Pearson Edexcel

Examiners' Report
Principal Examiner Feedback

January 2022

Pearson Edexcel International GCSE
In Chemistry (4CH1) Paper 2C

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Question 1

The majority scored both marks for (a)(ii). A few lost a mark by referring to carbon and hydrogen molecules and some failed to mentioned that the hydrocarbon contained **only** carbon and hydrogen**.** Part (a)(ii) was vey well answered with only a few confusing unsaturated with saturated solutions. Many candidates knew the correct values in (c)(i) with others just guessing. Surprisingly (c)(ii) was poorly answered with the majority writing the formula C_2H_5OH, which is not the **molecular** formula for ethanol.

Question 2

The two multiple choice questions in (a) were well answered and the majority ticked the correct boxes in (b)(i). Global warming was the most common answer in (b)(ii) with some giving examples of the effects of global warming. Another common answer was 'greenhouse effect' which was an allowable answer. A few mentioned acid rain and the ozone layer and so failed to score. In (b)(iii) many candidates failed to read the question carefully enough and wrote 'nitrogen' failing to note that the question asked for the highest percentage of the **trace** gas. The majority gave the correct answers to part (c) with a few giving the answer to (ii) as either sulfur or sulfuric acid. Although both are associated with acid rain, the question asked for the **gas** that forms acid rain, so these answers did not score.

Question 3

Part (a)(i) was well answered with the majority scoring both marks. A few lost a mark for not showing how they obtained their answer from the graph and others did show how they obtained their answer but then read the scale incorrectly so lost the second mark. In (a)(ii) many candidates used the graph to calculate the value correctly. A few used the wrong curve, but if they showed their working on the graph and subtracted the values correctly they were able to score one mark. Parts b(i) and (b)(ii) were correctly answered by the majority of candidates but some were unable to use these answers to calculate the solubility in (b)(iii). A common incorrect answer in 3b(ii) was 20.1, but some were then able to score the marks in (b)(iii) as the error carried forward. A common mistake in (b)(iii) was to divide 5.1 by 100. Many candidates seemed to struggle with (b)(iv) and referred to the solubility or insolubility of copper sulfate. Some candidates recognised that there was water present in the hydrated copper sulfate but did not say that the water would be lost or that it would become anhydrous.

Question 4

The reaction of sodium with water was well known with the vast majority of candidates scoring both marks for (a)(i), usually for mentioning bubbles and sodium disappearing. Some candidates gave correct statements which were not observations such as 'hydrogen given off' or 'solution gets warmer'. Reference to a flame was often seen and this was ignored. Some gave indicator colour change answers despite the fact that this was mentioned in the stem of the question and other observations were asked for. In (a)(ii) most gave a correct colour, although yellow and pink were sometimes seen, perhaps confusing universal indicator with methyl orange and phenolphthalein. A few seemed to think the solution was acidic and wrote red.

Part (b)(i) was well answered by a large majority of candidates. Some good answers for (b)(ii) were well expressed and all three marks were gained. Marks were generally lost when explaining how the attraction between the nucleus and outer electron affected how easily the electron was lost. Some candidates lost marks by not giving a comparison with statements such as 'attractive force in lithium is strong' but no indication of how this compares with sodium. On the whole many candidates were able to explain why sodium is more reactive than lithium. Weaker candidates simply chose to explain this in terms of the position of the elements in the group and the trend in reactivity. In (c) many candidates obtained all 4 marks with a variety of different methods of calculation with most of these using the one in the mark scheme. Some managed to gain the first two marks but were not sure what to do next and sometimes multiplied instead of dividing. Some candidates lost a mark by only using 1 significant figure in the first marking point. Using an appropriate number of significant figures is a maths skill, and candidates should be taught to use the same number of significant figures as those given in the data in the question.

Question 5

In (a) very few candidates made mention of plotting a graph and calculating the gradient. Most candidates scored the last marking point for stating that the catalyst that gave the fastest rate or lowest time to give the greatest volume was the most effective catalyst. Many candidates were able to score at least three marks on this question although the explanation of the method was of very variable quality. Some candidates failed to mention actually adding the catalyst **to** the hydrogen peroxide. Some tried to measure the rate of reaction by loss of mass on a balance despite the apparatus being a closed system where gas could not escape. Other marks were lost by failing to explain the need to keep the mass of catalyst and volume of hydrogen peroxide the same throughout. Most scored marks for adding the catalyst and starting the timer, but many did not say what they were timing. Many said 'time until the reaction finishes', but did not say how they would know this. A number of candidates just tried to prove that the solids were catalysts by re-weighing them at the end, which was ignored as this was not what the question was asking them to do. While many candidates showed good knowledge in (b) scoring full marks, others showed little knowledge about reaction profiles. A few candidates placed the activation energy label on the top of the curve with no line drawn. Some candidates were not very precise about the start and end of the line for either the activation energy or the enthalpy change.

Question 6

In (a)(i) the point plotting on the graph was very good and many candidates gave an acceptable curve of best fit in (a)(ii). A few candidates did not plot the point at the origin and started the curve from one minute. Very few candidates scored marks in a(iii) as most candidates described the shape of the curve in terms of mass changes rather than explaining why the mass changes. On the whole (b)(i) was poorly answered. Although many candidates correctly stated the need for an inverted test tube over the anode most failed to recognise the need for it to contain either water or some of the solution. The third marking point was very rarely seen. There were a sizeable number of candidates that wanted to use a gas syringe to collect the gas with no indication as to how they would do this.

Very few candidates scored both marks for the equation in (b)(ii). The majority thought oxide ions were present in the solution and attempted to write an ionic half equation starting with oxide ions. Most of these were incorrectly balanced and electrons were often on the wrong side of the equation. One mark was awarded if the equation with oxide ions was fully correct. Candidates need to realise that the question relates to the electrolysis and the equation must start with either water or hydroxide ions which are the ones present in the solution. The reason why metals are ductile was well known with many candidates gaining both marks in (c)(i). Part (c)(ii) was generally well answered with many candidates gaining both marks. Some candidates failed to gain the first mark by writing about ‘free electrons’ or ‘a sea of electrons’ with no mention of delocalisation. Weaker candidates thought that ions moving were responsible for conducting electricity.

Question 7

Only the better candidates circled the correct ester group in (a)(i). Some just circled the C=O and others included the methyl group. Many just left it blank. Even fewer knew the correct name of ethyl ethanoate in (a)(ii). In (a)(iii) despite being told not to use an indicator in the question many candidates still used one. Common incorrect reagents included bromine water and potassium dichromate. A few candidates reacted the mixture with ethanol to produce an ester which would have a sweet smell, ignoring the fact that ethanol and an ester were already present in the mixture. Only a minority of candidates added a named metal or carbonate. Most of these either stated that bubbles or effervescence was seen or went on to describe the test for hydrogen or carbon dioxide. A few just lost the second mark for just stating that hydrogen or carbon dioxide was formed. Very few candidates named the bonds being broken and made in (b) with a small number stating that the same bonds were broken and formed. Some candidates referred to the same **number** of bonds being broken and made, so did not score the first mark. More candidates scored the second mark but many who had the right idea did not score the mark because they stated that the energy needed to break the bonds was the same as the energy **needed** to make the bonds or that bond breaking **released** energy. A fair number of candidates scored both marks in (c)(i) but others lost marks by stating that the forward and backward reactions were equal, but with no reference to rate. Others lost the second mark by stating that the concentrations of reactants and products were **the same** as opposed to remaining constant. Some candidates answered (c)(ii) by stating what a catalyst does, such as speeds up the rate of reaction, is not used up and provides an alternative route with lower activation energy. Many candidates correctly stated that the rates of both the forward and reverse reactions are increased but not all went on to state 'equally'. There were a creditable number of fully correct answers to the calculation in (d). Marks were generally lost when either working to an insufficient number of significant figures, or by incorrectly calculating the number of moles of barium hydroxide. Often a mark was lost by failing to give the final answer to three significant figures as required. It was evident that some candidates did not understand significant figures by rounding the answer to 0.007. In (e) candidates either knew how to show the repeat unit or they didn't. Common errors in those candidates that only scored the first marking point was to either include too many terminal O's or to include OH groups at the ends of the repeat unit.

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