Examiners' Report
Principal Examiner Feedback

January 2023

Pearson Edexcel International GCSE
In Chemistry (4CH1) Paper 2CR

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Question 1

As expected in (a) most candidates could give the pH of a neutral solution and in (b) a weakly acidic solution. Also, in (c) most correctly suggested Group 0 or 8. In (d) although the majority of answers were correct, some gave the number of atoms present rather than the number of elements.

Question 2

(a) Most candidates answered correctly by stating temperature. The most common answers which were not credited included references to concentration, particle size or amount of solute. In (b)(i) the majority placed step G in the correct place, but the other three steps were less commonly correctly placed in order. In (b)(ii) the vast majority scored the first mark with the most common subsequent error being to then divide 17.6 by 100 instead of multiplying by 2.

Question 3

Part (a) was reasonably well answered. The most common errors were the omission of, or incorrect conversion of, kg to g. Some otherwise good answers did not gain full marks as the final answer was not given to three significant figures as required. In (b)(i) a majority of candidates correctly found the percentage of sulfur in the fuel, but a significant number of upside down calculations were seen. Mathematical errors giving an answer of 30% were also quite common. Part (b)(ii) was often well answered. The most common errors were the use of 64 as the Ar of sulfur instead of 32, and not converting dm^3 to cm^3 in the final answer as required. The environmental problem was usually correctly identified as acid rain in (b)(iii) although references to global warming were often seen.

Question 4

In (a)(i) most correctly selected structural formula with molecular formula quite a common incorrect choice. In (a)(ii) many candidates incorrectly stated that members of the same homologous series have the *same* chemical properties, instead of similar chemical properties, and also the *same* physical properties instead of referring to a trend or gradation. Another common error was to state that they had the same molecular or same empirical formula. Some candidates gave more than the required two properties, which was fine if they were all correct, but often this was not the case and the candidates ended up penalising themselves. In naming the homologous series in (a)(iii) and the compound in (a)(iv), the correct spelling is important. In (b)(i) many correctly recognised condensation polymerisation often with a correct explanation, but addition polymerisation was also quite common. In the challenging part (b)(ii) there were a pleasing number of fully correct answers and others just missed the second mark by placing an oxygen atom at both ends of the repeat unit. Large numbers correctly showed a correct ester linkage and gained one mark but there were also many candidates who had no real idea about the structure.

Question 5

In (a) most gave the correct electronic configuration, occasionally in orbital notation, which is obviously not necessary at this level, but was credited if correct. In (b) while many candidates identified the correct charge on the phosphide ion, only good candidates were able to then elucidate why this resulted in a 3:2 ratio of ions. Many gave explanations involving ideas that the "charges swap" or similar, probably indicating the "cross-over method" of teaching how to work out chemical formulae. This is not good practice as it does not give an explanation of charges on ions needing to balance. The completion of the equation in (c)(i) proved straightforward to most candidates. In (c)(ii) many correctly identified carbon as acting as a reducing agent, but explanations were regrettably often inadequate, whilst other candidates did not attempt an explanation at all. Some other candidates thought carbon acted as a catalyst. In (d) a large proportion of candidates were unable to give the correct formula for calcium hydroxide, some were confused or misread the question and started with calcium phosphate rather than calcium phosphide as stated in the question. If the correct formulae were given, most could them balance the equation. In (e) many failed to mention the structure in their explanations despite it being in required by the question. References to covalent bonding and/or intermolecular forces were not uncommon.

Question 6

(a)(i) was often well answered with most candidates gaining at least the first mark and many went on to score the second mark often using a displacement argument involving carbon and iron. However, some candidates seemed confused and gave answers in terms of oxygen being displaced or compared the reactivity of oxygen to carbon/iron. In (a)(ii) many did not make the required link that electricity was required for the process of electrolysis to be used. There were many good succinct explanations in (b)(i) for why the molten electrolyte conducts electricity. However, a large proportion of candidates incorrectly mentioned (delocalised) electrons. The correct cation was often selected in (b)(ii). In (b)(iii) good numbers of candidates correctly stated that sodium would react with water but often did not then continue to state hydrogen would be produced. A surprisingly large number of candidates thought sodium chloride reacts explosively with water. Part (b)(iv) was often poorly answered with common errors being incorrect charges on ions, incorrect or no balancing of the ionic half-equations, incorrect species at electrodes including a number identifying H_2 as being formed at one of the electrodes and others O_2, despite being shown what was produced in the diagram. Some did have the ionic half-equations correct but at the wrong electrodes and were awarded one mark. Part 6(c) requiring an explanation for why the reactivity of metals in Group 1 increases from lithium to potassium was generally well attempted. However, some explanations were hindered by a lack of fluency and some did not answer in terms of a comparison.

Question 7

In (a) many gave good answers in terms of the white tile enabling the colour change to be seen (more) easily/clearly. In (b) suggestions for a suitable indicator were generally good with methyl orange and phenolphthalein (with a tolerance given in spelling) being most commonly seen. However, some candidates just put a colour for each of their answers and did not actually mention an indicator. Part (c) of this question probably gave an indication of the practical experience of candidates. Those who were familiar with doing a titration often gave very good descriptions of the further steps required and scored well, whilst those who had possibly not had the relevant practical experience struggled, with some basically just suggesting a repeat. Some surprisingly thought this was a question about making a salt. Although significant numbers had no idea how to do the calculations in (d), many others did well with fully correct answers not uncommon. Those that made an error in part (i) often carried their error forward and were able to score marks in the other two parts of the question.

Question 8

In (a) many candidates were able to score the first two marks. ΔH was often not indicated clearly, or precisely enough and future candidates should be advised to be more careful in their drawing of lines and/or arrows and where they start and end. Only the best candidates correctly showed the activation energy. Many either did not put in the "hump" or, if they did, labelled activation energy from the products to the top of the 'hump'. A few candidates gave diagrams for an exothermic reaction and were able to access three of the marks. Regrettably, it was clear that some candidates had no idea how to draw a reaction profile diagram. Part (b) involved calculations using bond energies to calculate the enthalpy change for a reaction. The answer to (i) was more often correct than was that for (ii). Many calculated (iii) correctly even if they had incorrect earlier answers and so were able to gain marks in this part. However, many omitted to include a sign even though they had been told to do so in the question.

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