GCSE
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Report on the Examination

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General

There were ten questions on this paper. Questions 8–10 were common to the Higher Tier.

The paper produced a range of responses, from students whose responses showed an excellent understanding to students who struggled throughout the paper.

The mark scheme was designed to allow students to achieve marks for showing knowledge, understanding and application of chemistry. The extended response questions caused few problems with many students achieving full marks

A common fault was students not reading and understanding the information given and the question itself and then going on to simply repeat what they had been told or to answer a completely different question.

The majority of students appeared to have sufficient time to complete the paper. A few used up a lot of space by repeating the question, which is not needed in an examination and wastes time and space that could be used to give a creditworthy response and achieve more marks.

Basic 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, not just on questions that may have been targeted at the level at which they are working.

Question 1 (low demand)

01.1 58% of answers were correct, although 'product' was given by 25% of students.

01.2 95% of students could correct identify the reversible reaction symbol.

01.3 69% of the responses were correct.

01.4 Again, this question was answered well with 72% of students realising that this was a subtraction and carried it out correctly.

01.5 55% of students could answer this percentage calculation correctly. Where errors occurred it was usually caused by the student involving the mass of anhydrous copper sulfate (1.6 g) calculated in the previous part of the question.

01.6 99% of students got the formula for water, with 71% able to identify sulfuric acid's formula.

Question 2 (low demand)

02.1 54% of students identified the correct formula with all the other distractors proving equally popular as each other.

02.2 71% of students recognised that octane was an alkane.

02.3 This question was not well answered with 87% of responses failing to score. Of these responses, about half gave 'plants / trees / photosynthesis' as the source of oxygen with the remaining suggesting 'hydrogen / carbon / oxide' or a named oxide such as 'carbon dioxide' was the source.

02.4 Most students knew that sulfur dioxide caused acid rain, although the environmental effect of particulates was less well known.

02.5 Most students realised that carbon dioxide was produced in car engines but far fewer identified carbon monoxide as the other possible product. Nitrogen was often given instead.

02.6 89% of students could identify both ways of reducing atmospheric pollution in cities.

Question 3 (low demand)

03.1 67% of students achieved both marks. The most common error was to place the last tick under Polymer K, thinking that water absorption was an advantage.

03.2 A straightforward calculation in which 80% of students recognised selected the correct values from the table provided and inserted them into the given formula. A few students either inverted the values or, despite showing the correct working, multiplied the two densities instead of dividing.

03.3 80% of students correctly identified not melting as an advantage of firefighter's uniforms.

03.4 78% of students correctly identified being hard-wearing as an advantage of using polymers for firefighter's uniforms.

03.5 Many answers focussed on the fact that wool was readily available rather than picking up on the keyword in the question: 'sustainable'. Those who realised that wool was renewable often didn't go on to say that it would not run out, or the reverse argument for crude oil. Many answers simply referred to the properties given earlier in the table, missing the aim of the question.

Question 4 (low demand)

04.1 This question was well answered with 79% of students achieving both marks and most of the rest missing the second mark by not labelling the bar 'copper'.

04.2 60% of students calculated the cost of the gold correctly.

04.3 Students found this calculation much more daunting and there were many obscure methods employed resulting in incorrect answers (often greater than 5.0g!). It appeared that the problem often related to the students lack of understanding of the concept of ratios and hence the need to include the term 22/9 in their calculation.

04.4 26% of students achieved both marks usually giving the first two answers on the mark scheme. Responses failing to gain credit referred to gold's sustainability / weight / density / rusting / reactivity / availability.

04.5 Students found this question difficult and too often simply repeated the information given in the stem. For example, many achieved a mark for saying 'copper ores are finite', but a similar number just copied 'Copper ores are non-renewable' from the stem or incorrectly stated that 'recycled copper is renewable'.

References to landfill were often too vague to gain a mark where we were looking for the idea of the decreasing number of landfill sites or to reducing the amount of copper that is wasted. Few realised the implications of producing less carbon dioxide, the greenhouse effect or global warming, as a result of using less energy. Many answers referred to pollution but they often did not link it to mining. Few mentioned that recycling was cheaper than extracting new copper.

Question 5 (low demand)

05.1 39% of the answers correctly identified both methods of making the solution more concentrated. A significant number ignored the instruction to tick two boxes, by ticking one.

05.2 A large majority knew that the start line should not be in ink. But far fewer picked up the clue in the stem, that the colours were insoluble in water.

05.3 This was well answered, with 70% of students achieving both marks.

05.4 Full marks were achieved by 93% of students. The only common errors were caused by either inverting the values in the given formula or multiplying instead of dividing.

Question 6 (low demand)

06.1 65% of students correctly identified the correct monomer.

06.2 79% of students correctly identified the correct process.

06.3 This question differentiated well, with a good spread of marks. 36% of students achieved full marks.

06.4 This question required an 'extended response' and was marked holistically using a 'levels' mark scheme. The command word was 'compare'. Lower-attaining students simply repeated the information in the question and gained no credit.

As a guideline, those who only identified the various properties as advantages and disadvantages were probably in level 1. 53% of responses moved beyond this into level 2, by explaining why. For example, that being made out of wood was an advantage because wood is renewable or that being non-recyclable was a disadvantage because it fills up landfill sites.

Question 7 (low demand)

07.1 88% of students read the volume correctly. As for incorrect readings, '80.3 (cm^3)' was the most common.

07.2 This question was found to be fairly difficult, with 31% of students correctly identifying both of the control variables.

07.3 This calculation challenged many students as they often ignored the instruction to not include the anomalous result (30) or included the time (40). Many did not give their answers to two significant figures. 41% of students achieved full marks.

07.4 Generally the graph points were accurately plotted although the final point was occasionally mistakenly taken as 110 (rather than 100). More commonly the origin was omitted. A few students also misread the question and either plotted all the data points rather than just the mean and / or drew a line of best fit.

07.5 The calculation was completed correctly by students who read the volume at 50 seconds, but many chose a different time to that in the question. A significant minority inverted the expression, 50 ÷ 80 rather than 80 ÷ 50.

07.6 Generally, students showed a notable lack of understanding in this question. The graph was volume against time, but the question asked how the rate changed with time. Most responses were either wholly or partially about volume rather than rate. 10% of students achieved full marks, while 14% achieved two.

07.7 Again, this was challenging, with 38% of students correctly identifying both of the reasons for the faster rate of reaction.

07.8 Most appeared to know that limewater was used to test for carbon dioxide, although many answers did not appear to realise that it was necessary to name the gas that was being tested for.

07.9 The burning splint test was commonly identified correctly as the test for hydrogen and incorrectly for oxygen, carbon dioxide and a whole range of other substances, many of which are not gases.

Question 8 (standard demand)

08.1 38% of students gave yellow or orange. There was a lot of variety in the wrong answers with all the colours of the spectrum represented.

08.2 Copper was the most common answer given although a few gave barium

08.3 A lot of students lost this mark as it was unclear if they were talking about the mixture of flame colours or the mixture of metal ions. 29% of students answered correctly.

08.4 57% of students correctly identified both of the ions in the flame emission spectrum.

08.5 3% of students identified the correct answer as bromide. A few put bromine but most seemed to guess.

08.6 The test for sulfate ions was not well known: 10% achieved the mark while 42% of students left it blank.

Question 9 (standard demand)

09.1 2% of students recognised a formulation from this part of the specification.

09.2 This was a more difficult calculation as there were lots of numbers given in the question. It appeared to presented little difficulty for some students, however.

09.3 Reading the stem would have avoided answers such as 'to make it more attractive to drink'. 14% of students realised that it was to warn people not to drink it.

09.4 Uses of ethanol, and therefore methylated spirits, as a solvent, steriliser and fuel were well known with 42% of students achieving the mark.

09.5 Very few students knew about the production of ethanol from sugar solution by fermentation. Some knew the name of the process but could give no correct detail. 8% of students achieved two or three marks.

09.6 3% of students could complete the displayed formula for ethanol. Ethane was the most common answer, but more students did not attempt this question.

09.7 12% of students knew that hydrogen would be the gas produced.

09.8 Even fewer knew that an oxidising agent was required.

Question 10 (standard demand)

10.1 27% of students realised that the other gas used in the Haber process is hydrogen.

10.2 Few knew the temperature and pressure used in the process. This was made even more challenging as they had to give the correct units as well. 12% of students achieved any marks for this question.

10.3 7% of students could explain why only the ammonia, and not the other gases, turn into a liquid because its boiling point is higher.

10.4 This was another 'extended response', 'level marked' question. This time there were three levels and the command word was 'explain'. Again, the question was marked holistically. Students were given information about the current atmosphere of Venus, believed to be similar to that on the early Earth, and the Earth's atmosphere today. Generally, a level 1 response used the percentages given to say in which direction the amounts of these gases had moved. Level 2 moved beyond this, giving an explanation in terms of one process, such as photosynthesis or dissolving in oceans. Level 3 responses usually gave more than one process, for example both of the processes mentioned above. Many students talked only about the changes in the last few centuries, which was not what the question was asking. 47% of students were able to reach level 2 or 3.

10.5 Few students seemed aware of the timescale under consideration here, namely the atmosphere of billions of years ago. A lack of evidence or proof was also accepted.

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.