Pearson Edexcel

Examiners' Report

Principal Examiner Feedback

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Pearson Edexcel International GCSE Level

In Chemistry (4CHI1)

Paper 1C

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Question 1

Part (a) was well-known, although in (ii), it was not uncommon to see oxygen, rather than nitrogen, being given as the gas making up 78% of the atmosphere. In (iv) significant numbers thought oxygen was produced by the thermal decomposition of calcium carbonate. Part (b) was well answered, with most candidates giving a correct equation and a reference to acid rain. However, candidates should appreciate that when writing chemical formulae, they should pay careful attention to the correct use of upper or lower case letters and the position of numbers.

Question 2

Part (a) was generally high-scoring, although the Period was frequently given as Period 2. The charge on the ion was not always correct, with "2" frequently appearing without a sign. The relative atomic mass calculation in (b), although well done by many, proved troublesome for others. One of the most frequent errors was dividing by (24 + 25 + 26) rather than by 100. Candidates who had used the correct method sometimes forgot to give their answer to one decimal place as requested.

Question 3

In (b), the common name 'rust', and the conditions needed for it to be formed, were better known than the process of 'galvanising' in (a). Definitions of exothermic in (c) did not always refer to **heat** energy. Parts (ii) and (iii) caused some difficulties, with candidates often giving very similar answers. In (ii), candidates needed to consider the reaction between aluminium and iron(III) oxide, and use it to give the idea that iron is displaced by aluminium showing aluminium is more reactive than iron. Part (iii) was looking for candidates to explain it was a redox reaction by considering which species had been oxidised and reduced, which was easiest in terms of what had gained or lost oxygen. Those who chose to answer the question in terms of electron transfer were more likely to make an error, most likely describing iron as gaining electrons, rather than iron *ions* gaining electrons.

Question 4

Only the very best candidates gave three correct formulae in (a)(i). It was very surprising to see how few candidates could name ammonium nitrate in (ii), with a plethora of wrong answers being given. Definitions of the term ionic bond in (b)(i) often tended to be weak, with many just giving the idea that metals lose electrons and non-metals gain them. This is stating how ions are formed and is not the definition of ionic bonds in the specification and does not score. Dot and cross diagrams in (ii) weren't always accurate, with incorrect, or missing charges being a more common error than incorrect numbers of electrons. Some candidates did not read the question, which asked for diagrams showing the arrangement of the electrons in the ions, not diagrams showing arrows indicating transfer of electrons.

Question 5

In (a)(ii) which asked for letters of the two compounds having the same empirical formula, many candidates failed to score, with R & Q being common incorrect answers. The bromine water test in (b) was more accurate than in some other years, although some candidates had the results the wrong way around. Candidates should be reminded that “clear” does not mean “colourless” and that bromine water is not red. The characteristics of a homologous series were often accurately given, but some incorrectly stated *same* or *similar* physical properties instead of a *trend*. In (d) the name but-1-ene was given by the majority of candidates but the necessary number was frequently missing. As with similar questions in other years, some of the isomers suggested were often just the same as the original molecule but drawn with a bend in the chain. There were some unorthodox methods in (e) with candidates sometimes working backwards from the formula to the percentages, for example. Candidates should note that in a question that contains the instruction “Show that….”, the expectation is that they use the data to get to the answer, not the other way around.

Question 6

A as in (a), a question sometimes asks for a word equation, in this case to see if candidates knew that the products would be a salt + hydrogen. Some candidates made an incorrect attempt at a symbol equation and so lost a mark that perhaps they would have got from giving the simpler word equation. As is common with reading scales, there were examples in (b) of scales read the wrong way up or with incorrect scale divisions. Candidates often knew that polystyrene was an insulator in (c)(i) and many were able to explain why this was important. Temperature was often given as a factor to be kept constant in (ii) – although this was the variable that changed during the investigation and was being measured. Part (d) was well done, with few candidates finding it difficult to predict a sensible temperature change or put the metals in order of reactivity.

Question 7

The table in (b) seemed to cause some difficulties, with only strong candidates scoring both marks. Often candidates did not score a mark because they invented their own colours such as red or purple, rather than using the information given in the table as expected. Part (ii) was not a difficult question, but expressing this idea in a clear way was a challenge for many candidates. The equation in (iii) was generally correct, although a number of candidates “balanced” the equation by using incorrect formulae for the sodium halides. It was pleasing to see some excellent answers to (c) from candidates who had learned their tests for ions. However, some carelessly lost marks by failing to use the word “precipitate”, instead just saying that a result was “goes blue”. Candidates that chose a flame test method did not always score the mark for copper, as “blue” was frequently seen instead of “blue-green”, and candidates obviously could not positively identify iron by a flame test. Some candidates gave muddled answers, in particular some gave the impression that both cation and anion tests were being done simultaneously on a single sample. In future, candidates should make answers clearer by separating cation and anion tests.

Question 8

As expected, the answer of sublimation and the test for limewater were well-known in (a). Part (b) asked why carbon dioxide, a simple covalent substance, changed from a solid to a gas at a very low temperature. Despite this being a regular topic on papers, large numbers of candidates still think it is because the covalent bonds are weak and are broken in forming a gas. In (c) there were some excellent accounts, particularly for graphite, with candidates writing well about the layers of atoms sliding over each other because of the weak forces between them, although some candidates incorrectly referred to them as being intermolecular forces. Candidates found it harder to score all the marks for diamond, with references to intermolecular forces being common, often as an addition to earlier correct explanations involving covalent bonds.

Question 9

The intended idea behind (a) was quite subtle, and only those who have actually carried out this experiment were likely to give a correct answer in terms of minimising loss of fuel by evaporation when the burner is still hot. More candidates simply referred to being able to measure the mass of fuel used up and, as this was an answer to the question, it was allowed. The can being made of copper provided a major distraction in (b), with a sizeable number of candidates identifying the black solid as copper oxide, rather than as soot formed from incomplete combustion. Again, this possibly shows that some students have not actually done this experiment and seen the practical issues involved. The calculation in (c) had candidates on more familiar ground, although unit conversions from J to kJ proved problematic for some in (i). Part (ii) was less accessible, with some candidates failing to start the calculation. Of those that did know what to do, some often lost a mark by failing to add a negative sign to show that the reaction was exothermic. The graph in (d) was mostly well plotted, although the point at -2020 kJ was frequently mis-placed to -2200 kJ. When extrapolating a graph to find a value, candidates are reminded to show the line extrapolation. The negative sign was, again, frequently missing from the answer in (ii). In (iii), some candidates seemed to be confused by the minus sign – which is only there to show that the reaction is exothermic. This does not mean that the enthalpy change becomes smaller as the size of the molecules increases – in fact, exactly the reverse.

Question 10

Part (a) provided an accessible start to the question for good candidates, with only the equation in (i) causing problems to significant numbers. The equation in (b) was correctly answered by most, although some candidates managed to get an incorrect formula for nitrogen dioxide, even though it was provided in the question stem. In (c)(i) the mass calculation, as usual, differentiated between the more able candidates and others. Candidates are advised that setting out their answer logically, especially with some words explaining each step, would probably help them just as much as the examiner! One common incorrect answer was 7 tonnes, obtained by candidates who used the ratio method (138 tonnes of nitrogen dioxide produce 126 tonnes of nitric acid), but then used the 3 : 2 ratio again later in the calculation. In (ii), those who had looked at the stages given earlier the question could easily pick out the idea of nitrogen dioxide being reused in stage 2 of the process. Others showed some confusion with ammonia, as manufacture of fertilisers was a common suggestion. The calculation in (d) was done correctly by many candidates using either of the expected methods.

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