakes when drawing the line of best fit were to draw a straight line, a series of dot-to-dot straight lines, a very thick line or multiple lines.
- 05.6** About two-thirds of students realised that the percentage yield of ammonia would also increase.

Question 6 (Low and standard demand)

- 06.1** The equation was correctly balanced by about three-quarters of the students.
- 06.2** Over 80% of the students knew that (s) represents a solid reactant.
- 06.3** The use of a cross on paper to monitor the turbidity of the sulfur produced was known by over 70% of the students, although use of a gas syringe was a common incorrect response.
- 06.4** Over 80% of the students gained the mark, by associating a drop in gradient on the graph with a fall in the rate of reaction.
- 06.5** Many deduced that one of the reactants was used up, with over 60% of the students gaining a mark. A sizeable number asserted that no light was reaching the sensor, even though the graph did not reach $y = 0$.
- 06.6** Over 60% of the students gained a mark, but most of the remainder thought that the line would be less steep at the start.
- 06.7** Over 50% of the students gained two marks. However, there was a wide range of incorrect response combinations, the most common of which used the two responses which were linked to a higher temperature rather than a lower one.

Question 7 (Low and standard demand)

- 07.1** Over 80% of the students were able to identify nitric acid.
- 07.2** Around 25% of the students gained both marks, but a significant number inverted the equation when carrying out the calculation. .
- 07.3** The idea of bias was well known to some students, but many responses blamed inadequate testing in one form or another. Around 25% of the students gained the mark.
- 07.4** Over half of the students were able to deduce that there was one nitrogen atom in the formula. Two and four were sometimes seen.
- 07.5** Over 40% of the students gained the mark, but almost as many incorrectly identified oxygen.
- 07.6** The term “formulation” was not well known with fewer than 5% of the students giving a correct response.

Question 8 (Standard demand)

08.1 This was well answered by a small minority of students with around 10% of students scoring both marks. The most common errors were to omit the double bond, to add additional bonds or atoms to the carbon atoms. Brackets and/or the inclusion of the letter n were ignored.

08.2 The better responses correctly referred to the insulation being burned or melted or the lack of purity or ‘contamination’ of the copper produced. Uncreditworthy responses often made comments such as ‘so you only get copper’. Around 40% of the students scored this mark.

08.3 This was reasonably well answered as responses such as the copper melting and being reformed/moulded into new pipes were seen. Responses referring to ‘heating the wire’ were insufficient to gain credit. Around 40% of the students scored both marks.

08.4 The most common correct responses referred to the conservation of copper and the use of less energy in this process. Relatively few answers identified specified environmental impacts.

Weaker responses referred to ‘pollution’ alone which was too vague to gain credit. Some referred to cost without making a link to the amount of energy needed. Less than 10% of students were able to identify two advantages of recycling, though just over 40% could identify one.

08.5 The test for copper(II) ions was not well known.

A variety of tests were chosen, with the most common incorrect response being the use of flame tests. The addition of acids, especially hydrochloric acid, was also often suggested.

Acceptable results included shades of blue precipitate, e.g. pale/light blue, but answers giving two colours such as green/blue were not credited. Around 1% of students scored both the marks.

08.6 The use of barium chloride or barium nitrate as the reagent for the test was generally followed by the correct result.

The test was often incorrect, with the result, therefore, not able to be awarded a mark. The most common incorrect responses were the use of a flame test or an incorrect reagent(s). Again, around 1% of students scored both the marks.

Question 9 (Standard demand)

- 09.1** Nearly half of the students correctly determined the mass of the empty test tube as 24.5g.
- 09.2** A number of inaccurate responses referred to the unspecified contents of the test-tube evaporating when heated causing a decrease in the mass. Specific reference to water(vapour) or steam evolving was only given by just over 14% of students for the first marking point. Fewer students realised that the escape or loss of water from the test tube completed the explanation. Around 2% of the students scored both marks.
- 09.3** The indication that the reaction was complete or finished was needed. Similarly, the idea that all of the water had been given off, or that only anhydrous cobalt chloride was left, gained credit. Mentioning that the reaction had stopped was insufficient. Some students seemed to think that they were actually timing how long it took for the reaction to complete. Around one fifth of the students gained this mark.
- 09.4** The calculation discriminated well. Approximately 15% of students successfully completed the calculation, usually showing full details of their working.

The final marking point was awarded for giving the answer to 3 significant figures. Some students were able to gain this mark for an incorrect calculation (usually by inverting the fraction and only if they used data given in the question) expressed correctly to 3 significant figures. Working was occasionally omitted, and students need to be sufficiently familiar with their calculator to understand when it is appropriate to include a recurring dot over one or more digits, and also when it is not.

- 09.5** Exothermic and chemical were common incorrect responses. Approximately one-third of the students scored this mark.

Question 10 (Standard demand)

- 10.1** In this extended response question, the command word was 'evaluate'. This command word demands a reasoned judgement to be given for a fully complete answer and therefore for access to a Level 3 mark. Isolated comments such as 'I think polymer is a better material than glass' are not reasoned judgments. The vast majority of students did not go further than this and were therefore capped at four marks. Very few students gained 5 or 6 marks.

Most students scored a Level 1 mark (merely by comparing the values given in the table) or a Level 2 mark (by introducing one or two pieces of 'added value' information about the impacts of the data provided). Nearly 30% of students gained a Level 2 mark, whilst a further 15% or so did not attempt the question.

- 10.2** This straightforward calculation presented no difficulties for the majority of students. Well over 70% of the students gained all three marks.

Use of statistics

Statistics used in this report may be taken from incomplete processing data. However, this data still gives a true account of 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.