Pearson Edexcel

Examiners' Report
Principal Examiner Feedback

January 2021

Pearson Edexcel International GCSE

In Chemistry (4CH1) Paper 2CR

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Question 1

As anticipated, most candidates gave correct answers regarding changes of state in (a) and the arrangement of particles in a gas in (b) although occasionally the particles were shown as being slightly ordered or touching. In (c) the most common incorrect selection was believing the particles in water have a regular arrangement.

Question 2

Part (a) was well answered with only a few incorrectly suggesting astatine is monatomic by just giving the symbol At for the formula of a molecule of astatine, whilst some others suggested As_2 for the formula. In (b)(i) the correct identification of chlorine as the oxidising agent was unfortunately often accompanied by an incorrect explanation by reference to chlorine taking electrons from bromine rather than from bromide ions. Candidates really need to be very careful about using correct language in respect to halogens and halides. Some very concise and well-constructed answers were seen in (b)(ii) in explaining the decrease in reactivity from chlorine to bromine.

Question 3

In (a) many candidates correctly included the necessary term *delocalised* electrons in gaining both marks for explaining why metals conduct electricity. The non-conductivity of covalent compounds was less well answered, but good candidates used their knowledge of how metals conduct to correctly suggest that in covalent compounds the electrons are held in covalent bonds meaning there are no delocalised electrons, so there are no electrons free to move.

Others gained credit by using their knowledge of how ionic compounds conduct (when molten or in aqueous solution) to state that there are no ions in covalent compounds. In (b) the presence of ions was often correctly stated as being the particles allowing dilute hydrochloric acid to conduct electricity, but many others thought electrons are responsible. In (c) most plotted the points correctly, and also identified the anomalous point. Having done this, some did not then draw the line of best fit through the origin.

A few surprisingly used a *dot to dot* method and so only gained the first mark for the correct plotting of the points. In (c)(iv) candidates should have stated the result was anomalous in being lower than expected and be more precise in their suggested reasons; an answer such “as the reading was taken at the wrong time” is too vague. Instead, candidates should ensure the reason explains why the result was lower than expected eg “the reading was taken before 5 minutes”. In (v) most candidates gave a correct relationship between current and volume. In (d)(i) only the best candidates gave answers in terms of equal moles of the two gases being produced (and so equal volumes expected), but in (ii) more were aware of the solubility of chlorine in the solution reducing the volume of chlorine gas.

Question 4

The table in (a) was very often completed correctly but incorrect answers for both the relative formula mass of ethanol and the name (correct spelling required) of C_4H_9OH were seen regularly. Although many identified sulfuric acid as the other reagent needed in (b)(i) it was not uncommon to see oxygen being suggested. In (c)(i) the majority of candidates identified ethyl ethanoate (correct spelling required) as the ester formed.

In (c)(ii) most candidates, as is the expectation in these esterification reaction equations, gave structural (or displayed) formulae for the ethanoic acid reactant and methyl ethanoate product. However, quite frequently the formula for propanoic acid was used instead of ethanoic acid, carbon atoms were missing from, or added to the ester formula, and occasionally molecular formulae were seen.

Question 5

In (a) most candidates could give a property of a catalyst with the most common acceptable answers being "not used up in the reaction" or "lowers the activation energy or '*chemically* unchanged'. A significant minority incorrectly stated that catalysts do not take part in the reaction. In (b) some excellent answers were seen with detailed, logical descriptions of how to show which of the solids act as a catalyst in the decomposition of hydrogen peroxide. These probably came from candidates who had done the investigation themselves as it is part of the specification. However, it was evident that for some reason, many candidates had not carried out a similar investigation and so they found the question very difficult to even start. The best candidates gave details of a control experiment using just a fixed volume of hydrogen peroxide before going on to describe experiments using the possible catalysts. They detailed the necessary readings of time and volume which need to be taken. The best candidates were aware of measuring masses of solids before and after each experiment. In (c) the reaction profiles were usually well drawn and labelled as instructed. In (d) it was pleasing to see many candidates in (iii) being able to cope with the slightly unusual task of finding an unknown bond energy instead of the molar enthalpy change (ΔH), although the sign of the final answer was sometimes incorrect.

Question 6

In (b) it was surprising how many candidates ticked the non-concordant result. Either they did not know what was meant by concordant results despite being reminded of this in the question, or they misunderstood the question. However, most did correctly tick the concordant results and used them to find the mean volume, although some candidates did not give the mean to the required two decimal places as in the given results table. The typical titration calculation to find the concentration of the sulfuric acid in (c) was often well done. The most common error was to not divide by 1000 in (i) and so making an error in the number of moles of KOH.

Question 7

Part (a) was usually correct, but some had inverted the calculation to obtain an answer of 40. In (b) where the answer was given and candidates were asked to show how the answer is obtained from the information given, they had to give a convincing logical explanation showing they understood the basis for the calculation being number of moles = mass ÷ Mr.

In (c) most as expected, took the easier option of just showing (4x12)+(10x1) = 58. However, a surprising number took the alternative algebraic route involving the general formula for alkanes to gain the mark. In (d) although many gave the correct displayed formula of the branched-chain isomer, various orientations of a straight chain were also seen which obviously did not score.

Question 8

In part (a)(i) the most common error was the omission of NH_3 on the products side of the equation. The test for ammonia gas in (ii) was well known but a sizable minority did not state “damp/moist” red litmus. In (b) many correctly described the rate of the forward reaction being the same as the rate of the reverse reaction, but significant numbers incorrectly stated that the concentrations of reactant and products were equal.

In (c) candidates needed to analyse information from a graph to explain if a reaction was exothermic or endothermic. Good candidates gave succinct, correct answers, but others got confused and incorrectly discussed pressure. A number correctly identified that the yield increased with a decrease in temperature but then incorrectly stated this meant the forward reaction was endothermic. It was pleasing to see very few arguments involving the use of Le Chatelier’s Principle, which, as usual were ignored.

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