Examiners' Report

Principal Examiner Feedback

Summer 2018

Pearson Edexcel International GCSE
In Chemistry (4CH0) Paper 1CR

Pearson Edexcel International GCSE
in Science Double Award (4SC0) Paper 1CR

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Examiner Report International GCSE Chemistry 4CH0 1CR

Question 1

The majority of candidates managed to score at least five marks out of six for this question. Common errors included thinking that iodine was a liquid, probably confusing it with iodine solution which is used to test for starch, or that carbon dioxide was a mixture. Surprisingly some candidates thought that nitrogen was used as a fuel.

Question 2

The majority of candidates scored two out of three in (a), usually for saying that the sugar dissolves and then the particles spread out by diffusion. However many candidates missed marks for not discussing bombardment of the sugar cube by water molecules and not giving a final statement to say that the particles of sugar would eventually be evenly distributed. Instead many just repeated the stem of the question by saying that the concentration was the same at the top and bottom of the beaker. Candidates need to be aware that they cannot gain credit for repeating the stem of the question and that when the question asks them to use particle theory they must refer to particles in their answer to gain full marks.

In (b)(i) the distillation apparatus was well recognised but surprisingly many candidates had trouble naming the pieces of apparatus in (b)(ii). A common error was to name the gauze as a wire mesh or a heat proof mat. Others lost a mark by not specifying that the flask was a conical flask. The majority knew the purpose of the condenser but some could not name it, and referred to it as a cooling tube or something similar.

Question 3

In (a) most candidates realised that pencil, unlike ink, is insoluble in water or wouldn't run or smudge. A significant number ignored the words 'in pencil' and simply answered that the line was there as a reference mark to see where the colourings had started. In (b)(i) the majority of candidates correctly identified drink D as only containing one colouring. In (b)(ii) the majority also identified drink C as the one that contained the most soluble colouring, but some failed to score the second marking point by commenting vaguely that 'it' had moved the furthest, which was unclear as to whether they were referring to the drink or the colouring, rather than some identifiable spot on the paper. Candidates should avoid using the word 'it' in their answers as this is often ambiguous and can cause them to lose marks unnecessarily. In (b)(iii) most identified A and C but sometimes did not score the second marking point by not being specific enough, saying that 'they' rather than the spots had travelled the same distance. Others thought it was because they both had three spots. A few lost both marks by not reading the question carefully enough and identifying only one drink.

Question 4

In (a) the most common errors here included answering merely + and – or positive and negative for the charges on the proton and electron but not giving their relative magnitude, and stating that the electron has a mass of 0. Consequently only a minority of candidates gained all three marks here. The particles in (b) were usually identified correctly.

Question 5

The majority of candidates answered (a)(i) and (ii) correctly. In (a)(iii) many candidates did identify two correct elements, but others thought it was the metals that formed acidic oxides and some appeared to be just guessing the answers by choosing one metal and one non-metal. A surprising number gave oxygen as one of their answers and others gave elements from period 3 or group 2 as their answers. Candidates should use the information from the Periodic Table at the front of the question paper to avoid errors such as these. 5(a)(iv) was usually answered well, with most candidates mentioning the formation of acid rain and giving one of the acceptable adverse effects. A few mentioned acidic oxides increasing the pH of lakes rather than increasing acidity or decreasing pH. Some candidates said that acid rain damaged buildings or statues but did not make this specific to limestone or marble and so lost the second marking point. The few that missed out on both marks thought that acidic oxides dissolving in water caused global warming or the greenhouse effect.

The most common mistake in (b)(i) was to give magnesium sulfate as the product of the reaction between magnesium and sulfur, even though the symbol equation had been given to help them. A few wrote magnesium sulfite and others magnesium sulfuride. It appears that many candidates do not realise that sulfate and sulfite contain oxygen as well as sulfur. 5(b)(ii) was usually well answered with many candidates scoring all three marks. Those who scored two marks usually failed to give the charges on the ions, even though the question specifically asked for these. Some gave incorrect charges or just stated that magnesium formed a positive ion and sulfur a negative ion. Others lost marks by not specifying that it was two electrons which were transferred. A minority of candidates stated that Mg^{2+} gave two electrons to S^{2-} to form magnesium sulfide, which showed a lack of understanding of the process of electron transfer. It was encouraging to see that very few candidates lost marks by referring to electron sharing or covalent bonding in their answer. Many candidates scored all three marks for the calculation in (b)(iii). Unexpectedly, quite a few chose to calculate the mass of sulfur separately and then add that to the mass of magnesium given in the question, producing the correct final answer and receiving full credit. This approach works in this instance as it is a one to one ratio of magnesium to sulfur. A few candidates failed to calculate the moles of magnesium and just multiplied 0.3 by 56, but still managed to score one mark

for the 56. Only a very small minority used atomic numbers instead of relative atomic masses.

Question 6

Only a minority of candidates gave a fully correct equation in (a). The most common error was to give the formula for calcium nitrate as $CaNO_3$ and as the balancing mark was dependent on all formulae being correct no marks could be awarded. Often the formula of nitric acid was not known which meant that a correct formula for calcium nitrate could not be deduced. Those candidates who did write all the formulae correctly usually balanced the equation correctly as well.

In (b)(i) many candidates gained one mark by realising that gas could escape through the thistle funnel. Comparatively few mentioned downward delivery or standing the gas jar upright to collect the gas. Many realised that carbon dioxide would not go into the gas jar but did not go on to say why, so failed to gain the mark. Others mentioned that carbon dioxide was denser than air, but did not state that this would prevent it from going in to the gas jar so did not gain the mark. A surprising number of candidates thought the gas jar should be sealed with a bung to keep the gas in whilst being collected, suggesting that their understanding of the physical properties of gases is rather limited. Some candidates said that the gas should be collected in a syringe or over water, indicating that they had misread the question and were trying to suggest improvements rather than identify potential problems. 6(b)(ii) was poorly answered with the majority of candidates scoring zero marks. A variety of incorrect answers were given to do with rates, relative reactivities of the two acids, the presence of impurities, equilibrium not being reached and the water produced making the acid too dilute. A small minority had been taught this and gave the mark scheme answer and a few knew that the calcium sulfate was insoluble but failed to say how this affected the reaction.

In (d)(i) many candidates offered vague and uncreditworthy responses about electrons being shared between non-metal atoms, instead of describing the origin of the force holding the atoms together. Of those that did answer in the appropriate way, a fair proportion failed to note that it is a pair of electrons which are shared. This question was surprisingly poorly answered considering the definition of a covalent bond is clearly stated in the specification and all candidates needed to do was to learn this definition. 6(d)(ii) was encouragingly well answered, with a good proportion of candidates referring to the weak intermolecular forces and stating that only a little energy was required to overcome these. However, many stated that less, rather than little, energy would be required. There was no point of comparison for use of the word 'less' and hence they were not awarded the second marking point. Predictably, a sizeable minority thought that the covalent bonds were being broken and so failed to score. In (d)(iii) the diagram for carbon dioxide was completed correctly

by many candidates, with the most common error being to show the carbon-oxygen bonds as single bonds, which unfortunately meant they lost both marks. The majority who showed the two double bonds correctly also went on to complete the rest of the molecule correctly, however a few lost the second marking point by showing the incorrect numbers of electrons on the oxygen atoms or by adding extra electrons to the carbon atom.

Question 7

Many candidates knew that haematite was the name of the iron ore in (a), but there were some strange spellings. The most common incorrect answer was iron oxide, which was not creditworthy as the question asked for the common name of the ore. Part (b) was poorly answered with most candidates thinking that carbon dioxide made up the highest percentage of the waste gases. Most candidates scored at least one mark for (c), usually for saying that carbon or coke reacts with carbon dioxide, but often forgetting to say that the carbon initially reacts with oxygen to form carbon dioxide. The better candidates described correctly the two reactions, and a few gave balanced chemical equations for them. Some explained the origin of carbon monoxide in terms of incomplete combustion, but often lost the one mark available for this by not noting that carbon or coke was undergoing incomplete combustion. Quite a few candidates who gained the first mark lost the second mark by saying that carbon dioxide reacts with more oxygen to make carbon monoxide.

The equation in (d) proved difficult for many candidates. Common errors included writing FeO or Fe_2 as a product or reacting the iron(III) oxide with carbon instead of carbon monoxide. Those who did manage to write the correct formulae sometimes lost the second mark by not balancing the equation correctly. It would be worthwhile to emphasise to candidates that no marks can be scored for a chemical equation, even if it is balanced, unless all formulae are correct.

Question 8

The most common answer in (a)(i) was 'Bunsen burner', which was an allowable answer, with only a small proportion of candidates writing 'thermometer', which was the expected mark scheme answer. Common incorrect answers included fractionating column, condenser and clamp and stand, even though it was stated that she uses a clamp and stand in the stem of the question. In (a)(ii) most candidates gained the mark for saying that the gases were condensed or turned to liquid, however only a minority said that the vapour was cooled. Some candidates who mentioned cooling still did not score the mark as they referred to the crude oil or the fractions rather than the gas or vapour.

The majority of candidates identified fraction A correctly in (b)(i) and (ii), although some either did not understand what viscous meant or misread the question and thought that they had to identify the most viscous and wrote

fraction D as the answer to (b)(i). Part (c) was answered correctly by most candidates. A common error in (d)(i) was to give just the one alkene, C_6H_{12}, causing them to lose a mark. Candidates need to read the questions more carefully as this question specifically asked for two molecules of the same alkene. Many candidates knew the correct catalysts and temperature range used for cracking in (d)(ii), however a number of vague answers were given referring to high temperature, high pressure and a catalyst, which failed to score.

Question 9

All of part (a) was answered well by the majority of candidates. Some gave the incorrect order of metals in (ii) with a small number including metals which weren't even in the table. Common errors in (iii) were to use a glowing splint or to just write 'squeaky pop test' which was not creditworthy. In (iv) some tried to write a symbol equation when only a word equation was required and often the formulae were incorrect. Another common error here was to give water instead of hydrogen as one of the products. In (v) some candidates thought that sodium did not react with acid or the acid was not concentrated enough or the reaction too slow.

Candidates found (b)(i) difficult with only a minority of candidates referring to the colour change of the solution or the formation of a brown or pink solid. The most common correct answer was to say that the zinc disappeared. Many candidates said that bubbles would be produced which is not the case here. Some said that copper solid would form or the solution would change colour, but these statements were not creditworthy. In order to gain the marks candidates were required to describe the colour of the solid copper and the final appearance of the solution. Many failed to score in (b)(ii). A significant number of candidates stated that as no reaction occurred between copper and nickel sulfate that this meant the order of reactivity could not be determined. Of those who recognised that it was the reactivities of nickel and zinc that were not known, many did not say that an experiment needed to be carried out between them, so did not score the second mark.

In (c) the majority of candidates gained at least 1 mark for knowing that both oxidation and reduction occurred. The better candidates went on to say that zinc lost electrons for the second mark, but a significant number lost the third mark by saying that copper, rather than copper ions gained electrons. Even though many questions of this nature have been set before many candidates still make this fundamental mistake.

Question 10

In (a)(i) surprisingly few candidates were able to define an element successfully and just stated that nitrogen is an element because it contains only one element or only contains nitrogen. More candidates were able to give a correct definition of a compound. Most candidates stated that ammonia contains two elements, but some stopped here and did not go on to say that they have been bonded or chemically combined and so failed to score the mark. In (a)(ii) the majority of candidates knew that gas X was hydrogen and most of these gave a correct raw material. The most common incorrect answer was air. It is surprising how many students think that air contains significant quantities of hydrogen. The majority of candidates knew that solid Y was iron in (a)(iii) and an even greater number knew that it was a catalyst in (a)(iv).

In (b)(i) many candidates did realise that this was a neutralisation reaction, but there were quite a few different incorrect answers given, the most common ones being addition, redox and displacement. Some wrote exothermic which is not incorrect but was ignored, as it is not a type of reaction. In (b)(ii) the majority of candidates knew that compound Z was ammonium sulfate, but only a minority gave the correct formula. Common incorrect formulae included NH_4SO_4 and $(NH_3)_2SO_4$. In (b)(iii) the majority of candidates failed to score here as they did not know that in order for ammonium ions to give off ammonia gas an alkali such as sodium hydroxide needs to be added. Those who did add sodium hydroxide often went on to score all three marks, but others failed to specify that it was the gas or ammonia and not the reaction mixture which was being tested with the red litmus paper, losing them two of the three marks. In (c) only a minority of candidates scored both marks. Only a few students demonstrated understanding of liquids occupying smaller volumes than gases. The few who did go down this route often scored both marks. The majority of one mark answers were for stating that the ammonia gas is more likely to escape or leak.

In (d)(i) the majority of candidates gave the correct answer of enthalpy change or heat change. Allowances were made for small mistakes in the spelling of enthalpy, but use of a similar word, such as 'empathy' was not accepted. A few candidates wrote 'energy change' which was not sufficient. The majority of candidates recognised that the reaction was exothermic in (d)(ii), with fewer stating that there were more moles of gas on the right hand side in (d)(iii). Those who failed to score here often tried to relate the change in pressure to the rate or the exothermic nature of the reaction. Others talked about the position of the equilibrium moving to the right but failed to relate this to the number of moles. The majority of candidates scored at least one mark in (e) for knowing that ammonium nitrate was used as a fertiliser, but some of these did not go on to explain the benefits of this on the growth of plants. Those who failed to score here often thought that ammonium nitrate was a pesticide or that it was used to change the pH of the soil.

Question 11

The majority of candidates gave the correct state symbols in (a)(i) but only a minority gave the correct charge on the chromate ion in (a)(ii). Part (b) was well answered by the majority of candidates. Only a very small number failed to plot all the points correctly or to circle the anomalous result. Most also drew the lines of best fit correctly using a ruler, with only a small minority trying to include the anomalous point. In (b)(iv) a large number of candidates failed to read the question properly and read from the graph the height of precipitate produced on adding 5.0 cm^3 of lead(II) nitrate, giving an answer of 1.5 cm, instead of reading off the volume of lead(II) nitrate needed to produce the maximum height of precipitate. Those who did know what to do nearly all scored the mark here for reading off the volume where the lines crossed. Most candidates managed to score at least one mark in (b)(v) for one of the mark scheme answers or for the allowable answer of misreading the height. Those who failed to score were too vague with their answers, giving statements such as 'she added the wrong volume of potassium chromate' without specifying that too little was added, or saying 'there was parallax error' but without explaining how this affected the height measurement.

In (c)(i) some candidates took this to be an exercise in crystallization, describing a procedure for producing crystals of potassium nitrate from the solution remaining, therefore scoring either zero or one mark for filtering. Of those who focused on the precipitate, nearly everyone scored the mark for filtering. Most followed this by washing, but some forfeited this mark by not making it clear what was being washed. The majority suggested a suitable drying procedure. However there were many good answers scoring all three marks. The majority of candidates scored both marks in (c)(ii). Most candidates knew that a flame test would be required, and many gave correct descriptions of the procedure, sometimes in considerable detail, although this was not required for the first marking point. The flame colour was almost universally known, and nearly always described as lilac rather than pink or purple. Part (d) was generally well answered with around half of the candidates scoring all three marks. A common error which lost some candidates one mark was to not recognise there was a one to two ratio of lead(II) nitrate to potassium iodide. A few others recognised the one to two ratio but multiplied by two instead of dividing when determining the moles of lead(II) nitrate, which also lost them one mark.

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