Pearson Edexcel

Examiners' Report
Principal Examiner Feedback

November 2021

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

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Question 1

Part (a) was well answered by the majority of candidates. Part (b) was also well answered with most gaining at least one mark for the idea of different elements or different sizes of particles. Many also mentioned that the particles were not joined or combined. There was some confusion with candidates referring to compounds, molecules and ions rather than elements, atoms or particles. Some thought that the fact that the particles were randomly arranged meant that this was a mixture, which showed a lack of understanding as elements and compounds would also be randomly arranged in the liquid or gaseous state.

Question 2

Part (a)(i) was not particularly well answered. Some referred to the diagram, stating fluorine has two shells without any kind of a comparison with the other members of the group. Many answers discussed the atomic number, the mass or the numbers of protons and neutrons, with no reference to the fewest number of electrons or shells.

A large majority of candidates answered (b)(i) correctly as they understood the trend in the table. Part (b)(ii) seemed well understood if not always well expressed. Most gave a direct comparison between size and reactivity, but there were several examples that did not show a direct comparison and some just stated that fluorine was the most reactive.

Question 3

Part (a)(i) was very well answered with only a very small number referring to air rather than oxygen. Most knew that rust was iron oxide in (a)(ii), with a few sadly losing the mark by giving the wrong oxidation state, namely iron(II) oxide.

In (b)(i) most gained at least one mark by stating that plastic stopped water or oxygen reaching the iron, but the first mark was not scored so often as many failed to mention that plastic acted as a barrier. Part (b)(ii) was well answered by the majority giving the expected answer of galvanising, with a few mentioning sacrificial protection. Sadly a few lost a mark by referring to sacrificial method, which was ignored. Many candidates correctly stated that zinc was more reactive than iron in (b)(iii), but did not always state that this meant that zinc would react in preference to the iron. A number simply stated that if the coating was damaged the iron would still react with the oxygen or water. Some candidates here simply indicated that the zinc coats the iron so the iron does not rust. A few candidates simply said that the zinc 'sacrifices' itself but did not elaborate.

Question 4

Parts (a)(i) and (ii) were very well answered by a large majority of candidates. A few lost the marks in (a)(iii) by discussing atomic number and mass number with no reference to protons and neutrons, but these were only a small minority with most candidates scored both marks. Most candidates gained one mark in (a)(iv) by stating that there were more electrons than protons. Some gave very detailed explanations of ionic bonding leading to negative ions, but sadly they often lost a mark because they completely forgot to mention that protons were positive and therefore could not score the second mark for this omission. Candidates need to read the question more carefully as they were asked to refer to the charges of the sub-atomic particles.

Part (b) was answered well by the majority of candidates with a small number losing a mark by failing to give the answer to two decimal places.

Question 5

Part (a) was not particularly well answered as most candidates were not specific about the tube they were extending into the limewater. There were very few additions to the diagram, which was a shame as if they had extended the tube on the diagram many more would have scored the mark as it would have removed the ambiguity. A small minority did however specify the tube connected to syringe A and even fewer mentioned adding more limewater. Some candidates showed a total lack of understanding with comments about pulling out syringe B or removing or adding a bung.

Part (b)(i) was generally well answered. A number of candidates lost a mark here for incorrect rounding. For example, an answer of 13.15 was sometimes seen instead of 13.16. Many candidates scored at least one mark for the correct volume of carbon dioxide.

The large majority knew the result of the test for carbon dioxide in (b)(ii) with very few incorrect answers seen. Part (b)(iii) was not well answered. Many candidates answered this question along the lines of air containing a mixture of gases or that the gas syringes were not large enough to contain all the gases. Some candidates gained one mark for stating that the percentage of carbon dioxide was very low but often failed to explain that the syringes were not precise enough to measure small volume changes.

Part (c) was well answered by the majority of candidates. Most knew that copper oxide was formed in (i) with a small number writing soot or carbon. In (ii) many knew that powder had a larger surface area and that this would increase the rate of the reaction. The majority scored at least one mark in (iii) for stating that argon had a full outer shell, but many failed to score the second mark for not stating that argon did not need to lose or gain electrons.

Weaker candidates simply referred to argon as being a noble or inert gas or that it was unreactive.

Question 6

Part (a) was generally well answered. Most candidates gained the mark in (v), usually for a correct structure of but-1-ene. Some candidates did not score the mark because they had too many bonds to a carbon. A small number did not give a displayed formula and had used one or more $–CH_3$ groups. Some candidates just drew a different representation of cis
but-2-ene. The most common correct answers in (vi) were ‘same general formula’ and ‘similar chemical properties’, but the other alternatives were also seen. Those that did not score said ‘same physical properties’, ‘same molecular formula’ and sometimes ‘same functional group’ which was already mentioned in the stem of the question.

Part (b)(i) was well answered with the large majority of candidates scoring both marks. Relatively few only scored 1 mark. Common errors were to divide by atomic numbers or do the calculation upside down, but these were rarely seen. A small number of candidates tried to use a method similar to that used for calculating relative atomic mass. Part (ii) was also well answered, although some gained a mark for 31, but then failed to write down the molecular formula.

Question 7

Surprisingly many candidates could not write a correct chemical equation in (a)(i). A common error was not to realise that nitrogen is a diatomic molecule. Some gave the product as NO_2 even though they were given the formula of nitrogen monoxide in the question. Many candidates failed to mention energy in (a)(ii) and just said that a high temperature was needed for the reaction to occur, which was not creditworthy. The most common correct answer seen was the idea of high energy needed to break the bonds in the reactants. Very few candidates referred to high activation energy. 'Nitrogen is unreactive' was also seen but this was often accompanied by statements saying that oxygen was unreactive as well. Some thought that energy was needed to form bonds, which showed a lack of understanding. Part (a)(iii) was answered well by the majority, the most common answers being acid rain, toxic and references to global warming. Some confused this with the effects of carbon monoxide and others just gave vague answers such as 'harmful to the environment' or 'harmful to humans' which were not creditworthy answers.

Many candidates scored at least one mark in (b)(i) for 'lowers activation energy' or 'alternative pathway' with many scoring both. Weaker candidates tried to answer this in terms of giving a definition of a catalyst rather than explaining how the catalyst achieves the increase in reaction rate. Many candidates lost marks in (b)(ii) by referring to the particles having more kinetic energy or moving faster. Many candidates however did have the correct idea about why the reaction rate increases. Some candidates struggled with adequately explaining the effect of an increase in pressure on the number of particles per unit volume. A small number of candidates answered this question in terms of shifting the equilibrium in a reversible reaction.

The majority of candidates scored at least one mark in (c)(i) for the three shared pairs of electrons, with most also scoring the second mark. Weaker candidates answered (c)(ii) in terms of a description of a covalent bond involving sharing electrons with no reference to a shared pair of electrons. Others referred to the attraction between the two nuclei with no reference to electrons. The majority of candidates referred to the weak intermolecular forces in ammonia in (c)(iii) but many went on to lose the second mark by referring to less energy rather than little energy. This point has been stressed many times in past reports. The word 'less' should only be used when making a comparison, which is not the case here.

A few of the weaker candidates lost both marks by referring to weak covalent bonds being broken.

Question 8

In part (a) most candidates scored at least one mark, usually for adding the barium carbonate to the hydrochloric acid. Common errors involved not adding excess barium carbonate and failing to filter off the excess, evaporating without heating and evaporating to remove all the water. Others went on to dry the crystals without filtering to obtain the crystals. The better candidates gave a concise answer and scored all six marks. A few candidates thought barium chloride was an insoluble solid and went on to describe how to wash and dry the residue.

Many candidates failed to add acid in (b) and so lost both marks. Those who did add an acceptable acid almost always went on to score the second mark. A few added sulfuric acid which lost them both marks.

Question 9

The majority of candidates plotted all points correctly and scored both marks in (a)(i). Many candidates were able to draw the curve of best fit in (a)(ii) but sometimes of dubious quality. A common error was to use the anomalous point in the curve of best fit. A few candidates for some reason started their curve at 0.5 g of sodium carbonate added rather than at zero. Whilst the majority of candidates scored the first mark in (a)(iii) for polystyrene being and insulator most went on to refer to preventing heat loss, which was incorrect here as this was an endothermic reaction. Some candidates were however able to pick up a second mark by reference to the results being more accurate. In (a)(iv) the majority of candidates referred to reading the thermometer incorrectly or human error rather than being specific on why the temperature recorded was too high. Common correct answers included not adding enough sodium carbonate or not stirring the mixture. Many candidates in (a)(v) referred to the last two readings being constant or the graph levelling off which showed candidates were actually looking at all the data supplied in the question. Some described the graph in terms of it decreasing without discussing the end point at all so missed the mark. Many candidates scored the third mark in (a)(vi) for stating that the temperature decreased and also recognised that the reaction was endothermic. A number of candidates however thought that the reaction was exothermic and therefore did not gain any marks. A few candidates missed the point of the question entirely and described the reaction as being neutralisation. Part (b)(i) was poorly answered with only a small minority mentioning the solution splashing out. Most candidates thought that the cotton wool was to stop the carbon dioxide escaping. Some thought it was to stop other gases entering the flask or to prevent evaporation. In (b)(ii) many candidates scored all three marks here with weaker candidates gaining credit for the relative formula mass of sodium carbonate only. An error seen several times in calculating the relative formula mass of sodium carbonate was to only include one sodium giving a value of 83, however two marks could be awarded if the error was carried forward in the next two steps. Very few candidates scored the mark in (b)(iii). The most common incorrect answer was to state that some of the carbon dioxide escaped. A very small number gave one or other of the two acceptable answers.

Question 10

Part (a) was well answered by the majority of candidates, with a few losing the mark in (i) for writing simple distillation.

In (b)(i) many candidates scored both marks, although some multiplied by 46 rather than dividing. Those who had the correct answer to (i) usually went on to score in (ii) and some gained the mark as an error carried forward. A few of the weaker candidates did not appear to understand standard form and either left the question blank or omitted the 10^{23}.

Part (c)(i) was fairly well answered by many candidates. A few used cobalt chloride paper and gave the correct colour change. There was some confusion between physical and chemical tests so some referred to boiling and freezing points with some candidates crossing out their first answer when they had read question (c)(ii). A common incorrect chemical test was to use universal indicator. Part (c)(ii) was generally very well answered with most candidates describing finding the boiling point and some also finding the freezing or melting point. Only very rarely did candidates score only one mark in both parts of question (c) as if they gave the correct test they usually went on to give the correct result of the test.

In (d)(i) many candidates correctly obtained the answer of 20790 J here. Most candidates scored at least 1 mark for correctly calculating the temperature change.

In (d)(ii) candidates gave a range of answers using values from 10d(i) in the calculation. Some failed to convert to kilojoules and others divided by 100 rather than 1000. Others multiplied by 0.02 rather than dividing. The most common error was to give an answer without a negative sign. Only the best candidates scored both marks here.

Question 11

In (a)(i) many gave the correct answer of displacement, with a small minority stating redox. A common incorrect answer was substitution. Surprisingly (a)(ii) was poorly answered with the majority omitting cadmium entirely even though there were three lines for three metals. The better candidates who included cadmium invariably had the metals in the correct order.

In part (b) most scored the first two marks although a few thought that copper was more reactive than magnesium. A small number lost the first two marks by not stating that there was no colour change. Most knew that zinc was more reactive than iron and often followed this with the solution becoming colourless. There was some confusion over what turned dark grey with some attributing this to the solution.

In (c)(i) many candidates just repeated what was in the question, referring to volume and mass without really considering that these were already mentioned. Temperature was the most common correct answer followed by the concentration of the acid. Surface area of the metal was rarely seen and more often candidates referred to the size of the metal, rather than the surface area. In (c)(ii) many candidates simply repeated what was given in the question, stating that calcium sulfate was insoluble. The other common error was to state that one or all the reactants were used up or the reaction had finished. Only a small minority gave a correct answer here.

In (d) a number of candidates calculated the number of moles of aluminium correctly and then the better candidates went on to calculate the moles of sulfuric acid required to react with the aluminium. A common incorrect answer involved calculating the mass of sulfuric acid in 0.06 moles, 0.06 x 98 = 5.88 g, and then comparing this with the 1.0 g of aluminium.

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