Examiners’ Report

Principal Examiner Feedback

Summer 2018

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In Chemistry (4CH0) Paper 1C

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Examiner Report International GCSE Chemistry 4CH0 1C

Question 1

The labelling of the chromatography experiment in (a) was usually correct with the most common mistake being *solvent* and *solvent front* given the wrong way around. It was rare to see a student fail to identify food colouring P in (b)(iii), with most then referring to it having formed the most spots. However, some lost the mark for the explanation, usually because they simply repeated the question and said that it had the largest number of dyes, instead of four dyes.

Question 2

In (a) many candidates did not recognise the tap funnel, with burette and thistle funnel being popular choices. In (b) those who gave the correct product almost always then correctly balanced the equation, but significant numbers thought the product was hydrogen gas. Although the density of carbon dioxide was often known in (d)(i), many candidates did not make the necessary comparison with the density of air and *heavier than air* was a common but unacceptable answer. In (d)(ii) a number of candidates incorrectly chose upward delivery. Those that knew carbon dioxide could be collected over water often gave an acceptable description of the method. Unfortunately, some gave another method of making carbon dioxide rather than a method of collecting the gas as was asked. Most chose a suitable weakly acidic pH value in (e), but the colours of copper carbonate and copper oxide in (f) were not well known. In (g), candidates often had the right idea in but didn't always suggest properties, but instead gave statements such as *It stops oxygen getting to the fire*.

Question 3

Some candidates in (a)(i), despite the wording of the question instructing them otherwise, just repeated observations given to them such as floats and fizzing and so gained no credit. However, many did give other correct observations as well as a balanced equation in (ii), although the state symbols were often not all correct. Part (b) was well answered, with candidates invariably giving a correct order of reactivity in (ii), having already related the similar reactivity to electronic configurations in (i).

Question 4

As expected, part (c) was well answered although NE instead of the correct Ne, was sometimes seen for the symbol for neon. In part (d) many scored one mark but often candidates failed to score both marks because arguments were not always clear. For example, candidates should avoid using expressions like *It does not react…* in a question like this without making it clear what *It* is referring to. Candidates should also be aware that giving something a name or label such as a *noble gas* or *Group 0 element* does not constitute an explanation by itself. Other suggestions which did not gain credit involved descriptions of expansion of gases and possible explosions and broken glass.

Question 5

The methods involved in the practical techniques involved in salt formation are often featured in questions, but it seemed that candidates are not always sure about the reasons behind the method used, and they find it difficult to evaluate a method. This was shown in part (a) as the majority of candidates did not appreciate from the method given, that the acid was all going to be reacted because the base was added in excess. A variety of incorrect responses was seen including references to the acid evaporating, the acid being in excess, specific amounts of crystals not being made so it was not necessary to know the precise volume of acid used. Part (b) produced better answers although some referred to particles gaining energy without going on to state the rate of reaction increases. Some candidates thought heating would remove the impurity. In (c), those that gave answers that referred to the conduction of heat also needed to state why this might be an issue in terms of the possibility of being burned. Many thought a glass rod was used to check on the crystallisation point being reached. In (d) there were some good responses, but many referred to the reaction stopping when there was *no more fizzing* or similar. Very few picked up on the idea in (e) that the soluble impurity would still be in the solution and so would contaminate the cobalt(II) chloride crystals if the solution was evaporated to dryness. In part (f) it was very pleasing to see very good descriptions of producing the sample of crystals by the expected method. However, the information about the soluble impurity seemed to create an issue for some candidates and a range of answers were seen. Often candidates just repeated the method that they had already been told did not work i.e. evaporating to dryness. Others started their description with various suggestions as to how to remove the soluble impurity, such as by washing the filtrate, or even fractional distillation.

Question 6

Many did give the correct answer in (a), although ammonium rather than ammonia was quite common as, more surprisingly, was hydrogen. Many gave a name rather than a formula in (b) whilst others omitted the charge on the ion. In part (c)(i), the common error was to refer to *halogens*, or to chlorine, bromine and iodine, rather than to halide ions. In (ii), as candidates were asked to *Identify the* anion, they were allowed to write either a name or a formula – but if they gave both, both had to be correct and unfortunately this was often not the case.

Question 7

Most students found (a) very straightforward, particularly as references to electrons were ignored. A variety of answers were given in (b)(i) with many negative ions seen and also ions containing oxygen. Better candidates did realise that the bismuth ion could not be negative, as the oxide ion is O^{2-} and so they correctly worked out the formula of the bismuth ion. Regrettably, not all candidates read the information in the question about bismuth oxide having a giant ionic structure, so descriptions of giant covalent bonding frequently appeared in (b)(ii). However, many answered the question very well, although some did not refer to energy. The equation in (iii) was challenging, but an encouraging number of candidates successfully worked out the bismuth chloride formula and were able to give a fully correct answer. Others were able to gain one mark for appreciating that water would be formed.

Question 8

The points were well plotted by most candidates and the curve of best fit was also usually well drawn with only a minority trying to incorporate the anomalous point. In part (b)(i) some were not quite succinct enough as they suggested the reading was taken at *the wrong time* instead of making it clear it was taken after more than two minutes. In (c) a majority of candidates knew that the reaction had finished, but many suggested this was because all the zinc, rather than all the acid had been used up. Both (d)(i) and (ii) were often well-answered, although some candidates did not gain full credit as they failed to refer to a time factor or frequency when discussing collisions between particles.

Question 9

This question regularly produced excellent answers in what was effectively three questions, each worth two marks, joined together. To score highly, clarity of terminology and understanding was needed, and candidates generally displayed this when describing why magnesium metal conducts. However, descriptions for solid and aqueous magnesium chloride were not always so accurate, with many answers again referring to electrons in this ionic compound, with many thinking that electrons could not move in the solid but then could move in aqueous solution.

As a general point, candidates should be reminded that in questions worth several marks, the space provided for answering is made large enough to accommodate those who may cross out, write in large letters, or even possibly sometimes choose to use diagrams. There is no need to fill the whole space and indeed, many answers that scored full marks on this question used no more than a few lines. The use of bullet points is also perfectly acceptable.

Question 10

In part (a) most candidates referred to the increased energy of the particles but often did not explain completely enough to score both marks. In (b), some candidates forgot that bromine is diatomic and so lost the mark. The calculation in (c)(i) very frequently allowed candidates to gain full marks with approaches using moles and masses both regularly seen. Part (ii) proved more challenging, with a number of vague suggestions, rather than ones specific to the experiment being given. Despite being told the acid was in excess, many thought the situation was caused by a shortage of acid or an incorrect concentration of acid.

Question 11

Apart from those candidates who produced a method which did not use the malachite at all, many candidates had some good ideas about how to approach this question, based on reacting the acid with the carbonate and then using a displacement reaction. The main problem was that answers were often poorly thought-out and lacked a logical structure; perhaps the use of bullet points would have helped. Providing the list of apparatus was meant to give some clues to the method and certainly did help many candidates get started with the first mark being for crushing the malachite. Unfortunately though, a number of candidates had evidently not come across a pestle and mortar before, with a variety of possible uses being seen. Those that followed the correct method most frequently lost marks because they did not filter out impurities after reacting the malachite with acid and before adding the magnesium; or because they added both the magnesium and the malachite to the acid together.

Question 12

In part (b) the uses of refinery gases and kerosene were well-known with the Mark Scheme being slightly more generous in the first part. As expected most identified the most viscous fraction. Part (c) was also well answered in the main. The most common errors were suggesting an iron catalyst in (i), temperatures of less than 600°C for cracking in (ii); and not referring to either the inertness or non-biodegradability of poly(ethene) in (vi).

Question 13

In part (a) many students did not follow the instruction to give all values to the nearest 0.5 °C and so lost a mark. In part (b) many scored 1 mark for the idea of a faster reaction or that collisions happened more frequently, but the idea that this meant that heat transfer would also be at an increased rate was not often seen. Good candidates realised in (c)(i) that the rate would be the same, as the temperature, surface area and acid concentration were all the same. However, many candidates assumed that a lower volume caused a lower concentration of acid with a consequent effect on the rate. In (ii), which was challenging, some candidates unfortunately misread or incorrectly interpreted the question, and gave answers describing how increasing the temperature affects the rate of reaction. Others did not use or appreciate the information given that the acid was still in excess, and suggested that using a lower volume of acid would produce less reactions and so less heat energy. However, it was pleasing to see good candidates being rewarded with all three marks.

Question 14

The context of this titration question was not one that the examiners expected candidates to have encountered. The idea of the question was to test the ability to perform titration calculations within an applied context that was not acid – base. Most candidates coped well with this and were able to work their way through the calculation, which was structured step-by-step, with any errors being carried forward. Common errors were arithmetic involving misreading or misuse of the calculator, such as being out by a factor of 10 in (a). Some divided by 5 rather than multiplying in (b). It was very pleasing to see large numbers of candidates scoring full marks on this question.

Question 15

Although many knew it involved the use of electricity, the meaning of the term *electrolysis* was often not well explained in (a), with many candidates describing it as a separation process, rather than a decomposition. In (b), candidates usually realised that the reason concerned reactivity, but they were often not precise enough, with answers such as *graphite is less reactive than magnesium* being common. Some thought it was concerned with the relative conductivity or melting points of graphite and magnesium. Most recognised that chlorine should be diatomic in the half-equation in (d) and many candidates gave fully correct answers. In part (e) most correctly appreciated that the electrolyte had solidified and that ions were no longer mobile and so gained a mark. However, few candidates gained the more difficult second mark by indicating they knew that electrolysis works by electrons being deposited by ions at one electrode and picked up by ions at the other electrode. Many candidates incorrectly referred to electrons flowing through the electrolyte.

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