GCSE

Rewarding Learning

Chief Examiner's Report

Chemistry

Summer Series 2018

Foreword

This booklet outlines the performance of candidates in all aspects of CCEA's General Certificate of Secondary Education (GCSE) in Chemistry for this series.

CCEA hopes that the Chief Examiner's and/or Principal Moderator's report(s) will be viewed as a helpful and constructive medium to further support teachers and the learning process.

This booklet forms part of the suite of support materials for the specification. Further materials are available from the specification's microsite on our website at www.ccea.org.uk.

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GCSE CHEMISTRY

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General Remarks

As a general rule, only symbols written as shown on the Periodic Table will be accepted. Candidates should be encouraged to use this style rather than their own as it will be penalised. The use of small capitals for lower case letters is common for Ca and Cl. Numbers in formulae should be clearly subscript.

Candidates should not use pencil in the examination. Marks left by a pencil can be picked up by the scanning process so even though a candidate thinks they have erased a drawing, some marks may remain and this could lose them marks if the examiner cannot clearly see their intended answer. It is always best to cross out an incorrect answer and redraw a diagram or structure in a clear space.

Assessment Unit 1 Structures, Trends, Chemical Reactions, Quantitative Chemistry and Analysis

Foundation Tier

Less than 20 candidates took the Foundation Tier of this New Specification GCSE Chemistry Unit 1. Candidates at Foundation Tier were unable to achieve many marks on this paper.

- Calculations of the number of subatomic particles from atomic number and mass number were poorly answered.
- Balanced symbol equations were not answered well with many incorrect formulae of oxygen and products of the reactions.
- The responses to the QWC chromatography question showed knowledge but this was poorly written.
- Marks were often lost in calculations of percentages and moles in Question 5.

Q1 Candidates knew the names of the subatomic particles in an atom in Part (a) but did not know which one of the particles was discovered by Chadwick. They can draw the electronic configuration of an atom but cannot draw the electronic configuration of the ion formed from the atom. Many candidates drew the electronic configuration of the aluminium atom and gave it a charge. The size of a nanoparticle was unknown to the vast majority of candidates in Part (b)(i). The significance of atomic number and mass number was poorly understood in Part (b)(ii).

Q2 The balanced symbol equation for the reaction of lithium with oxygen was not well answered in Part (a) with many not using diatomic oxygen and the incorrect formula of lithium oxide. The observations made when lithium reacts with water are well known in Part (b), however, the preparation of lithium and the name of the gas produced was not well known. Very few candidates picked up any marks for their knowledge of the halogens in Part (c).

Q3 Candidates did not read the initial column of the table and assumed the indicator was universal indicator in Part (a)(i). Candidates were in general unable to write balanced symbol equations throughout the paper including this one for sodium hydroxide and hydrochloric acid in Part (b)(i) and the one for calcium carbonate and hydrochloric acid in Part (c)(i). Most candidates gave the two general observations, heat and bubbles, in Part (c)(ii).

Q4 Question four examined a new section of the specification and again it was unfamiliar to the candidates even in Part (a)(ii) when the answers were given in a box above the question, the candidates were unable to name the processes. The definition of a pure substance was poorly answered in Part (b)(i). Most candidates were familiar with the process of chromatography in Part (b)(ii), however, they were unable to articulate their answers with any degree of clarity. Candidates do not have the skills to write formulae beyond the 1:1 ratio of simple ions.

Q5 Candidates were able to pick up some marks on the mathematical section of the paper for relative formula masses but percentage calculations in Parts (a)(ii) and (v) proved more challenging. Marks were also lost calculating moles in Part (b).

Higher Tier

- Many candidates do not understand the distinction between bonding and structure.
- The description of a molten ionic compound conducting electricity is poorly described with "delocalised electrons can move and carry charge" being a common error.
- Half equations and ionic equations are not well known.
- Questions about water treatment processes were poorly answered.
- Clear workings should be shown in quantitative questions.

Q1 In Part (a) the size of nanoparticles produced a variety of answers with many not stating units which was penalised. In Part (b)(i), the bonding was often described correctly but some did not give the correct structure as giant covalent or macromolecular. In Part (b)(ii), some gave malleable as a property of graphite or lubricant which is a use rather than a property. The dot and cross diagram for carbon dioxide in Part (c) was well answered with unpaired lone pairs being a common error or extra electrons in carbon's outer shell. Only outer shells need to be shown. In Part (d)(i), most gave the correct number of protons, electrons and neutrons but in Part (d)(ii), often the nucleus was not clearly labelled or some drew the electronic configuration of a chlorine atom rather than a chloride ion. The high melting point of silver in Part (e)(i) was well answered with incorrect answers giving the wrong type of bonding or failing to state that metallic bonding is strong. Ionic was not sufficient on its own in Part (e)(ii) for the structure of silver chloride; lattice or giant were required with ionic. Many gave "electrons can move and carry charge" for the reason why molten silver chloride conducts electricity in Part (e)(iii) whilst others incorrectly stated atoms or particles can move and carry charge.

Q2 Many gave incorrect equations for lithium reacting with oxygen in Part (a)(i) with the formula of lithium oxide being the sticking point. The half equation was also not well answered with many giving $Li^+ + e^- \rightarrow Li$ as an incorrect answer. The preparation of lithium for the reaction with water included descriptions of how lithium is stored and tarnishing reactions rather than how it is prepared in Part (b)(i). The two other observations were well answered in Part (b)(ii) but some did say floats but it was clear in the question that lithium moved on the surface so this was not awarded. The gas produced in the reaction in Part (b)(iii) was well answered but oxygen, carbon dioxide and lithium hydroxide were common incorrect answers. The half equation for the formation of fluoride ions from a fluorine molecule was poorly answered in Part (c)(i) but the description of reactivity of the halogens in Part (c)(ii) was relatively well answered. Shielding/distance of outer shell from the nucleus and a description of the attraction for the incoming electron were required. The names of Group 1 and Group 7 were well known with "alkaline metals" being the most common incorrect answer.

Q3 In Part (a), many correctly described that pH decreases but some added "so becomes less acidic" which was penalised. The ionic equation for complete dissociation of sulfuric acid was poorly answered with the omission of the charge of the sulfate ion being a common error. The pH value for sulfuric acid in Part (b)(ii) was relatively well answered but three and even higher values were seen. The balanced symbol equation for the reaction of calcium carbonate with hydrochloric acid in Part (c)(i) was well answered but CaCl was a common incorrect product. Many gained marks for the observations in Part (c)(ii) but exothermic was not accepted nor was "solid dissolves". Measuring cylinder was a common answer in Part (d)(i) which was not credited nor was pipette filler. The colour change was often given the wrong way round which was awarded one mark. Charcoal (in a variety of spellings) was not often seen in Part (d)(iii) and again few could explain why crystals form on cooling the solution in Part (d)(iv). Most were able to give a correct method of drying the crystals in Part (d)(v).

Q4 In Part (a)(i), few could explain the use of aluminium sulfate in water treatment as a coagulant and many did not know the processes which occur in water treatment in Part (a)(ii). Kills bacteria was the answer expected in Part (a)(iii) but this was not often seen. The definition of a pure substance was not well known in Part (b)(i) but many did gain most of the marks in the description of the chromatography experiment. The most common errors were using orange juice as the solvent, not measuring from the origin or base line and multiplying the Rf value by 100. Most knew the colour of the precipitate in Part (c)(i) but very few gave the correct ionic equation in Part (c)(ii) and the state symbols were random or missing. In Part (c)(iii), the use of ammonia solution was credited as the only solution which will prove magnesium ions are present is sodium hydroxide solution. Any other solutions were penalised. Many said the precipitate was soluble in excess sodium hydroxide solution rather than insoluble.

Q5 In Part (a), very few could correctly calculate the percentage of oxygen in hydrated sodium carbonate. The error being that they did not use all the oxygen from the sodium carbonate and from the water of crystallisation, thus calculating an incorrect RFM/Mr value. The calculation of degree of hydration in Part (b) was well answered. 35.5 was often used to calculate the moles of chlorine in Part (c) rather than 71 and some did obtain the correct answer using this if they used a 1:1 ratio but this was not credited fully. In Part (d), many used the masses to try to determine which substance was the limiting reactant and not the moles; in this case they did obtain many of the marks as the masses were such that they could identify the magnesium sulfate as the limiting reactant but using masses may not always allow for this erroneous method. Most performed well in this calculation showing clear working out.

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