GCSE
CHEMISTRY

8462/2H Paper 2 Higher Tier
Report on the Examination

8462
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General Introduction to the November Series

This has been another unusual exam series in many ways. Entry patterns have been very different from those normally seen in the summer, and students had a very different experience in preparation for these exams. It is therefore more difficult to make meaningful comparisons between the range of student responses seen in this series and those seen in a normal summer series. The smaller entry also means that there is less evidence available for examiners to comment on.

In this report, senior examiners will summarise the performance of students in this series in a way that is as helpful as possible to teachers preparing future cohorts while taking into account the unusual circumstances and limited evidence available.

Overview of Entry

Just over 200 students sat this component, of which a greater proportion than usual were private students. In a normal summer series, the entry size typically exceeds 100 000 students, so the range of responses seen was inevitably much more limited.

Many students gave responses which showed an excellent understanding while others had difficulty even with core chemical concepts.

The majority of students appeared to have sufficient time to complete the paper. A few used up a lot of time and space in practical and extended writing contexts by providing detailed additional information that did not contribute to a fully answered question.

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.

Comments on Individual Questions

Questions **01** to **03** were common to questions **08** to **10** on the Foundation Tier paper.

Question 1 (standard demand)

01.1 Nearly all students were able to quantitatively describe one trend, while a quarter scored two marks. Marking point 3 was seldom mentioned.

01.2 Over a quarter of students provided a Level 3 response while over two thirds achieved at least Level 2. The main obstacle to Level 3 was not referencing the effect of the combustion of sulfur. Level 2 responses required some linkage between polluting gases and their named effects or impacts. There were very many uncreditworthy references to the Earth's ozone layer.

01.3 Three quarters of students knew that solar energy is renewable.

01.4 Two thirds of students identified one reason, usually the fluctuation in output, but very few students could give two reasons.

Question 2 (standard demand)

02.1 This was very well attempted and three quarters of students gained both marks.

02.2 Most students were able to determine the boiling point of heptane.

02.3 Two thirds of students identified that the *y*-axis did not fall below 0°C.

02.4 Just over two-thirds of students identified the gaseous nature of butane at 20°C.

02.5 More than three-quarters of students were able to apply the general formula to nonane.

02.6 Many students were able to state that nonane has a higher boiling point than the other alkanes in the table, but far fewer could use this to explain the condensing location in the column.

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Question 3 (standard demand)

03.1 Nearly two-fifths achieved a Level 3 response and well over four-fifths gained at least a Level 2 mark here. The main barriers to accessing Level 3 were an assertion that the solvent level should start at or above start-line level, or a failure to identify if or how measurements should be made. Level 1 responses usually had several keys steps missing.

03.2 Most students answered this question correctly.

03.3 Most students answered this question correctly.

Question 4 (standard, standard / high and high demand)

04.1 Around half of the students either drew five single bonds or wrote 'n'. Around one third provided a completely correct response.

04.2 Many of the students scored one mark, usually for stating that poly(ethene) melts. The consequence in terms of recycling was less well known.

04.3 How poly(ethene) is produced from ethene was not well known.

04.4 Approaching half of the students scored one mark but only a tiny number scored both. The fact that the chains are closer together or unbranched was well known but not how that linked to density.

04.5 Some students seem to think that any -OH is an alcohol group even if it is part of a carboxylic acid group. Other students circled whole molecules rather than functional groups.

04.6 Very few students were able to use the diagrams to work out that hydrogen chloride was the small molecule formed when a polyester was produced from monomers **A** and **B**.

Question 5 (standard / high and high demand)

05.1 Nearly four-fifths of students identified one salt, while more than a third worked out both.

05.2 Around two-thirds of students could identify calcium nitrate.

05.3 Two marks were usually easily scored, often for ideas relating to a quicker or continuous process. Four marks were almost never awarded, because students did not appear to appreciate the need for a reasoned judgement when the command word is 'evaluate'.

Question 6 (standard / high and high demand)

06.1 The bromine water test was known by many students, but some of these were then unable to gain the second mark, usually because an incorrect colour change was stated.

06.2 A large number of students were able to apply their knowledge of general formulae to the unfamiliar context of cycloalkenes.

06.3 Only around a third of students gained at least one mark in this demanding question.

06.4 The vast majority of students were able to calculate the relative formula mass of $C_6H_{10}Cl_2$ as 153, although a few used 35 as the relative atomic mass for chlorine even though 35.5 was given in the question stem. Over half of students scored all three marks.

Question 7 (standard, standard / high and high demand)

07.1 Over half of the students knew that a flame test should be used but fewer knew the correct result for potassium.

07.2 Only a few students mentioned flame emission spectroscopy as an instrumental alternative to a flame test.

07.3 Just over a third of students gave white precipitate.

07.4 Very few students were able to complete the steps needed to differentiate between metal ions producing a white metal hydroxide precipitate.

07.5 Students found this difficult with many students unable to go beyond the need to acidify the solution being tested.

Question 8 (standard, standard / high and high demand)

08.1 The likely toxicity of lead was identified by approximately half of the students.

08.2 Nearly half of the students gained this mark.

08.3 A good spread of marks were seen here, with around 70% giving at least one creditworthy response, usually linked to energy or waste. However very few were able to gain all 3 marks.

08.4 Approximately one-third of students were able to gain the first two marking points. However, very few scored beyond marking point 2 as the need to add the resulting ash to acid was almost never given.

08.5 Under half of students gave one reason, usually that phytomining is slow. Very few were able to give a second reason.

Question 9 (standard, standard / high and high demand)

09.1 Only around a third of students knew this, which may reflect a lack of practical experience.

09.2 Many students were able to say that the reaction had stopped but only a much smaller number could explain why.

09.3 Around half of the students were able to explain this in a valid way, usually by reference to the slope of the line.

09.4 There was a wide spread of marks here. There is still confusion between mean and instantaneous rate of reaction, so students who approached this as a mean reaction rate usually only scored one mark for giving an answer to 2 significant figures. Amongst the better responses, the first mark was sometimes dropped because the tangent was not close enough to 80 seconds. Some students were able to obtain all 5 marks.

09.5 Around one-third of students identified copper(II) as the only transition metal amongst the choices and therefore more likely to have a catalytic effect.

Question 10 (standard, standard / high and high demand)

10.2 More than two thirds of students knew one condition (high temperature) and more than one third knew two.

10.3 There was a very wide range of marks but many did not score above Level 1. The main failure to reach Level 2 was that the question focuses on economics so that an answer which fails to mention energy, cost or a compromise in reaction conditions does not meet the level descriptor for Level 2. Similarly, the requirements for Level 3 were not usually met if the references did not mention the impact of reaction conditions on both rate and yield. Only a handful of students gave a Level 3 answer.

10.4 Fermentation was well known.

10.5 Around half of students scored one mark by extending their knowledge of fermentation to this unfamiliar context, 'warm' was seen much more often than 'anaerobic'.

10.6 This was completely correct in the responses of nearly half of students. Where a mark was not obtained, this was usually caused by a failure to convert kilometres to metres.

10.7 A challenging concluding equation with no scaffolding which students found difficult.

Concluding Remarks

There is still some evidence that command words are misunderstood or ignored. This limits the marks awarded, especially in extended response questions. This is particularly true where a command word demands a reasoned judgement.

Students seemed well prepared for questions based on Organic Chemistry and Chemistry of the Atmosphere. In this series they seemed less equipped to deal with Chemical Analysis, Rate of Reaction and some aspects of Using Resources.

There were a number of instances of key reagents, techniques and colour changes still not being well known.

Mark Ranges and Award of Grades

Grade boundaries and cumulative percentage grades are available on the Results Statistics page of the AQA Website.