



GCSE EXAMINERS' REPORTS

**GCSE (NEW)
CHEMISTRY**

SUMMER 2017

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SCIENCE - CHEMISTRY
GCSE (NEW)
Summer 2017
CHEMISTRY (DOUBLE AWARD)

Foundation Tier

1. (a) (i) Very well answered.
(ii) Very well answered.
- (b) (i) Poorly answered. Many candidates gave purple and blue, which was not creditworthy.
(ii) Well answered. Many candidates attained the mark, although a significant number drew only one dot.
(iii) The majority of candidates gained both marks.
2. (a) (i) Poorly answered. Many candidates stated that there were three carbon atoms in the formula.
(ii) Very poor. Many candidates gave five by adding the numbers within the formula.
- (b) Very poorly answered with a minority of candidates gaining any credit. A significant number did not attempt the question.
3. (a) (i) Very well answered. Most candidates gained both marks.
(ii) I Well answered although '12' was a common incorrect answer.
II Generally well answered.
- (b) (i) Well answered although a number of candidates assumed the hardest water produced the most lather.
(ii) Poorly answered. The majority of candidates gained one mark for the explanation in terms of the amount of froth but only a small minority referred to the boiling point of exactly 100°C for the second mark.
(iii) Poorly answered. Many incorrect answers referred to time or the boiling point of the water samples.
(iv) Poorly answered. The most common incorrect formulae given were CaF and Ca²⁺F⁻.

4. (a) Many candidates gained one mark for 'fizzing' or 'bubbles'. Few gained the second mark. A minority of candidates misunderstood the question stating that hydrogen/gas is produced rather than giving an observation.
- (b) Poorly answered. Only a minority of candidates gained any marks. Common errors were $\text{Mg}^{2+} + \text{HCl}$ for reactants and $\text{MgCl} + \text{H}$ for products.
- (c) (i) Most candidates plotted the results correctly and gained two marks. Candidates who joined the points with a ruler were not awarded the third mark.
- (ii) I Many candidates gained this the mark, although some had difficulty converting 90 seconds into minutes to read from the graph.
- II Poorly answered. No credit was awarded for 5 or 7 minutes and the unit was required i.e. 6 minutes.
- (iii) The majority gained a mark for a steeper curve mark. Many curves did not stop at 50 as required.
5. (a) Well answered.
- (b) Very well answered.
- (c) Poorly answered. The most common values given were -101°C and 20°C . Even in cases where an acceptable value was given, the explanation was usually very poor.
- (d) Poorly answered. Many candidates gave 'diatomic molecules'.
- (e) Well answered, with many getting one or two marks.
6. Most candidates scored a lower band mark for this QER question but a reasonable number attained the middle band. Many candidates recognised the flame test and the lilac colour for potassium and middle band candidates correctly identified the flame colours for the other compounds. Few referred to the silver nitrate test for halide ions. Very few candidates described both tests and correct precipitate colours which was required for the top band.
7. (a) (i) Very poorly answered. Many candidates stated that carbon dioxide increased over time due to global warming.
- (ii) Many candidates gained one or both marks. Common errors included omission of reference to a flame in the test for hydrogen and carbon dioxide 'putting out' a burning splint.
- (b) (i) Most candidates gained one mark for the increasing temperature. Very few candidates stated that the increase has got larger over time.
- (ii) Very poorly answered. The most common error was dividing the two values from the table, i.e. $278/288$, with no attempt to calculate an increase as a first step.

8. (a) (i) Well answered. **A** was the commonest incorrect answer.
- (ii) Well answered.
- (iii) Poorly answered. Only a minority of candidates recognised the isotopes and gave the correct explanation.
- (b) (i) Well answered although a minority of candidates did not attempt the question.
- (ii) Well answered although a significant number referred only to the group number and therefore gained no credit.

SCIENCE - CHEMISTRY
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CHEMISTRY (DOUBLE AWARD)

Higher Tier

1. (a) (i) Well answered. Many candidates gained two or three marks. A minority stated that carbon dioxide increased over time due to global warming.
- (ii) Many candidates gained one or both marks. Common errors included omission of reference to a flame in the test for hydrogen and carbon dioxide 'putting out' a burning splint.
- (b) (i) Most candidates gained one mark for the increasing temperature. Few candidates stated that the increase has got larger over time.
- (ii) Poorly answered. The most common error was dividing the two values from the table, i.e. 278/288, with no attempt to calculate an increase as a first step.
2. (a) (i) Well answered. **A** was the commonest incorrect answer.
- (ii) Well answered.
- (iii) Poorly answered. Only a minority of candidates recognised the isotopes and gave the correct explanation.
- (b) (i) Well answered.
- (ii) Well answered although a minority referred only to the group number and therefore gained no credit.
3. (a) Poorly answered.
- (b) Well answered.
- (c) Poorly answered.
- (d) Many candidates gained two marks for correctly recognising the mixture of temporary and permanent, as well as the decrease in the volume of soap after boiling. A minority identified the significance of a volume of soap greater than 2 cm³ being needed to form lather after boiling and gained the third mark.
- (e) Well answered with many gaining one or two marks. An opinion of some description had to be clearly implied.

4. (a) Most candidates gained two marks for the graph. Many were not awarded the 'curve' mark because they changed its shape to hit all points or because they joined the points with a ruler.
- (b) Most candidates gained one mark for drawing a less steep curve however some failed to show that it became horizontal at 50 cm^3 for the second mark.
- (c) Nearly all candidates gained one mark for the increase in kinetic energy. Few candidates related this to the increase in frequency of successful collisions.
- (d) Nearly all candidates gained one mark for repeating the experiment. Very few referred to calculating the mean of repeatable results or discarding of anomalous results.
- (e) Very poorly answered. Most candidates made vague references to accuracy and to the time taken to set up the apparatus. These gained no credit.
5. (a) (i) Many candidates scored one mark with only a minority gaining full marks. A number of candidates gave the names of the substances rather than their formulae.
- (ii) Poorly answered. Many candidates referred to wearing gloves or goggles rather than the need for a fume cupboard to handle toxic gases.
- (iii) Many candidates gained credit for recognising that iodine would not react with sodium bromide solution. Explanations showed a lack of understanding of the difference between bromine and bromide.
- (b) The majority of candidates carried out the calculation well and gained credit. The most common error was dividing A_r for the element by its mass rather than the mass by its A_r .
- (c) (i) Very poorly answered. Few candidates gave the correct ionic equation and state symbols. Ionic equations for precipitation reactions should include only the species taking part i.e. two aqueous ions and a solid product.
- (ii) Poorly answered. Many candidates gave the formulae CaI in the reactants and CaNO_3 in the product.
6. (a) Many candidates gained some credit but only a minority scored full marks. The wide range of incorrect answers seen suggests that some candidates had little idea of an appropriate method to complete the calculation.
- (b) (i) Well answered. Candidates who applied the correct method using an incorrect answer from part (a) were awarded the mark. The most common error was to divide one of the values given in the question by the other.
- (ii) Poorly answered. Candidates showed little awareness of the possibility that the reaction was not complete. Vague comments such as 'the product has reacted' and 'some of the product remained in the container' were often seen.

7. Most candidates made a reasonable attempt at the QER question. Many attained middle band marks with good descriptions of the observations and the trend in reactivity. Reference to electronic structures was generally vague in middle band answers but candidates who scored 5 or 6 marks explained the increasing reactivity on descending the group in terms of the outer electron being further from the nucleus and therefore easier to lose.

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CHEMISTRY

Foundation Tier

1. (a) Generally well answered. The most common incorrect answers included:
 - (i) 'more dense than water' and 'magnetic'
 - (ii) 'alcohol and water both boil when heated'
 - (iii) distillation
- (b) Parts (i) and (ii) were well answered.
 - (iii) Weak candidates were unable to divide 4 by 8 often giving 2 as the answer. A common mistake was to divide 4 by 7.
2. (a) Well answered.
- (b) Weaker candidates confused group with period.
3. (a) Generally well answered.
- (b)
 - (i) Weaker candidates mixed up lithium and rubidium.
 - (ii) Weaker candidates gave vague descriptions of how the reaction would be different, e.g. the reaction would be more dangerous. These gained no credit.
- (c) Most candidates were unable to choose the correct formula for sodium oxide. 'NaO₂' was the most common incorrect answer.
- (d) Extremely poorly answered. **A** and **D** were the most common incorrect choices.
4. This question was designed to assess candidates' scientific literacy and their understanding of changes resulting from human activity.
 - (a)
 - (i) Generally well answered.
 - (ii) Surprisingly not known by many candidates. The most common incorrect answers were fluoride and chloride. However, most candidates knew that the substance added kills bacteria.
 - (iii) Many candidates could not describe a major cause of surface water pollution. Vague answers referring to litter or waste being disposed of did not gain credit.
 - (b)
 - (i) Those candidates who were able to read the correct values from the graph generally gained both marks for this question. Unfortunately the scale on the graph was beyond many candidates. Some did not read the question carefully enough to realise that the total volume of water used is given as 450 litres.
 - (ii) Generally well answered.

5. This question assessed the application of mathematics in chemistry. Unfortunately weaker candidates gained only about 2 or 3 marks out of the possible 8.
- (a) (i) Well answered.
(ii) Most candidates were able to read the solubility values at 70°C and 30°C but did not know what to do with them. Weaker candidates subtracted 30 from 70.
- (b) (i) Most candidates transferred the correct relative atomic masses from the periodic table on the back cover but some used the atomic numbers instead.
(ii) Many candidates lost the second mark in this calculation by rounding their answer incorrectly.
- (c) Weaker candidates failed to gain this mark.

6. There have been many previous questions relating to testing hard water samples and candidates have obviously used these questions as a revision resource. However, they must appreciate that each question is slightly different and that the information given must be read carefully to understand exactly what is required.

Many candidates failed to demonstrate that they fully understood the meaning of a fair test. The following issues were commonly seen.

- Some candidates inferred that one sample was soft water, one temporary hard and the third permanently hard
- Many candidates did not add soap solution in increments
- Some candidates carried out a completely different method, e.g. add a known volume of soap solution to each water sample and measure the height of lather formed
- Weaker candidates were unable to give a conclusion

As in previous years the quality of literacy was poor. It was evident that many candidates did not plan their responses before starting to answer the question.

7. This is a common laboratory practical but it was evident that some candidates were unfamiliar with the reactions.
- (a) (i) Endothermic gained no credit.
(ii) Generally well done.
(iii) I. Poorly answered. Candidates who had seen this reaction were obviously at an advantage. Most common correct answers referred to fizzing but very few gained the second mark for stating that the chip swells and/or crumbles.
II. Most candidates gained one mark for the reactants but failed to gain the second mark by giving CaOH_2 as the formula of calcium hydroxide.
- (b) Generally well answered.
- (c) Percentage yield was not understood by many candidates. This was evident from the way many tried to use of all three values given in the question in their calculation.

8. This was well answered except for part (c).
- (a) Well answered. The most common error was choosing the letter of the element in Group 2 and Period 2.
 - (b) Well answered.
 - (c) A generic definition of isotopes only gained one mark. Reference to the structure of these particular atoms/nuclei was needed for both marks, e.g. nitrogen-14 contains 7 protons and 7 neutrons whilst nitrogen-15 contains 7 protons and 8 neutrons.
9. (a) It was surprising to see that very few candidates gained this mark. Many read from the edge of the meniscus and many others assumed that the value must be less than 60.
- (b) Most candidates were able to plot the points accurately but many failed to draw a suitable line of best fit.
Errors included:
- joining points with a ruler
 - drawing the line through the incorrect 25 minute point
 - continuing their line of best fit above 90 cm^3
- (c) Most candidates gained one mark for sketching their graph to the left of graph **X**. Many lost the second mark by failing to ensure that graph **Y** also became horizontal at 90 cm^3 . Some candidates did not label their graphs as instructed in the question.
- (d) This question was not answered well by foundation tier candidates. Most gained one mark by stating that the reaction rate increases.
- (e) Most candidates gained the first mark by drawing a downward curve starting at 179.80 g. Only the best foundation tier candidates ensured that the curve became horizontal at 40 minutes.

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CHEMISTRY

Higher Tier

1. This was well answered except for part (c).
 - (c) A generic definition of isotopes only gained one mark. Reference to the structure of these particular atoms/nuclei was needed for both marks, e.g. nitrogen-14 contains 7 protons and 7 neutrons whilst nitrogen-15 contains 7 protons and 8 neutrons.
2.
 - (a) It was surprising to see that very few candidates gained this mark. Many read from the edge of the meniscus and many others assumed that the value must be less than 60.
 - (b) Most candidates were able to plot the points accurately but many failed to draw a suitable line of best fit.
Errors included:
 - joining points with a ruler
 - drawing the line through the incorrect 25 minute point
 - continuing their line of best fit above 90 cm³
 - (c) Most candidates gained one mark for sketching their graph to the left of graph **X**. Many lost the second mark by failing to ensure that graph **Y** also became horizontal at 90 cm³. Some candidates did not label their graphs as instructed in the question.
 - (d) This question was generally well answered well by higher tier candidates.
 - (e) Most candidates gained the first mark by drawing a downward curve starting at 179.80 g. Weaker candidates failed to ensure that the curve became horizontal at 40 minutes.
3. This question was designed to assess candidates' scientific literacy and their ability to apply science knowledge to a real-world situation.
 - (a) Weaker candidates failed to gain both marks. Candidates needed to carefully read the information provided in the text and in the diagram.
 - (b) The most common errors were using 3% instead 0.3% in the calculation and failing to give their answer in standard form.

- (c) Common errors which resulted in loss of credit included:
- failure to refer to seawater being heated by the Sun
 - reference to seawater being heated to 100 °C
 - reference to *seawater* evaporating rather than *water* evaporating
 - reference to *water boiling* rather than *water evaporating*
 - reference to *steam* condensing rather than *water vapour* condensing
 - not naming the overall process
4. (a) As in previous years many candidates do not know the difference between 'explain' and 'state'. The question required candidates to '*explain two reasons*' not '*state two reasons*'. The consequences of actions relating to limestone quarrying were required, e.g. blasting causes dust; blasting is noisy; landscape destruction creates an eyesore; habitat destruction causes loss of wildlife, etc. Each of these would have gained one mark.
- (b) Most candidates knew the two products formed but weaker candidates were not able to write the correct formula for calcium carbonate.
- (c) Weaker candidates failed to gain any marks for this question. The most common errors included:
- using the atomic number rather than the A_r from the Periodic Table
 - dividing A_r for the element by its mass rather than the mass by its A_r
 - using 'C' instead of 'Ca' and 'S' instead of 'Si'
 - translating a 1:2 ratio of Ca:Si to a formula of Ca_2Si
5. The specification states that candidates should be familiar with '*simple methods to determine solubility*' but unfortunately this was not the case. Responses here suggested that many candidates do not understand the meaning of solubility.
- (a) (i) Very few candidates were able to state what is meant by a saturated solution.
- (ii) Most candidates correctly calculated the mass of potassium nitrate in 25 cm³ to be 11.6 g but many multiplied by 2 rather than 4 and therefore lost the second mark.
- (iii) Candidates who had carried out a similar experiment were better prepared to answer this question than those who had not. Many candidates failed to understand that it is water that is removed in stage 3.
- (iv) This question required an understanding of what 'solubility' actually means and only the more able candidates gained this mark.
- (b) (i) Most candidates calculated that 64g/100g of water is equivalent to 32g/50g of water and gained one mark. Only the stronger candidates were able to complete the second part of the calculation.
- (ii) Generally well answered. Again, some candidates used atomic numbers rather than A_r values from the Periodic Table. Many candidates ignored the instruction to give the answer to 'two significant figures' meaning they lost the second mark.

6. (a) Well answered.
- (b) The chemistry and reactivity of Group 1 metals is a familiar topic however this was not particularly well answered.
- (i) The question required candidates to 'state' and 'explain' a similarity and a difference they would expect to see when lithium and potassium react with water. Once again, many candidates gave an observation but no explanation. Candidates must appreciate one simple response would not be awarded two marks.
 - (ii) Most candidates gained the reactant mark but failed to gain the second and third marks by not being able to give the correct formula for lithium oxide. The most common incorrect formulae were LiO and LiO_2 .
 - (iii) Candidates needed good writing skills to gain all three marks for this question. This was no problem for able candidates but weaker ones often gave confused and contradictory responses.
7. (a) (i) This is a common question relating to ion exchange. Some candidates gave answers completely unrelated to the questions being asked showing no knowledge or understanding of the process. Candidates were helped by the diagram showing the resin being coated with Na^+ ions. Weaker responses made no reference to calcium or magnesium ions being present in hard water.
- (ii) Some candidates were unable to name a sodium salt that could be used to regenerate the resin.
- (b) Generally well done. Candidates with weaker writing skills often failed to gain more than 2 marks but those who planned and gave a logical structure to their answer generally scored 3 or 4 marks.
8. The format of this question has become familiar over previous years and this was again a good discriminator for A/A* candidates. Only the most able candidates gained credit for parts (a)(ii) and (c).
- (a) (i) Surprisingly, some higher tier candidates did not know the flame test colours for Group 1 metals or the precipitate colours for the halide ion tests.
 - (ii) Only the most able candidates demonstrated any knowledge of what was required for this question.
- (b) Marks were often lost in this question by candidates being careless in giving halide ions instead of halogens. A significant number failed to identify **W** and **Z** but identified **X** and **Y** correctly.
- (c) Many candidates were able to give the correct formula for iron(III) fluoride but gave 'F' for fluorine.
9. Most candidates made a good attempt at this question. Many concise and detailed responses were seen but others lacked planning and logical structure. Barriers to gaining higher band marks included confusing the two processes and reference to conservative plate boundaries.



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