GCSE

CHEMISTRY

8462/2F: Paper 2 – Foundation
Report on the Examination

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General

There were ten questions on this paper. Questions 8, 9 and 10 were common to Foundation and Higher Tiers. These were targeted at grades 4-5, as were parts of questions 5, 6 and 7. The other questions were targeted at grades 1-3.

Basic knowledge and understanding of how science works in everyday situations, including in the laboratory, are tested throughout this paper. The mark scheme was designed to allow students to gain marks for showing knowledge, understanding and application of chemistry. This means that it is essential that students read and analyse the information provided.

The majority of students appeared to have sufficient time to complete the paper. Students are getting far better at fully answering questions and therefore gaining more than one mark on the higher value questions. A few do use up a lot of space by repeating the question, which really is not needed in this examination, wasting time and space that could be used to give a creditworthy response and gain more marks.

Level 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 Over 90% of students scored both marks, with filtration correctly linked to the removal of solids and sterilisation linked to killing bacteria.

01.2 Nearly all students identified the use of chlorine in sterilisation, but far fewer knew that ozone could also be used.

01.3 Approximately 90% of students identified at least one method of detecting the presence of dissolved solids in water, with 50% identifying both methods.

01.4 The tests for ions are not well known, with very few (roughly 5%) identifying both reagents correctly.

01.5 Most students (nearly 80%) knew that distillation was used to make water pure.

Question 2 (low demand)

02.1 This was well answered, with around 60% getting all three marks.

02.2 Over half identified a lack of oxygen as the cause of incomplete combustion, although air was also an acceptable answer. However incorrect responses included a wide variety of other gases.

02.3 Three quarters of students could use ratios to correctly answer this calculation. A common error was just to write “3” and not finish the calculation.

02.4 Most students were able to identify that animal waste or food in landfill was a renewable source of methane, but far fewer were able to identify both.

Question 3 (low demand)

03.1 Nearly all students identified the two way arrow as showing that the reaction was reversible.

03.2 Most students could identify the reverse reaction as exothermic. A significant minority tried to explain the term rather than just naming it.

03.3 Three quarters of students identified the use of catalysts, either to reduce costs and use of energy, but only around 20% of students were able to identify both.

03.4 Over 95% of students correctly identified the trend in ammonia production as increasing, but far fewer went on to say that the increase was not steady or that it fluctuated. Those who did usually referred to a specific time period.

03.5 About 40% of students correctly identified both reasons for the increase in production of ammonia, but over 80% of students identified one reason.

03.6 Most students identified the correct combination of fertilisers required for a NPK fertiliser.

03.7 Most students could identify the fertiliser not made from ammonia.

Question 4 (low & standard demand)

04.1 Approximately 70% of students correctly interpreted the percentages in the table to identify the gases present in smaller proportions on Earth.

04.2 Generally, drawing the two bars to show the percentage of nitrogen and oxygen in Earth’s atmosphere was well done. Some students did, however, use the wrong data.

04.3 Most students realised that it was a lack of carbon dioxide that would prevent photosynthesis on Titan.

04.4 Only around 40% of students chose the correct cause of global warming from the three given.

04.5 This proved to be a difficult question, with only about 15% correctly linking both boxes. Over half scored zero marks.

04.6 Around 70% of students used the proportions correctly to calculate the mass of propene.

Question 5 (low & standard demand)

05.1 Two thirds of students correctly identified the bonding in alkenes as covalent.

05.2 Two thirds of students correctly identified the functional group in alkenes.

05.3 One third of students correctly identified the coating as a composite.

05.4 A significant number of students (about 60%) correctly identified both limestone and sand as the materials used to make soda-glass.

05.5 There were a lot of very good reasons given for the covering on addition polymer surfboards, with most students scoring at least 1 mark. The most common misconception was that the boards might otherwise rot or decay.

05.6 This question was very well answered, with many students getting at least three of the four available marks. The last point, the idea that the addition polymer board was more difficult to dispose of at the end of its life, was a challenging mark, with most students simply repeating the information given in the question.

05.7 This was a more challenging calculation as the equation had to be rearranged, which many students did not do correctly. Those who did (nearly 50%) usually went on to gain full marks.

Question 6 (low & standard demand)

06.1 This six mark extended response question proved challenging. Whilst some students were clearly familiar with the standard rusting experiment, others did not appear to be. However, most realised that the need to put nails in a variety of environments, which usually gained credit. Ideally, there should have been a nail in tap water left open to the air, another in boiled water, preferably covered in oil or with a stopper, and a nail in air, preferably with the drying agent. Time scales were often unrealistic, leaving them for minutes rather than weeks. Expected results were often omitted.

06.2 Nearly all students could perform the subtraction to find the increase in mass correctly, although some did round it to one significant figure.

06.3 Most students could calculate the mean increase in mass.

Question 7 (low & standard demand)

07.1 Most students identified the use of a glowing splint to test for oxygen.

07.2 Over two thirds of students correctly identified the need to measure the mass of manganese dioxide in order to make the results repeatable.

07.3 Over two thirds of students identified an improvement to make the results more accurate.

07.4 Most answers for this calculation gained some marks, but only 12% of students gained full marks. The first mark was for taking two readings from the graph and subtracting to get the volume of oxygen formed. The allowable range was from 36 to 40 cm^3. The second mark was a simple subtraction of the numbers given in the question. The third mark was for substituting these numbers into the given equation. The final mark, for completing the calculation and giving the answer to three significant figures, proved the most difficult.

07.5 The answer required a second line to be drawn on the graph, for the same reaction but with a finer powder. Most students realised that it would be steeper, but then did not level it off at the same volume.

07.6 Over two thirds of the students knew that a fine powder had a larger surface area, which would increase the rate of reaction.

Question 8 (standard demand)

08.1 The most common correct answer was 450°C. Over half of the students gained this mark.

08.2 Around 40% of students gained both marks. The most common incorrect answers were descriptions of chain lengths; however, these answers often went on to make a correct link with boiling points. However, the link with relative boiling point ranges was often given the wrong way round.

08.3 Chain lengths were again often referred to rather than properties. Some students incorrectly stated that fuels need energy to burn, particularly those which do not ignite easily. All three correct properties were identified with roughly equal frequency, although most students found it difficult to give two correct properties. Fewer than 10% of students gained both marks.

08.4 The majority of students were able to apply the C_nH_{2n+2} rule to identify hexane in the list of formulae. Well over half of the students gained this mark.

08.5 The need for a high temperature was most frequently seen as a correct answer; however, students do need to take care when expressing themselves, frequently using hot or heat instead of high temperature. If a temperature was specified, it had to be above the boiling point range of the diesel oil fraction. The catalyst was the more common of the two alternatives for the second marking point. Around one in twenty students gained both marks, with about one third of students gaining 1 mark.

08.6 Students found difficulty in expressing the idea of greater demand for smaller hydrocarbon molecules and the uses were more commonly seen in responses. Approximately 2% of students gained both marks.

08.7 Over two thirds of students were able to complete the equation.

Question 9 (standard demand)

09.1 Most students found this question very difficult with only around 12% of students managing at least a mark in Level 2. In the carbonate test, there were some that just added limewater straight to the carbonate and said that it would go cloudy. Others added the tablet to a mixture of limewater and hydrochloric acid. However, there were some good descriptions of the use of delivery tubes or pipettes to transfer carbon dioxide from the acidified tablet in one flask or tube to the limewater in another. The flame test was seen more often than the carbonate test. Although 'red' was permitted as a correct flame colour for lithium ions, its use is discouraged because of the possible confusion with calcium. Some students thought that they needed to sterilise an inoculating loop before using it in a flame test – a possible confusion with agar plating procedures in biology. Less effective responses introduced whole tablets into the flame or used the wire provided to cut it up.

09.2 The idea of a formulation did not appear to be understood, with only around 5% of the students gaining this mark. The similar words 'formula' and 'formulate' are not synonyms and gained no credit. There were many references to compounds, medicines and drugs.

09.3 The calculation of percentage by mass of lithium carbonate in the tablet was well done by approximately 40% of students. Common errors included failing to convert to common mass units, and then calculating the fraction the wrong way up to obtain a percentage less than 100%. A common error was to divide by 100 instead of 1000 when converting from mg to g.

Question 10 (standard demand)

10.1 The expression 'aq' was credited with or without brackets. Some students named the symbol 'aqueous' and gained credit that way. More than 60% of students gained this mark

10.2 Approximately half of the students gained one mark for naming a piece of apparatus capable of measuring volume or mass change. However, the question asked for equipment to measure the rate of production of gas and therefore apparatus that could be used to measure time was required for the other mark. This aspect was less well answered with a much smaller number of students achieving this mark. Around a tenth of the students gained both marks.

10.3 The question was generally well answered with most students gaining at least one mark. Around 4 in 10 students gained all three marks. The plotting of points was accurate in many cases and if an error occurred it was usually as a result of incorrect plotting of one of the first two points.

A greater number of students did not gain credit for the line of best fit, generally as a result of drawing a straight line. There were few instances of straight line linking between successive pairs of plotted points, but excessively thick or 'feathered' lines were not awarded the mark.

10.4 This proved to be a difficult question with fewer than 2% of students able to access all three marks. A large number of responses correctly identified that the rate of reaction decreased as time increased. However, others asserted more vaguely and ambiguously that less gas was produced as time increased. A significant number of incorrect responses referred to the rate at ten seconds being the highest. The table of results gave no information about the rate before ten seconds so credit could not be given for this point. A slightly smaller number of answers correctly referred to the fact that the reaction had finished by 60 seconds. However, correct answers relating to the rate at which the rate changed during the experiment were rarely seen. Students should not assume that a graph with this general shape shows inverse proportionality.

10.5 Nearly a third of the students recognised that the higher temperature would increase the rate of reaction and were able to identify the correct links to a faster reaction.

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.