GCSE
CHEMISTRY

8462/1F: Paper 1 – Foundation
Report on the Examination

8462
June 2019

Version: 1.0

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General

Students appear to have been well prepared for this paper.

There were 10 questions with questions 8 –10 being common with the Higher Tier.

The demand levels of the questions are designed to increase from low demand to standard demand through the paper, and as expected, students had more difficulty gaining credit in the standard demand questions towards the end of the paper.

Students generally demonstrated competence in the questions involving mathematical skills. However, in calculations, quite a common error was to give the answer with a dot over the final number indicating that this number recurs.

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 Approximately 80% of students identified both the nucleus and the electron in the diagram of an atom.

01.2 Approximately 60% of students identified the electron as having the lowest mass.

01.3 Approximately three-quarters of students correctly applied their knowledge and understanding of the link between electronic structure and group number.

01.4 Almost 60% of students scored both marks. Here, they applied their knowledge and understanding of the links between atomic structure and both atomic number and mass number.

01.5 Approximately 70% of students knew the term 'isotope' for the type of atom described.

01.6 Students found this multiple choice question about the link between isotope ratios and relative atomic mass difficult.

The first incorrect option was chosen more often than the correct one. This suggests that, in many cases, students did not understand how the relative atomic mass is determined from the average mass of all isotope atoms and were perhaps drawn towards the word 'fewer' alongside the smaller number '79'.

Question 2 (low demand)

02.1 Over 85% of students identified the correct formula of hydrogen peroxide.

02.2 Approximately 70% of students identified covalent bonding as the bonding in a hydrogen peroxide molecule.

02.3 Students found this question about elements as catalysts difficult. The 3 options were chosen in similar proportions.

02.4 Approximately three-quarters of students correctly identified the activation energy on the reaction profile diagram.

02.5 This question proved more difficult with approximately 45% of students being able to identify the energy of hydrogen peroxide on the reaction profile diagram.

02.6 Approximately 80% of students identified the reaction as exothermic, having been given a description.

02.7 Approximately 55% of students were able to score both marks for completing the dot and cross diagram.

The mark for the bonding electrons was scored more often than the mark for the non-bonding electrons.

Question 3 (low and standard demand)

03.1 This question tested recognition of a diagram representing only one compound.

Almost half of the students identified the correct option.

The diagram representing only one element was a strong distractor.

03.2 This question tested recognition of a diagram representing a mixture of elements.

Approximately 55% of students identified the correct option.

03.3 This question tested recognition of a diagram representing a mixture of an element and a compound.

Approximately 60% of students identified the correct option.

03.4 This question tested students' ability to apply their knowledge and understanding of chromatography and crystallisation.

Approximately two-thirds of students scored both marks.

03.5 The diagram showing how a mixture of sand and water can be separated by filtration was often drawn and labelled clearly enough to score all 3 marks. The most common omissions were a filter funnel or filter paper.

03.6 Approximately two-thirds of students correctly predicted the temperature of 100 °C.

03.7 This question which required a description of distillation was generally answered well. Almost 60% of students scored at least 3 marks.

The marks for the solution being heated and for the water being collected in the beaker were the most often scored.

Marks for the vapour cooling in the condenser and for the vapour condensing were the least often scored. Here, the term vapour / gas / steam needed to be used rather than, for example, evaporated water.

Question 4 (low and standard demand)

04.1 Students found the identification of control variables very difficult with almost two-thirds of students scoring 0 marks.

Students were quite often imprecise in their description of the control variables. The use of the word amount is unlikely to gain credit and students should be encouraged to use scientific terminology such as 'volume'.

The most common control variables given were the volume of solution and the concentration of solution.

04.2 Almost 90% of students were able to use the voltages to place the metals in the correct order of reactivity.

04.3 Students found this question difficult. Approximately 15% of students gained one mark for predicting that the voltage of the cell would be 0 V. Only 7% of students were then able to give a reason why the voltage would be 0V and score the second mark.

04.4 Approximately a half of students scored the mark for using 8 cells to make the battery. However, less than a quarter scored the mark for connecting them together. Alternative terms for 'connect' were often too imprecise.

04.5 Over 90% of students identified an electric toy as the most suitable use for a non-rechargeable cell.

04.6 Students found this question very difficult with almost two-thirds of students scoring 0 marks.

The most common correct responses were:

- lasts longer (advantage of hydrogen fuel cell)
- hydrogen is flammable / explosive (disadvantage).

A common misconception was that a hydrogen fuel cell is single use, often expressed as 'cannot be recharged'.

Responses that did not include sufficient detail to be credited included:

- better for the environment
- cheaper
- more expensive (unqualified).

Question 5 (low and standard demand)

05.1 Almost 55% of students identified the correct state symbol for calcium carbonate.

05.2 Approximately 60% of students were able to give the correct reason for the decrease in mass.

05.3 Approximately three-quarters of students were able to identify the correct range of the results.

05.4 Approximately 60% of students excluded the anomalous result and then calculated the mean correctly.

Some students did not exclude the anomalous result. A calculation of the mean of all 4 results giving an answer of 0.74 (g) was the most common way of scoring just 1 mark.

05.5 Just under a half of students correctly identified the independent variable.

05.6 Approximately 80% of students scored this mark.

The most common incorrect response was 'in grams' referring to the units on the graph.

05.7 Approximately 85% of students correctly read the decrease in mass from the graph.

Question 6 (low and standard demand)

06.1 Approximately 60% of students calculated the percentage atom economy correctly.

A final answer of 77.3 with a dot over the 3 signifying a recurring 3 was a common error.

06.2 Approximately two-thirds of students performed the percentage calculation correctly.

06.3 Approximately 70% of students calculated the relative formula mass correctly.

06.4 The requirement to give the answer to 3 significant figures made this calculation more challenging. However, approximately a half of students scored all 3 marks.

A final answer of 89.3 with a dot over the 3 signifying a recurring 3 was a common error.

06.5 Students found this question difficult. Almost three-quarters of students scored 0 marks.

For those students who scored 1 mark, it was almost always for the relative reactivity of aluminium and carbon.

Question 7 (low and standard demand)

07.1 Only approximately 40% of students correctly identified a hand warmer as the piece of equipment that uses an endothermic change.

07.2 Almost 90% of students identified the correct thermometer to use to measure temperature to a particular resolution.

07.3 Approximately 50% of students identified the correct type of error represented by the loss of energy.

07.4 Only approximately a third of students scored this mark.

Plastic beaker and polystyrene cup were the most common correct responses, others knew that insulation was needed but didn't name the type of container.

07.5 This graph question was answered well.

Approximately two-thirds of students scored all 4 marks for plotting the points and then drawing and extending a line of best fit.

The most common errors were the line of best fit being drawn to go through the 'origin' or incorrect extrapolation through the 'origin'.

07.6 Approximately 70% of students correctly read the intercept on the y-axis.

07.7 Approximately 80% of students identified at least 1 of the 2 correct responses for the cause of the anomalous result.

Of these correct responses, 'too little sulfuric acid was added' was identified more often than 'the mixture was not stirred'.

Question 8 (standard demand)

08.1 Less than 10% of students scored this mark which required an appropriate reference to the properties of tellurium and/or iodine.

Many referred to atomic number or electron arrangement rather than properties.

08.2 Students found this question difficult. In many cases, they simply repeated the information in the question that Mendeleev thought there were undiscovered elements.

Less than 20% of students gained any marks. The most commonly scored mark was for the idea that these elements were eventually discovered.

08.3 Approximately 70% of students correctly identified relative atomic mass as the modern name for atomic weight.

08.4 Approximately 40% of students scored this mark.

The most common correct response was 'atomic number'.

Common responses seen that were not credited included:

- reactivity
- relative atomic mass
- mass
- number of electrons in the outer shell.

08.5 Approximately 60% of students scored 0 marks on this question, with approximately 10% not attempting it.

More students scored the mark for the state of astatine than for its formula. For the formula, At_2, the correct casing for the letters needed to be used; also, a subscript for the number.

08.6 Students appeared to be unfamiliar with the reaction in this question.

Many students described the reaction of sodium with water rather than chlorine, referring to the sodium floating, dissolving, fizzing, etc.

The observation of a flame was the most common correct response.

Question 9 (standard demand)

09.1 Approximately 50% of students correctly identified H^+ as the ion produced by all acids in aqueous solution.

The most common incorrect response was OH^-

09.2 Approximately 15% of students scored both marks for completing the word equation.

The correct answers 'hydrochloric' (acid) and 'water' were seen in approximately equal numbers.

Common incorrect responses included:

- chloric / chlorine (for the reactant)
- hydrogen (for the product).

09.3 The name 'burette' was not well known with only approximately a third of students scoring the mark. Phonetic equivalents of this word also scored the mark but not 'biuret' (as this is a reagent used in biology).

Common incorrect responses included:

- thermometer
- pipette

- syringe
- measuring cylinder.

09.4 Approximately 50% of students were able to take a correct reading from the burette scale.

The most common incorrect answer was 28.4 cm^3.

09.5 Even though this extended response question drew on their experience of a required practical activity, approximately 20% of students did not attempt it. A similar proportion scored 0 marks.

Approximately 10% of students achieved a Level 3 mark.

In many cases, at least one of the key steps in this titration was omitted, which therefore meant that students were not able to access Level 3.

Question 10 (standard demand)

10.1 Approximately a third of students scored a mark for referring to the presence of delocalised electrons in carbon nanotubes.

Very few scored the mark for explaining the role of these electrons in the conduction of electricity.

10.2 Most students understood that they needed to compare the properties of the three materials. However, a few did not add value and just quoted data from the table, which is insufficient to be credited.

Approximately 45% of students achieved a Level 2 mark by giving a consequence of one of the stated differences in properties. Some gave a justified conclusion in referencing the most suitable material for a racket frame.

For some students, there was a misunderstanding that a high density was good because it made the racket strong, despite strength being one of the other properties given.

10.3 Almost a quarter of students scored full marks for this calculation. A similar proportion correctly calculated the surface area as 40344 nm^2 but did not score the mark for converting this answer to standard form.

Some students calculated the volume of the nanoparticle rather than the surface area.

Even if the answer to their calculation was incorrect, a mark could still be scored for correctly converting this answer to standard form, provided that an attempt to calculate the surface area had been made.

10.4 Students found it difficult to give a reason why it costs less to use nanoparticles in sun-cream with only approximately 10% scoring the mark.

Common responses seen that were not credited included:

- nanoparticles are smaller
- nanoparticles are easier to make.

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.