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Examiners' Report
Principal Examiner Feedback

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Pearson Edexcel International GCSE In Chemistry (4CH1) Paper 1C and Science Double Award (4SD0) Paper 1C

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Question 1

Candidates were highly successful in answering (a), b(ii) and (c) which focused on the topic of states of matter. The straightforward nature of the questions meant that most candidates were able to secure all marks in these items. Q1b(ii) involved drawing six circles to represent atoms in a gaseous state – this question was less well answered, with errors including the wrong number of circles, only filling a small portion of the box and drawing circles in a regular pattern.

Question 2

Identification of the correct gas which correlated to the description in (a)(i)-(iii) was achieved by most candidates although some provided the formula rather than the required name. Whilst the formula is allowed under the mark scheme it is recommended that candidates read the question carefully and provide the answer in the form requested which in this instance was the name (not the formula). Most candidates were able to explain the classification of HCl as a compound with the few incorrect answers not quite reaching enough detail for the second mark or incorrectly including the term 'mixture'.

Question 3

In Q3(a)(ii) the chemical name for rust had common errors of iron(II) oxide, iron hydroxide, and iron oxide with no oxidation state given. Some candidates also named a process such as oxidation rather than giving the chemical name. When explaining how 'Method A' works for Q3(b)(i) candidates often used the term covering/coating rather than barrier losing them M1 but they were able to continue and achieve M2. In Q3(b)(iii) most candidates were able to explain that zinc is more reactive than iron but often answers did not develop beyond this to explain the significance of the reactivity difference. In some instances students went on to suggest that zinc would rust.

Question 4

For Q4(a) candidates were able to identify key steps when describing the setup for the experiment but there were many instances where the steps were not in a suitable order and in reality would not make a suitable method, for example drawing a pencil line after placing the chromatography paper in a beaker of solvent. In addition, M5 was the least commonly achieved mark and there were plenty of diagrams without any labels. Candidates were much more confident with both parts of Q4(b), with errors in responses being rare. For Q4(c) most candidates scored one mark on this item although a surprising number did not achieve both marks. The most frequent reasons for losing marks were for the fraction being described the wrong way around or, in the text, not being precise about which number went on top of the fraction and which the bottom. Some candidates incorrectly measured from the bottom of the paper rather than the baseline and some measured the distance of the solvent from the ink spot.

Question 5

Many candidates were familiar with the expected responses for both Q5(a) and Q5(b), which required recall of specification points. However, errors in Q5(b) from weaker candidates included repeating the stem of the question and focusing their answers on the catalyst speeding up the rate of reaction without explaining how this is achieved. When identifying equipment in Q5(c), candidates commonly recognised the (gas) syringe, though there was an interesting variety of spellings, with "cyringe" being particularly common. Some candidates struggled to identify the conical flask, often incorrectly labelling it as a beaker. As part of the mathematical skills assessed in Q5(b)(iii), candidates were expected to draw and use the slope of a tangent to a curve as a measure of the rate of change. While some candidates drew an appropriate tangent, others drew it at points other than 8 minutes. Additionally, some candidates—both those who had drawn tangents and those who had not—simply divided 58 or 59 by 8. A relatively large number of candidates failed to score the unit mark, with a surprising number using "m" as an abbreviation for minutes, which was not accepted.

Question 6

A wide range of responses were seen for Q6(a)(i), with $AlCl_3$ being the most commonly credited answer. Common incorrect answers included $Zn_2(SO_4)_2$ and NH_3N_4. In Q6(a)(ii), most errors occurred in the second half of the name, with common mistakes including "sulfite," "sulfide," and "sulfur (tetra)oxide." Candidates performed well in Q6(b) and Q6(c)(i), demonstrating a good understanding of bonding and dot-and-cross diagrams. For Q6(c)(ii), marks were often lost due to the omission of key terms, such as "shared," "pair," or the plural "nuclei." However, overall, candidates seemed familiar with this style of question and generally understood what was being asked.

Question 7

In Q7(a)(i), a significant number of candidates who correctly identified that the ice was used to aid condensation lost the mark by incorrectly stating it was to condense water rather than a gas or vapour. Conversely, candidates performed better on Q7(a)(ii), where the concept of heating to a constant mass was more widely understood. For the chemical test of copper(II) sulfate in Q7(b), the most common errors involved providing a physical test (e.g., boiling point), which scored zero marks. The use of anhydrous cobalt chloride for the chemical test was rarely mentioned, and some candidates attempted incorrect tests involving alkali metals or indicators. In Q7(c), many candidates benefited from marks awarded through error carried forward (ecf). While many struggled to determine the correct remaining mass of water, they were still able to attempt a calculation to find a ratio and deduce an answer for *x*.

Question 8

In Q8(a), a common misconception was that the reduction in size of the marble chips caused the reading on the balance to decrease. Another frequent incorrect response was the suggestion that hydrochloric acid escaped the flask, which scored zero marks. Many candidates incorrectly referenced "CO_2 produced" or "given off" without clarifying that the gas had left the flask, leading to the loss of marks. In Q8(b), many responses scored M1 by correctly identifying that the concentration was greatest at the start. However, for M2, only a few candidates referred to collisions, and even fewer included a reference to time, either directly or through frequency. Candidates often lost marks due to unclear expressions, with many stating that this led to the rate increasing rather than being greatest at the start. Numerous candidates mistakenly believed that the most energy was available at the start, which resulted in the loss of both marks. Both Q8(d)(i) and Q8(d)(ii) were well answered. Most candidates correctly identified that the rate of reaction would increase, though many failed to mention that "particles have more energy," and the word "successful" was often missing in their explanations. Despite providing high-quality explanations in some cases, many candidates missed the first mark because they were so eager to explain that they neglected to state explicitly that the rate of reaction increases.

Question 9

Over 80% of candidates did not score a mark for Q9(a) due to the lack of a comparative answer. Many responses referred only to "good conductor," which did not fully address the question's focus on comparing the use of an aluminium can to a glass beaker. Aluminium was also frequently described as an insulator, indicating confusion with past questions about why a polystyrene cup would be used. Q9(b)(i) was correctly answered by just over half of the candidates, with incorrect responses such as aluminium oxide, copper oxide, carbon monoxide, carbon dioxide, and coal being common. Many candidates left this part blank, and it appears that a significant number incorrectly believe that aluminium oxide is black. Some candidates, recalling from other parts of the specification that copper(II) oxide is black, incorrectly deduced that the can must contain copper. Unsurprisingly, the mark for Q9(b)(ii) was not achieved by many due to the lack of understanding demonstrated in (b)(i). The calculation in Q9(c)(i) had an approximate answer as guidance, enabling most candidates to score both marks. Similarly, Q9(c)(ii) was well answered, with many candidates carrying over the approximate 20,000 J value from the previous item and still achieving full marks. The most common error in this section was omitting the negative sign for the final mark. Common errors in Q9(d)(i) included using 11/2 or 5.5 for balancing, as candidates failed to account for the oxygen atom in butanol. Some responses appeared to be random guesses, evidenced by the use of letters instead of numbers. In Q9(d)(ii), the first two marks were most commonly achieved, but only stronger candidates were able to determine the "total amount, in moles, of gases" produced in the reaction.

Question 10

Candidates were more successful at scoring M2 for the condition, UV light, than for identifying the products of the reaction in Q10(a)(ii). Typically, those who completed the equation correctly also identified the required condition. In Q10(a)(iii), the most common error was the omission of the original colour; only half of the candidates provided the full colour change, with most of the remaining candidates mentioning just one colour. For Q10(b)(i), some candidates misread the question and repeated "general formula" as their answer, which was already given in the stem of the question. Familiar issues also arose, such as confusion between "same chemical properties" and "trend in physical properties." The answer "same empirical formula" was also a common incorrect response. The definition of an isomer for Q10(b)(ii) was well answered, with candidates generally familiar with the required response. However, applying this definition by drawing isomers in Q10(b)(iii) proved more challenging. The main issues included drawing carbons with 3 or 5 bonds or producing structures that were identical to the question (e.g., but-1-ene/but-2-ene) but drawn from a different angle. In Q10(c), it was surprising how many candidates did not know that ethene is a gas, which resulted in very few scoring M3 compared to M1 and M2. Confusion was evident in responses, particularly regarding the distinction between reactant and product, as well as the difference between the length of the repeating unit and the monomer. It was also notable how many candidates struggled to write coherently and refer effectively to the points in the question. In this instance, underlining key requirements given in the question and providing responses in bullet points could help avoid repetition and improve the clarity of candidates' answers.

Question 11

In Q11(a)(i), while most candidates scored M1 for the correct formulae of oxygen and sulfur dioxide, some responses suggested that some candidates were unaware that oxygen exists as a diatomic molecule or mistakenly thought that sulfur dioxide has the formula SO_4. The majority of candidates were able to score the mark in Q11(a)(ii) by identifying acid rain, a familiar question that was generally well answered. In Q11(a)(iii), the reacting mass calculation was straightforward and often resulted in full marks. Although the conversion factor was frequently omitted, it did not affect the final result, as it cancelled out during the calculation. It is recommended that candidates ensure they convert their masses into grams to calculate moles accurately, especially since this could lead to errors in answers where the moles, rather than the mass, are required as the final result. In Q11(a)(iv), common errors included identifying the wrong type of bonding or using additional terms such as "strong intermolecular forces" for lead sulfide. Responses concerning sulfur dioxide were generally of higher quality than those for lead sulfide, though marks were still lost for comparative energy responses such as "less energy" instead of "low energy." Additionally, responses for sulfur dioxide sometimes lost marks due to referring to intermolecular forces "between atoms." For the final question on the paper, many candidates were familiar with determining the empirical formula in Q11(b). However, most did not multiply to eliminate the 1.33 ratio, instead rounding this value up to 2 or down to 1. While the steps leading to the ratio were generally

correct, some candidates incorrectly used 32 as the Mr of oxygen instead of 16. In such cases, candidates could still score 3 marks out of 4 by correctly carrying their error forward.

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