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January 2013

International GCSE
Chemistry (4CH0) Paper 1C
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January 2013
Publications Code UG034346

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International GCSE Chemistry paper 4CH0 1C

Question 1

This was a straightforward question about atoms. The vast majority of candidates scored full, or nearly full, marks. Most errors occurred in part (a), where neutrons sometimes appeared instead of electrons in the last two sentences.

Question 2

This question on halogens was correctly answered by most candidates. In part (a), the most likely error was to state that bromine was a gas rather than a liquid at room temperature. Chlorine and astatine were occasionally given in (b) as the most reactive halogen, and in (c) the name hydrochloric acid was better known than hydrogen chloride.

Question 3

In this question about hydrogen, few candidates scored both marks in (a)(i), the commonest error being the formation of a precipitate., while in (a)(ii), water often appeared instead of hydrogen and occasionally an incorrect oxidation state appeared in iron sulfate. Parts (c)(i)-(ii) were generally correct, but unsuitable properties such as pH were occasionally seen. In part (d), most scored the mark in (i) but rarely in (ii), where helium was often stated to be less dense than hydrogen. Few correct answers were seen in (e), where the term "liquefied" was not understood, the commonest error being to include oxygen as a reactant and water as the product.

Question 4

Part (a) of this question about rusting was well answered, but (b) proved challenging, with only (iv) being well answered. The problem in 4(b)(ii) was that candidates often referred to the nail having the greatest mass, rather than the greatest increase in mass, while in 4(b)(iii) few were able to find the correct words to indicate that the mass increase was proportionally greater. In (c), most correctly chose grease or oil for the bicycle chain, but rarely paint for the railway bridge, with aluminium being a popular choice. The full range of marks was seen in (d), with most scoring the mark for galvanising or sacrificial protection. Many stated the greater reactivity of zinc, with a few believing that it was less reactive, but fewer stated that it reacted in place of iron - some repeated the reference to the barrier method stated in the question, while others referred to the rusting of zinc, which is not an acceptable term.

Question 5

Parts (a) and (b) of this question about hydrocarbons were generally well done, although some lost marks in (a) through referring to hydrocarbons as atoms, or containing a mixture of hydrogen and carbon. The main problem in part (c) was with (iii), where the usual errors of giving a trend in chemical properties or the same physical properties were seen. Also, this time some repeated the general formula answer given in the question, and with many quoting properties specific to alkenes, such as decolourising bromine water or having double bonds. There were many good attempts at part (d), although in (iii) there were references to general formula instead of molecular formula, and some confusion with isotopes, while in (iv) some pentavalent carbon atoms appeared. Most knew the final colour in (e)(i), but the formula in (e)(ii) was sometimes carelessly written. Careless writing of symbols and use of subscripts is normally penalised once in each paper, and this part was chosen for the purpose - this meant that answers such as $C_2H_4BR_2$ and C_2H4Br_2 did not score.

Question 6

Part (a) of this question about metal displacement reactions caused problems for candidates - some suggestions about same starting temperature and same polystyrene cup were unsuitable, while many other answers were incomplete (often mass or volume) or incorrect (mass of salt). Part (b) was generally well answered, although with some misreadings of the scales (17.35 instead of 17.7 and 22.2 instead of 22.4). Part (c) proved challenging for many candidates. Although most chose magnesium in (i) the second mark was not scored because of the lack of a comparison - stating that there is a large difference in the temperatures for magnesium is not sufficient. Similarly in (ii), it is not sufficient to state that the temperature rise is high, although the mark would have been awarded for stating that the temperature rise was the highest (or higher than for the other metals). Answers to (c)(iii) were usually correct, but in (iv) the commonest non-scoring answer was "the temperature changes for silver and X are the same", rather than "silver and X showed no temperature rise". The equation in (d) was often correct, although some started with Cu_2SO_4, no doubt because of the given oxidation state.

Question 7

This question about metal extraction brought candidates mixed success. In (a)(i), some scored all three marks, but for others, once reduction and oxidation were entered in the wrong order, no further marks could be scored, and marks were often lost for careless wording, such as "aluminium gains electrons". A surprising number repeated the given half-equation for Al^{3+} in (a)(ii), while several attempts at the oxygen equation were unbalanced or began with O_2^- instead of O^{2-}. In (a)(iii), some translated the supplied chemical equation into words (carbon combines with oxygen) without stating any effect on the electrode, while others referred to

corrosion or wearing away. The main problem in (a)(iv) was to give carbon rather than coke, or to list the other raw materials, although its purpose in producing heat was well known. Part (b)(i) was very poorly answered, with a variety of uses suggested, including photosynthesis and in blast furnaces, and the quoted properties often did not match (carbon dioxide is insoluble in water, and it does not burn). Few correct equations were seen in (b)(ii), with the burning of sulfur and the formation of sulfuric acid (without oxygen as the other reactant) being the commonest errors. The effect was better known, although the use of vague answers (it affect plants) and physical effects (erosion) continues to be a problem for many candidates. There were many successful attempts in (c), with several answers using an incorrect mole ratio that gave an answer of 774 g (which scored 2 marks).

Question 8

The early parts of this question about rate of reaction were much better answered than the later ones. In part (a), many scored for the reversible symbol and the negative sign of ΔH, but not with the meaning of ΔH, which often lacked a reference to change. Many attempts at the energy level diagram lacked any labels on the horizontal lines. Part (c) was well answered, except for the relatively large number who stated that a temperature increase would increase the yield in an exothermic reaction. It seems that many candidates misread the question wording and assumed that the stated pressure change (10 to 5 atm) was an increase and answered accordingly. Just over half were able to balance the equation in (e).

Question 9

In this question about bromine, much of part (a) was well answered, except for (iv) where several quite long answers did contain the right words to express the reason, and some did not choose either isotope or referred to the non-existent ^{80}Br. Although many correct answers were seen in (b)(i), it was disappointing to see ionic structures after the mention of molecule in the question. The nature of the covalent bond in molecules such as HBr, in terms of the attraction between the shared electrons and the two nuclei was rarely known, although it has been tested before and is explicitly included in the specification content. Part (b)(iii) was very poorly answered, revealing an ongoing problem for candidates in understanding the nature of bonding. Many answers compared the breaking of ionic bonds in sodium bromide and covalent bonds in hydrogen bromide or the intermolecular forces in both. The empirical formula calculation in (c) earned many candidates full marks, although a small number used atomic numbers (often just for bromine) instead of atomic masses. Rounding of numbers after the initial division caused problems for others, and candidates are advised to write their division results to 2 decimal places; this might have prevented answers such as 0.6 : 0.5 : 2.3 becoming $NaBrO_2$.

Question 10

This question about the boiling points of alcohols earned few candidates the mark in part (a), but the graph plotting in (b) was generally well done, although with the occasional points miss plotted. The relationship sometimes stated direct proportionality, while others lost the mark in (ii) through incorrect terminology (temperature instead of boiling point, mass instead of relative formula mass). The reading off from the graph in (iii) was usually well done, but many chose the alcohol with the lowest boiling point as the least volatile in (iv).

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Order Code UG034346 January 2013

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