Examiners' Report
Principal Examiner Feedback

Summer 2019

Pearson Edexcel International GCSE
in Chemistry (4CH1) Paper 1CR

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Question 1

As expected (a) was very well answered with few incorrect responses. In (b) the question specifically asked for a description of the arrangement and movement of particles in a solid. Most candidates were able to score at least two marks with many fully correct answers. However, some candidates failed to gain full credit as their answers did not address the question, but instead described the forces between particles in a solid or referred to the amount of energy the particles may have. Others gave references to solids having a fixed shape or volume. Also, it was quite common to see the statement *the particles do not move,* without adding the key word *around* or *freely.* These candidates gave the impression they did not appreciate that vibration is a type of movement. Some answers were not well worded when trying to describe the regular arrangement of particles.

Question 2

In (a) most candidates scored at least two marks with the most common error being a belief that potassium oxide solution is formed. In (b) a suitable pH value was often given although some did not give a high enough value. The correct ion was also often given in (ii) but it was surprising to see many suggesting K^+. In (c) most were able to correctly balance the equation.

Question 3

In (a) the majority of candidates wisely chose to heed the invitation in the question and base their answers on a labelled diagram of the set up for a chromatography experiment. It was disappointing not to see more candidates correctly commenting on when to stop the experiment, with many students suggesting just to leave it for a certain period of time instead of until the solvent has risen up the paper or one of the other acceptable alternatives. The other most common error was in responses which had either diagrams showing the solvent touching the baseline, or containing statements that the solvent should touch the baseline. Others had a contradiction between their diagram and written answer. Part (b) was well answered although some failed to score one of the marks as they did not mention the solvent/water. A majority gave fully correct answers to (c)(i). In (ii), apart from a few who gave Y and Z as their answer, possibly on the grounds that they contained the most dyes, most candidates correctly identified X and Z and gave the correct reason. In (iii) some lost the mark for the explanation, usually because they simply

repeated the question and said that V and W only contained one dye, instead of referring to one *spot* or equivalent term. In general, candidates should be reminded that clear handwriting is important, and it should be absolutely clear which letter they mean - the manner in which an 'X', 'V' and a 'Y' were sometimes written meant that it could be difficult to distinguish a correct answer from an incorrect one. On the whole part (d) was answered well with many candidates achieving full marks. The most common error was incorrect rounding or not giving answers to two significant figures as the question asked.

Question 4

In (a) nearly all candidates stated that carbon and hydrogen had to be present, and most also noted that these were the only elements present. Some candidates lost credit by using the term element or atom for compound. The majority of candidates were able to score both marks in (b)(i) although some were not able to correctly balance the equation. The most common errors in (ii) were to give carbon dioxide and hydrogen as products of the incomplete combustion of pentane but most gave at least one correct product. In (iii) many gave good answers describing how carbon monoxide reduces the capacity of blood to transport oxygen, with some going beyond what is required on the specification by describing the formation of carboxyhaemoglobin. Weaker answers just stated carbon monoxide is poisonous or toxic. In (b)(iv) many gave two correct isomers, but some did not appreciate that they had given the same isomer twice. Candidates should be reminded to look for the longest chain in their possible answers. Apart from the few who gave the general formula of an alkane or the chemical formula of a specific alkene, most candidates gave the correct answer in (c)(i) and in (ii) most also knew that unsaturated compounds contain a double (or multiple) bond. The majority of students also knew how to test for an unsaturated compound in (iii) with the majority of candidates scoring both marks. The most common error was the use of bromine instead of bromine *water/solution*. Although not necessary to give the starting colour, a few described bromine water as being red or red/brown, confusing the colour of pure liquid bromine with that of bromine water. It was pleasing to see fewer candidates using *clear* instead of *colourless*. Some candidates incorrectly stated that the test should be done in the presence of UV light and so did not score the second mark.

Question 5

Part (a)(i) was poorly answered with many believing the cotton wool was to prevent the gas escaping. Others suggested it was to prevent substances entering the flask or even to insulate the flask. A few correctly stated it was to prevent loss of acid spray but then negated the mark by adding *and to stop oxygen entering*. Very few candidates gained both marks. In (b) the majority of candidates obtained at least one mark for giving some correct state symbols in the equation. The most common incorrect ones given were for HCl and

$CaCl_2$. In (c) the majority of candidates scored at least one mark with many scoring both marks for sketching a steeper curve levelling off at the same mass as the original curve. A minority drew a new, separate graph below the original one, even though the instructions told them otherwise. Part (d)(i) was often well answered with many gaining all three marks. The reasons for lost marks were usually either for stating an increase in collisions but without a reference to time/frequency, or for stating *more particles* with no reference to *in the same volume*. Candidates should also be aware of the difference between area and volume. Some incorrectly stated the particles would have more energy whilst a few forgot to state that the rate of reaction increases. This was also true in (ii). Again, in this part, some candidates omitted the time/frequency aspect of the successful collisions whilst others did not refer to *successful* collisions which was necessary in this part.

Question 6

The majority gained full marks for the empirical formula question, but some missed the last mark as they failed to show (as asked in the question) how they went from a ratio of 3.2 : 4.8 : 1.6 to the empirical ratio of 2 : 3 : 1 by dividing each by 1.6/the smallest value. In (b)(i) most were able to give the correct formula for iron(III) chloride. The most common incorrect answer was Fe_3Cl. In general candidates should be reminded of the importance of the appropriate use of subscripts, superscripts or lower and upper case letters in chemical formulae. In (ii) most candidates correctly stated that a catalyst increases the rate of reaction with many adding that it lowers the activation energy. Although this is really an explanation of how a catalyst works it was also allowed as an alternative to the expected answer on this occasion. In (iii) most gave a correct explanation of exothermic although some lost this mark through not including heat/thermal energy in their answer. In (v), considering that both organic formulae were given in the question, it was surprising that so many candidates got one or both of them wrong. Some gave a reactant of $C_2H_6Cl_2$ or gave a product which was the same as the reactant. It was also not uncommon to see HCl_2. Part (c)(i) was generally very well answered with many gaining full marks, but a few gave an incorrect displayed formula for the chloroethene monomer, despite being given the molecular formula in the question. Others placed a single bond in the monomer or a double bond in the polymer. A minority omitted the extension bonds or gave more than one repeat unit. In (ii) a surprising number of candidates failed to show the electrons forming the double bond correctly. Some good candidates drew all the bonding electron pairs correctly, but omitted to show the unbonded electrons in the outer shell of chlorine, thereby failing to gain the second mark.

Question 7

(a)(i) Although many gave the correct formulae for both ions, it was disappointing to see large numbers of candidates struggle, particularly with the nitrate ion. Part (ii) gave the

expected wide range of marks, including an encouraging number of six mark answers. The main error in making the magnesium nitrate solution was not to add magnesium oxide to excess. Of those that did, some then did state it was necessary to filter, but failed to give a reason for it. When using the magnesium nitrate solution, many candidates incorrectly heated their solution to dryness, thereby limiting themselves to one mark. Disappointingly, some candidates thought that magnesium nitrate is an insoluble salt and described how to obtain a pure sample of a precipitate. In (b)(i) most gained the mark, with the most common error being not including all the oxygen atoms. Surprisingly, a few came up with an answer other than 256 and did not seem to realise that they had made a mistake. In the calculation in (ii) many were able to gain all three marks. The most common error was failing to divide the moles of HNO_3 by two. The majority of candidates could correctly calculate the percentage yield in part (iii).

Question 8

Most gave a correct word equation in (a)(i). Of the range of errors seen, the most common was to give hydrogen as a product instead of water. Of those candidates who attempted a chemical equation instead of the word equation asked for, the majority got it right and were awarded the mark. In (a)(ii) the majority of candidates knew that polystyrene would reduce heat loss, but a significant proportion failed to state that this is because it is an insulator. A surprising number thought that polystyrene is preferred because it is unbreakable or safer to use. Almost all gave a suitable safety precaution in (iii). In (b) the points were well plotted by most candidates and the lines of best fit were usually well drawn enabling correct values to be given in (ii). However, there were a few students who joined the tops of the lines with a curve, did not join the lines or did not use a ruler. It is worth noting that it was sometimes very difficult to see the points under the line if candidates had used dots instead of crosses.

Question 9

In (a) a high proportion of candidates correctly stated that covalent bonds are strong but did not make explicit reference to the large number of covalent bonds present in diamond. Many correctly indicated a large amount of energy is needed to break the covalent bonds. It was disappointing to see some candidates, having started well, then negate their good work by referring to strong intermolecular forces. In (b)(i) there was considerable confusion about which bonds were being broken. Even candidates who correctly referred to weak intermolecular forces often then went on to write about bonds between atoms also needing to be broken. Some stated that fullerene had fewer covalent bonds than diamond and so needed less energy to break them. In (ii) only the minority gave a sensible suggestion about the medicinal use of fullerene. Most candidates, however, just chose to give a physical property of the fullerene without giving much thought as to how that would

apply to its medical use. Common suggestions were low melting point so it melts in the body, or that fullerene could act as a lubricant in the body. In (c) the majority of candidates scored marks for indicating the layered structure in graphite and that the layers can slide over each other. A large number also noted the weak forces between the layers, although many of them then lost that mark by incorrectly specifying that these are intermolecular forces. The explanation of the conductivity of graphite was often not well answered, with many candidates not referring to *delocalised* electrons.

Question 10

Many did not answer (a)(i) well, with many candidates failing to realise that the zinc was in excess or that copper sulfate was the limiting reagent. Some missed the point of the question entirely and instead compared the reactivity of copper and zinc. In (a)(ii) many candidates knew that copper(II) sulfate is blue but less appreciated that the solution would turn colourless as zinc sulfate solution is formed. Common alternatives seen such as brown or orange seemed to relate to copper itself rather than the solution. Most were able to do the heat energy calculation in (b)(i) and many scored all three marks. The minority who could not remember how to do the calculation usually still scored one mark for finding the temperature increase. Most knew how to calculate the number of moles of copper(II) sulfate in (ii) although some then lost the mark by quoting the answer to only one significant figure, which from the given data was not reasonable. However, it did not prevent full marks being scored in part (iii). In this part many candidates were able to calculate Q/n successfully and nearly all divided the result by 1000 to give the correct units. It was quite common though, to omit the negative sign in the final answer.

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