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Examiners' Report
Principal Examiner Feedback

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Pearson Edexcel International GCSE
In Chemistry (4CH1) Paper 1C and Science
(Double Award) (4SD0) Paper 1C

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Question 1
Part (a) was well answered by the majority of candidates. A few were unfamiliar with the term sublimation.

The majority scored at least two marks for part (b) with most knowing that the particles moved freely or randomly. There was a lack of clarity in some answers where candidates wrote about the particles having no fixed shape and filling the whole volume available as well as the gas having high kinetic energy and little attraction between the particles. Although these statements were correct, they were not really answering the question in terms of arrangement and movement and therefore were not creditworthy.

Question 2
The majority of candidates answered the three multiple choice questions correctly and knew that Y was ionic.

Part (c) was not particularly well answered and many just stated that the melting point would change. Others thought the melting point would increase. The most common acceptable answer was that the melting point would decrease. Only a very small minority stated that the impure substance would melt over a range of temperatures, which is surprising as this is what is stated in the specification.

Question 3
Part (a) was poorly answered with only a small minority scoring both marks. Those who scored one mark was usually for diffusion. A common incorrect answer was displacement.

It was apparent that the large majority of candidates were unfamiliar with the experiment and in part (b) many entirely missed the point of the question. Most candidates did however manage to score the second marking point by stating that the particles moved faster or had more energy. They often then went on to talk about more collisions confusing this experiment with a rate of reaction question. The mention of the crystals dissolving faster was rarely seen and hardly anyone scored the third marking point.

Parts (c) and (d) were usually well answered. A few thought that the charge on the lead ion was 4+ and some just wrote positive which did not score.

Question 4
Only a minority of candidates scored all three marks for part (a). The most common mistake was to fail to add the 100 to 265 giving a final answer of 28.3%, which scored two marks. Another common error was to just ignore the air in the flask completely and just divide by 100 giving an answer of 75%. These candidates scored one mark for the correct volume of oxygen.

In (b)(i) most gained at least one mark for realising that the paint prevented oxygen and water from reacting with the iron. Fewer mentioned that the paint acted as a barrier,

coating or protective layer on the iron. A small minority thought the paint reacted with the oxygen and water. In (b)(ii) again most scored at least one mark for stating that zinc is more reactive than iron. Many then went on to say that the zinc would react with oxygen, but some lost the second marking point by not stating that the zinc would react instead of or before the iron. Some candidates misinterpreted the question and as zinc was mentioned there was often confusion with galvanising.

Question 5

Part (a) was generally well answered with many candidates scoring all four marks. Crystallisation was the least well known with some putting filtration or simple distillation for the fourth marking point.

In (b)(i) most candidates knew that A and B were in the purple ink, but many lost the second marking point as the answers were too vague. A common answer was to say that A and B moved the same distance up the paper but failed to refer to the spots in the purple ink meaning the second marking point could not be awarded. Generally (b)(ii) was more mark yielding as a large majority chose D as the answer and usually stated that the spot moved the shortest distance. A few candidates lost the second marking point by just stating that the spot was close to the start line. Candidates need to realise that a comparison needs to be made with words such as closest, nearest, least, shortest to gain the mark.

The majority of candidates scored both marks for part (c). Quite a few candidates divided the two numbers instead of multiplying, showing a lack of understanding of R_f values. Candidates need to realise that an answer which is larger than the distance between the start line and the solvent front is a nonsense answer and so cannot possibly be correct. Likewise dividing 0.72 by 120 gives such a small answer that would be unmeasurable.

Question 6

In part (a) the majority of candidates did not seem to realise which substances would form precipitates and which would not. It was apparent that many had not learnt the solubility rules given in the specification. Many thought that potassium carbonate would be a precipitate and others thought that barium sulfate was soluble. A few lost a mark by failing to write ‘precipitate of’ in front of the names of the substances. The one that was correct the most often was ‘precipitate of calcium carbonate’.

Part (b) was an example of a question that was mostly either well done or very poorly done with few in the middle. A good number of candidates gave all eight marking points, with many scoring the maximum six. The halide ion tests were well known by many candidates. Some lost marks here by not referring to precipitates or giving incorrect colours for the precipitates, brown silver iodide being relatively common. A few candidates earned marks for the alternative answer of adding a halogen solution. Flame tests for cations were also well known. Only a few candidates lost a mark for describing the colour of the sodium flame wrongly, usually as red or some variant thereof. When testing for the carbonate, very few candidates mentioned effervescence

or bubbles, the majority getting the fourth marking point by describing lime water turning cloudy or milky. Some lost a mark here by adding lime water directly to the potassium carbonate and acid mixture. Several candidates clearly had no idea how to answer this question. Some confused the alkali metals with their compounds and described the reactions of sodium and potassium with water or just added indicator to the solutions.

Question 7

In part (a) the majority of candidates gained two marks by describing correctly how the lithium atoms lose one electron and the oxygen atom gains two electrons. Many of these however lost the third marking point by failing to give the electron configurations. A few candidates gained marks from diagrams of the ions showing correct electron configurations. A small number of candidates lost all three marks by assuming that lithium oxide was covalent and said that electrons were shared.

In (b)(i) the majority of candidates scored both marks. Some lost the first mark for misreading the thermometer but managed to gain the second for a correct subtraction. In (b)(ii) there were frequent examples of candidates losing a mark by ignoring the instruction to give their answer to two significant figures. It seems that giving answers to a specified precision is generally one where candidates lose marks as presumably, they either do not understand significant figures or have not read the question carefully enough. A few candidates failed to use the 100 g in their calculation or occasionally used the initial temperature rather than the temperature rise. Others did not appear to know how to calculate *Q* and divided the numbers instead of multiplying.

In (b)(iii) the majority scored at least two marks here with many losing the third marking point for omitting the sign in their answer. Other errors included multiplying instead of dividing, failing to convert to kilojoules by not dividing by 1000 or dividing by 100 instead of 1000.

Most candidates gained the mark in (b)(iv) for stating that polystyrene was in insulator or that it prevented heat loss. A few thought it was because it would not react with the chemicals or that it could withstand higher temperatures than a glass beaker.

Question 8

Part (a) was well answered with the majority scoring both marks. A few gave an incorrect colour which was usually white or blue.

Most candidates scored at least two marks for the calculation in (b)(i). A common error was to not read the question carefully enough and therefore fail to give the answer to one decimal place. Answers 79.98 and 80 were often seen. Some candidates rounded the answer incorrectly giving a value of 79.9. In (b)(ii) most candidates gave the allowable answer ‘same number of electrons.’ A fair number however stated that there were the same number of electrons in the outer shell which was not incorrect but did not imply the same total number of electrons or the same electron configuration so did not score. Others missed the point entirely and just said there were the same number

of protons or they had the same atomic number, which are not reasons for the same chemical properties.

In (c)(i) many candidates knew the correct order of reactivity of the halogens and scored the first marking point. Some seemed to think that was sufficient, but the fact that the command word was 'explain' and the that there were three marks to be awarded should tell them that more was needed. Those who gave an explanation sometimes lost a mark for the incorrect use of -ide or -ine in their answers. Most candidates gained a mark in (c)(ii) often for stating that there would be no reaction. In (c)(iii) only a minority of candidates gained both marks here. Many lost one mark for stating that iodine is oxidised rather than iodide ions, even though it has been stressed in previous examiners' reports that in order to gain full marks they need to refer to the correct species that is being oxidised or reduced. A few candidates scored zero for thinking that it was bromine that was oxidised, and iodide reduced. Some just stated that oxidation and reduction both occurred at the same time which was not creditworthy on this occasion.

Question 9

The definition of a hydrocarbon was well known with most candidates gaining both marks for (a). Only a few lost a mark by omitting the word 'only'.

Part (b)(i) was also very well answered with only a very small number giving an incorrect answer which was usually carbon dioxide. In (b)(ii) many candidates stated clearly why carbon monoxide was poisonous to humans, however there were quite a few vague answers such as its toxic, causes suffocation or breathing problems or just deprives the body of oxygen with no reference to the blood.

Part (c) was poorly answered by the majority of candidates. Few candidates showed much idea about the forces involved in a covalent bond, many just saying that there were covalent bonds or that electrons were being shared. Some candidates did describe the attraction between electrons and nuclei; however, some lost a mark by not being specific about a pair of electrons. Others completely misunderstood the question and wrote about weak intermolecular forces, even though the question referred to attraction between the atoms in a molecule.

Part (d) was not well answered with very few candidates scoring all three marks. The majority gained one mark for stating that shorter hydrocarbon chains were more useful. Only a small number adequately explained the lower demand for the long chain hydrocarbons or mentioned the fact that alkenes were used to make polymers. Some confused cracking with fractional distillation and others just described cracking rather than explaining why it is used.

Part (e)(i) was a question in which a large majority either scored both marks for a fully correct equation or no marks, either for not attempting it or having no idea of the products. The most popular one-mark answer was $C_3H_6Br_2 + H_2$, which was given credit for a balanced equation with one acceptable product, even though hydrogen is not

produced in a substitution reaction. Many gave the correct answer for (e)(ii). The most common incorrect answers were addition and displacement.

Question 10

Many candidates found it difficult to draw the curve in (a)(i) and a number of candidates joined 'dot-to-dot' while others attempted a line of best fit. In (a)(ii) the majority of candidates showed on the graph how they read the boiling point at seven carbon atoms and most read it correctly. A small number were confused by the scale where one small square represents 2^{o}C. While most candidates in (a)(iii) managed to convey the idea that boiling point increases with number of carbon atoms, some lost the mark by proposing that the values were directly proportional. This was another question where some candidates failed to realise that the question required an explanation that was worth three marks and just gave the first marking point. Very few scored the second marking point by saying that intermolecular forces were stronger and even fewer scored the third marking point. Others who attempted an explanation referred to covalent bonds being broken when an alkane boils, showing a complete lack of understanding.
The majority of candidates gave a correct definition in (b). Some lost the first marking point by saying they have the same empirical, chemical or general formula instead of the same molecular formula.

The calculation in (c)(i) was generally well answered. There were the usual occasional errors of candidates using atomic numbers rather than atomic masses and doing the mole calculation fraction upside down. Occasionally, candidates lost a mark by not showing all the steps and going straight from 6.9:17.2 to 2:5 without showing the intermediate stages. In a 'show that' calculation it is necessary for candidates to show all the steps which lead to the final answer. Only a very small minority of candidates gave a correct answer to (c)(ii). It was apparent that the majority of candidates had no clue as to how to answer this question, even though the general formula of alkanes is well known, they did not think to use this to determine the correct molecular formula. Many either just wrote C_2H_5 again or left it blank.

Even though (d) was a somewhat unfamiliar type of calculation it was surprisingly well answered by many candidates. Some candidates clearly had no idea and scored zero. Others calculated the values for X and Y correctly, but often gave the wrong answer for Z, the most common being 15 by simply adding X and Y and 22 by failing to recognise that oxygen is diatomic. A few candidates calculated X and Y incorrectly but then scored a mark for Z by correctly balancing the equation using their values for X and Y.

Question 11

Most candidates gave a correct test for oxygen in (a)(i). Some lost the mark by referring to a lighted splint or just a splint. Part (a)(ii) was poorly answered. Those who gained some credit was usually for saying that the mass of manganese (IV) oxide was unchanged without describing a method to show this. Those candidates who suggested filtering off the manganese (IV) oxide rarely dried it. Many just described doing the reaction with and without a catalyst and comparing the rates, which was not a creditworthy method.

Many candidates scored both marks for (b)(i). Some however seemed to be confused by the mention of the word ‘mean’ and added the different volumes of gas and averaged those instead of just dividing 280 by 120. Only a small number read the volume incorrectly but then divided by 120 and did a correct evaluation gaining one mark. In (b)(ii) few candidates used the concept of concentration in answering this question, but nevertheless the majority scored the first marking point for stating that there were more particles at the start. Many candidates went on to say there were more collisions and the better candidates included the time factor in their answer. Many candidates scored both marks for (b)(iii). Those who scored one mark, usually started the curve correctly, at the origin and with a steeper gradient, but then carried on above the point where it should flatten out. A few started the curve showing a lower rate but flattened it out at the correct level. Quite a few started below the original curve and flattened it out below the original curve. Most candidates scored one mark in (b)(iv) for stating that the powder had a greater surface area, however many of these just went on to say that this increased the rate with no mention of collisions. Those who did mention collisions did not always relate this to frequency or time.

Part (c) was well answered by many candidates. Some calculated the moles of zinc correctly but then failed to use the mole ratio in their calculation, losing them the second marking point. A few calculated the mass of hydrochloric acid and compared this to the mass of zinc, which showed a lack of understanding.

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