

Examiners' Report/
Principal Examiner Feedback

Summer 2012

International GCSE

Chemistry (4CH0) Paper 1C

Science Double Award (4SC0) Paper 1C

Edexcel Level 1/Level 2 Certificate

Chemistry (KCH0) Paper 1C

Science (Double Award) (KSC0) Paper 1C

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4CH0/ KCH0 & 4SC0/ KSC0 (1C) Examiners' Report – Summer 2012

Question 1

Part (a) was very well answered with the majority of candidates scoring full marks. There were some rather odd drawings of a tripod and the naming of the top pan balance caused some candidates a problem, with names such as 'weigher' and 'weighter' appearing.

There were plenty of good answers to part (b), indicating that safety is being considered by candidates when they are performing experiments. Where candidates failed to score, it was usually because they quoted generalisations such as 'wear a laboratory coat' or 'stand back from the flame' rather than relate the risks involved to the experiment under consideration.

In part (c), a very large number of candidates, even eventual high scoring ones, failed to multiply by 2 in producing their final answer.

Question 2

This was a very high scoring question, as was expected. Some candidates did not read the given information carefully and hence stated in (b)(ii) that both reactants had been used up or that the magnesium had completely reacted. The most common mistake in (b)(iii) was to state that the colourless solution was magnesium sulfide.

Question 3

Better candidates scored highly on this question, but there was evidence that solubility rules had either not been learned or could not be applied to an unfamiliar situation. In part (a), a significantly large number of candidates thought that mixing potassium chloride and sodium carbonate solutions would produce a precipitate of potassium carbonate. Other errors involved not naming the precipitates that would be formed or not identifying the named compounds as precipitates.

In part (b), some used 'l' for 'aq', but on the whole this question was well answered.

Candidates should be aware that in the preparation of an insoluble salt, the filtration stage is to obtain the insoluble solid or to remove the solution, not the other way around. Too many candidates were content to write that the washing of the residue was performed in order to clean the solid, which was not sufficient to score. A number of candidates ruined what would have been a correct answer by stating that the tap water may react with the lead(II) bromide and some thought that the evaporation of the water would lead to crystallisation, forgetting that the lead(II) bromide was already a solid.

Question 4

Most knew that the elements in the Periodic Table are arranged in order of increasing atomic number, but there were a number of references to atomic mass and reactivity. The Periodic Table is supplied on page 2 of the examination paper and therefore, if consulted, should have resulted in all candidates scoring this mark.

The most common mistake in (b) was to suggest that helium is a halogen.

Part (c) was generally well answered, although some gave either two metals or two non-metals. Candidates should remember that 'chloride' is not the name of an element; it is the name of an ion or a type of salt.

Even when a metal and a non-metal were correctly identified, a significant number of candidates drew a covalently bonded structure despite having been given the clue of 'include the charge on each ion'. Many did not read the question carefully and showed only the transfer of electrons using arrows, rather than the ions in the compound.

Part (d) was well answered with only a minority of candidates failing to recognise that fluorine would react more quickly than chlorine and/or omitting the oxidation state of the iron in the final compound.

Part (e) was one of the least well answered questions on the paper. A large number of candidates had the colours in reverse and some thought that the colour of bromine water is red-brown. This was not accepted. Another common mistake was to suggest that the initial colour was green, presumably focusing on the chlorine rather than the solution.

Question 5

The equation for the decomposition of hydrogen peroxide was not well known. Many thought that the products were hydrogen and oxygen. Some attempted to include the catalyst in the equation. This was not penalised as long as its formula was correct and the same on both sides of the equation. However, most who included the catalyst either gave an incorrect formula or changed its formula in the products.

The test for oxygen was well known, but there were some who quoted a lighted spill, rather than a glowing one.

Most knew that the catalyst increased the rate of this reaction and that it was because it provided an alternative route that has a lower activation energy. However, some candidates thought that the catalyst provided the activation energy.

In (d), curve B was generally better drawn than curve A. Most candidates got the initial gradient correct but some lost marks on the levelling off. A number levelled A at 60 cm^3 with some levelling off at some indeterminate point between 30 and 60. Some lost the mark for curve B by taking it above 60 cm^3 and bringing it back down. The examiners did not expect candidates to know the

correct finishing time for curve A, hence any time between 30s and 120s was accepted.

Question 6

Part (a) was well answered with very few confusing protons and neutrons.

Despite being asked, in (b), to explain the chemical properties of isotopes in terms of electrons, some chose to answer the questions in terms of protons only. Some answers were spoiled by stating that the isotopes had the same electrons rather than the same number of electrons.

Very few candidates had any idea of what was meant by relative atomic mass, suggesting that this had not been universally taught, even though it is mentioned in the specification (statement 1.11 in the Double Award Specification). Many thought it was the same as the mass number and hardly any realised it was referenced to carbon-12.

The calculation of the relative atomic mass, by contrast, was well done with the most common mistake being the failure to give the final answer to two decimal places.

Question 7

The definition of a hydrocarbon was well known, with only a small minority failing to mention that only hydrogen and carbon are present. However, some candidates described a hydrocarbon as a mixture of hydrogen and carbon and others incorrectly referred to the hydrogen and carbon present as being molecules rather than atoms. The molecular formula of decane was almost always given correctly, with a few stating that there were twelve atoms of hydrogen present.

Almost everyone knew that the type of polymerisation was addition but many could not completely describe how the polymer was formed. Most realised that the one of the bonds in the double bond breaks, although this was usually described less accurately as 'the double bond breaks', but few were then able to take the next step and state that the monomer molecules joined together to make a chain.

In part (c), there was a lot of confusion between cracking and fractional distillation, with many describing the latter and the usefulness of the fractions obtained. Many answers lacked structure and contained much irrelevant information about, for example, how cracking is achieved. However, very few failed to score at least one or two marks and there were many fully correct descriptions of the importance of cracking.

Question 8

Part (a) was well answered although some failed to give a reason in (ii) and hence lost the mark.

In part (b), most recognised that the time taken would decrease and also that the particles would gain kinetic energy. However, some failed to realise that the most significant reason for the decrease in time was the faster movement of the molecules and discussed, instead, the increase in rate of reaction. Candidate should be familiar with the reaction between ammonia and hydrogen chloride and be aware that it is instantaneous when they collide.

Very few realised that the movement of molecules through air is random owing to molecular collisions. Most wrote about the temperature being too low or the gases being slow to evaporate from the liquids.

Question 9

Part (a) was another very poorly answered question. It would appear in this instance that the majority of candidates could not transfer their knowledge from one area of the specification; that is the reaction taking place in the blast furnace, to a question taken out of that context. Perhaps candidates had not appreciated why calcium oxide reacts with silicon dioxide in the blast furnace and were relying instead on learning information by rote rather than understanding.

In part (b), many failed to identify correctly the oxygen atom in the structure, with just as many quoting silicon as oxygen, and a large number thinking it was an electron or a covalent bond. Even when oxygen was correctly identified the reason was often incorrect, with a number of candidates stating that there were twice as many of them as silicon atoms in the structure given.

The second part of (b) proved to be a good discriminator. There were many excellent answers but often the structure was thought to be either ionic or metallic. A significant number mentioned that intermolecular forces need to be overcome, rather than covalent bonds to break. Perhaps this is because giant covalent structures are often incorrectly presented to them in text books as being giant molecules or macromolecules. Although these terms are accepted in the mark scheme as a description of the type of structure, they are best avoided.

Question 10

The calculation in (a)(i) caused few problems for the more able candidates but, after having correctly calculated the amounts in moles of each element, some failed to then move on to the next step, which was to point out that these were in a 1:1 ratio. Some used atomic numbers in their calculations and others performed the calculation 'upside down'. Neither of these two methods was given any credit.

A surprisingly large number of candidates who were able to recognise that the relative formula mass of X was twice the empirical formula mass then went on to state that the molecular formula of X must therefore be 2NaO , rather than Na_2O_2 . Most of those who obtained quoted the formula of X as either 2NaO or

Na_2O_2 managed to construct a suitable chemical equation in (b)(i), although some did not balance it and, strangely, some used X in the equation.

The hydroxide ion was almost always correctly identified as the cause of the alkaline solution. However, candidates need to be aware that, when they are asked to identify a particle of a substance, if they decide to give both the formula and the name both must be correct.

In part (iii), despite the structural formula of hydrogen peroxide being given in the question, a surprising number of candidates failed to recognise that a single covalent bond linked the two oxygen atoms. Of those that did, some failed to then put the non-bonding electrons on both oxygen atoms.

Question 11

The only problem regularly encountered in (a) was part (iii). Bromide was the most common incorrect answer. Candidates need to be aware that, particularly towards the end of the paper, a high level of precision of answer is required. Hence 'iodine' is not an acceptable alternative to 'iodide'.

There were many good descriptions of how to carry out a flame test that scored credit. However, some candidates lost marks for use inappropriate instruments to insert the solid into the flame and/or for not identifying correctly the type of flame to be used. Once again, candidates took the opportunity to quote information irrelevant to answering the question set. For example, there were many excellent descriptions of how to clean the platinum/nichrome wire, but such detail was not required.

Answers to part (c) indicated once more that a significant number of candidates are learning the tests for ions by rote, with little or no understanding of the chemistry underpinning them.

Very few candidates realised that carbonate ions, and/or other ions that form a precipitate with silver ions, need to be removed before the silver nitrate solution is added. Equally, very few recognised that the use of hydrochloric acid would provide chloride ions in solution which would then produce a precipitate when silver nitrate is added, thus interfering with the test.

Part 11(d) provided an almost random selection of answers. It was hoped that candidates would appreciate that all nitrates are soluble in water (statement 4.6 ii of the Double Award Specification) and cannot therefore be identified by precipitation. However, this proved to be beyond all but a very small minority.

Question 12

The equation in (a) proved to be a better discriminator than was anticipated, producing many unbalanced equations with correct formulae for one mark. It was disappointing that a large number of candidates gave the formula of lead(II) oxide as PbO_2 , particularly since it was given in part (b), and very strange that some got the formula of lead(II) sulfide incorrect since it was provided in the stem of the question. Perhaps some candidates are attempting to balance equations by changing the formula of the species involved rather than by through the stoichiometry

Part (b)(i) provided few problems for the majority of candidates, who chose to answer it in terms of loss of oxygen. However, most of those who chose to answer in terms of gain of electrons failed to state that it was the lead(II) ion that was gaining them.

The calculation in (b)(ii) was generally well answered. Common mistakes were failure to take into account the stoichiometry of the equation or using 446 as the M_r of lead(II) oxide.

The questions in part (c) were set to test the ability of candidates to deduce answers from the given text. Those who had acquired this skill scored well, but far too many failed to read carefully the questions set. For example, far too many candidates failed to provide a comparison between the solubility of silver in zinc and in lead in part (i), preferring to make statements such as 'it is soluble in both'. Similarly in part (ii), many discussed the melting points of both zinc and silver rather than of the mixture. Others failed to appreciate that the temperature of the total molten mixture was 530°C and therefore the melting point of the mixture of zinc and silver cannot be above this temperature. There were far too many vague answers such as 'around 530°C '. Part (c)(iii) was correctly answered by the majority, who made good use of the information given in the stem of the question.

Many realised that silver is a very valuable metal, but some focused instead on the effect that an impurity of silver would have on the properties of the lead.

Question 13

Very few problems were encountered in the simple subtractions in (a)(i) and (ii). Many then went on to calculate correctly the value of 'x' in the formula of hydrated zinc sulfate, although some inverted the mole calculations, which then leads to a value of $1/7$ (0.14) for 'x', but still gave the answer as 7, so lost all three marks.

Far too few candidates appreciated that the necessity of heating to constant mass was to remove all of the water of crystallisation. Too many candidates did not consider the question in the context of the experiment and automatically deduced that the repetition of a result is a requirement to produce more accurate or more reliable results.

There were many correct answers in part (c), with anhydrous copper(II) sulfate being the most common reagent chosen, but a number also chose cobalt(II) chloride paper. Some decided to give both and then made an error in one of them. Candidates should be encouraged not to give more information than is necessary. A number of candidates chose a physical test instead of a chemical test, which was disappointing.

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