Examiners' Report/ Principal Examiner Feedback

Summer 2016

Pearson Edexcel International GCSE in Chemistry (4CH0) Paper 2CR

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Examiner's Report International GCSE Chemistry 4CH0 2CR

Question 1

Parts (a), (b) and (c)(i) were answered well, with in excess of 85 % of the candidates obtaining the correct answer to all three. In (c)(i), some candidates counted oxygen twice and hence gave an answer of five instead of four, whilst in (c)(ii) some failed to multiply the oxygen atoms in the water molecules by five, producing an answer of sixteen instead of twenty one.

Question 2

Over 90 % of the candidates were able to identify, in part (a), that oxygen/air and water are needed for iron to rust. The most common mistake was hydrogen in place of air.

Part (b) proved slightly more problematic with some candidates giving iron(II) oxide or iron hydroxide as their answer.

Part (c) was answered well, with the majority of candidates scoring either two or three marks. The most common mistake was to include 'food can' as one of the answers, and some candidates lost marks by producing a list in which one answer was incorrect, thus cancelling any correct answers given. The instructions were to choose just **three** objects to complete the table; candidates are advised to read carefully the instructions and to follow them.

Part (d) proved more discriminating, with the full range of marks seen. The most straightforward way to answer this question is to state that zinc is more reactive than iron and hence corrodes in preference to iron. Since iron is the only metal that rusts, references to zinc rusting were penalised. If the route of electron transfer is taken, candidates must be careful to quote the correct species involved. Electrons are transferred from zinc **atoms** to iron(II) **ions.** Far too many imprecise answers such as 'zinc give its electrons to iron' were seen.

Question 3

The two multiple choice questions in parts (a) and (b) were answered correctly by the vast majority of the candidates.

Part (c) proved to be more difficult than anticipated with just over half of the candidates knowing that the compound formed when copper is heated in air has the formula CuO and is black; brown, green and blue were quite common incorrect answers.

Parts (d)(i), (ii) and (ii) proved to be straightforward for most; the most common mistake in (d)(iii) was to state that the gas could be collected by upward delivery.

Over one third of the candidates made at least one mistake in the state symbols in (e)(i), with the most common error being 'aq' for $CaCO_3$. The observation of limewater turning milky proved, as expected, to be an easy mark for most candidates.

Question 4

Assembling the various pieces of apparatus proved to be much more challenging than expected, with only a quarter of the candidates managing to do this successfully. Many left the potassium chloride solution in the beaker instead of placing it in the voltameter. Others did not insert the bungs fully into the voltameter with the result that any solution placed in it would immediately run out.

Part (b) proved to be a good discriminator, with roughly equal numbers of candidates obtaining 0, 1 and 2 marks respectively. Mistakes included having the polarity of the electrodes the wrong way around, adding electrons to chloride ions, omitting the charges on the chloride ions and putting positive charges on electrons.

The test for hydrogen, in (c), was well known, having been asked many times before. However, there are still some candidates who use a glowing spill rather than a lighted one.

Question 5

As anticipated, the vast majority were able to complete correctly the table in (a)(i). Calculations of relative atomic mass, such as that in (a)(ii), have been asked many times before, so it is surprising to see that the same mistakes continuing to be made. Some candidates divided the percentage abundances by the mass numbers, or vice versa. Others correctly multiplied the mass numbers by their respective percentage abundance, but then did not divide by 100 after adding together the two answers obtained.

The observations, in part (b), of potassium reacting with water were well known, but some gave the same marking point twice, usually 'effervescence' and 'bubbles of gas'.

In parts (c)(i) and (c)(ii), most knew that the liquid would be coloured pink and that the ion responsible for this colour has the formula of OH^-, although some failed to include the charge on the hydroxide ion.

Part (d) proved to be a good discriminator, with many failing to include either one or both of the two important points: 1. the outer electron of the potassium atom is more easily lost, and 2. because it is further from the nucleus. Some wrote generally about electrons being lost without specifying the 'outer' electron, so could not be awarded full marks. References to increased shielding or screening of the outer electron were ignored, since this degree of detail is not required at this level.

Question 6

The majority of candidates scored at least one mark in part (a), with most scoring both for stating that the use of lithium peroxide would remove more carbon dioxide and produce oxygen.

Over 60 % of the candidates scored all three marks for each of the calculations in (b)(i) and (b)(ii). The next most common mark for each calculation was zero, with very few scoring either one or two marks. In each calculation, the data supplied was quoted to two significant figures, and hence the final answer in each case should also have been given to two significant figures. However, it is not the policy of the examiners to penalise answers to a greater number of significant figures than is dictated by the data, hence, for example, 109 was accepted in (b)(i) when the answer should have been 110. Candidates should be reminded that it is good practice not to round until the final answer during a multi-step calculation.

Question 7

The question asked in part (a) was to identify the mistakes in each step, which were: 1. 'the use of nitric acid' in step 1, 2. 'using a solution of magnesium carbonate in step 2 when magnesium carbonate is insoluble in water', and 3. 'to boil off all of the water' in step 3. Many candidates chose to answer this question by stating what should be done rather than identifying the mistakes. This was overlooked in answer to step 1, where a mention that sulfuric acid should be used was accepted, but not for answers to steps 2 and 3.

In (b)(i), the majority of candidates scored either 1 or 2 marks, with those who scored 2 usually doing so for omitting the trailing zero from 23.80. There were the usual misreadings of the burette, with some reading 'upwards' rather than 'downwards' thus producing answers of 24.20 and 3.85 respectively. Such candidates could, however, score the third mark for a consequentially correct subtraction. In (b)(ii), very few candidates were able to reason the effect that the air bubble would have on the calculated volume of the ammonia solution added. Many just stated that it would have an effect but did not say whether it would be greater or smaller; others focused on the **actual** volume of ammonia added, rather than the **calculated** volume. Some realised that the volume would be greater, but were unable to give a satisfactory reason. The fact that the volume of the air would be added to the volume of ammonia seemed to elude all but the most able.

A majority of candidates now seem able to recognise which titres are concordant, so very few failed to score in (c)(i). Also, most were then able, in (c)(ii), to process their selected results to calculate a mean titre value.

Part (d) was answered rather poorly, with over 40 % of the candidates scoring zero, mostly for initially boiling the solution to dryness, which of course would produce anhydrous crystals rather than hydrated. Some confused this preparation with that of an insoluble salt and wrote about filtering immediately after mixing the two solutions and then washing and drying the, unfortunately non-existent, solid residue. Of those who managed to correctly described how to produce a hot, saturated solution some lost one or both of the remaining marks by not allowing the resultant solution to cool, and/or not stating how the crystals obtained after filtering should be dried.