Examiners' Report
Principal Examiner Feedback

Summer 2019

Pearson Edexcel International GCSE
in Chemistry (4CH1) Paper 2CR

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Question 1

Part (a) was very well answered by the majority of candidates, but some lost the mark in (b) for using a lighted or unlit splint to test for oxygen. A very small minority gave an incorrect test, e.g. the test for hydrogen or carbon dioxide.

Question 2

Part (a) was well answered, with many candidates scoring all five marks and very few scoring less than three. A minority thought boron was in period 1 and a few wrote the total number of electrons (5) instead of the electron configuration (2,3).

The majority of candidates scored both marks in (b). A few lost a mark by not dividing by 100 or rounding the answer to 11. The whole point of this calculation is to determine a more accurate value for the relative atomic mass, so just rounding the answer to the value of the most abundant isotope defeats the purpose of doing the calculation.

Question 3

The majority of candidates scored full marks in part (a) showing that the fractional distillation of crude oil is well known. A few candidates lost a mark in (iii) as they did not understand what was meant by viscosity, probably confusing it with volatility. A small number of candidates seemed to think the heavier fractions were collected near the top of the column and so the answers were completely back to front, unfortunately losing these candidates all four marks. Quite a few candidates felt the need to explain the differences in terms of intermolecular forces. Candidates need to realise that if the question asks for a description an explanation is not required.

In (b) many candidates recognised that the reaction between sulphur and oxygen would produce sulphur dioxide which, when dissolved in water, gives rise to acid rain. Some lost a mark by writing sulfur oxide or sulfur oxides, instead of sulfur dioxide. A small minority scored the second marking point for correctly identifying sulfur dioxide as a greenhouse gas instead of a cause of acid rain. A small but significant number thought that the presence of sulfur in the fuel would give rise to combustion problems and even explosions or that the presence of sulfur in crude oil would interfere with the fractionation process.

Question 4

Part (a) was answered correctly by a high percentage of candidates.

Predictably, the most common error in (b) was reference to bromide and chloride in the responses, showing that many candidates are unclear about the distinction between a halogen and a halide. Candidates need to understand that

a more reactive halogen displaces a less reactive halogen from a halide and make this clear in their responses. Some knew bromine was formed but failed to explain that this was because chlorine is more reactive than bromine. A number of candidates, despite noting correctly that bromine was formed, attributed the orange colour to potassium chloride.

There were many fully correct responses in (c), however a significant number gave the electron configuration of the atoms rather than the ions, although most of these often still scored the mark for the correct charges. Some gave an 'empty' outer shell for K^+, which was not creditworthy as the question asked for the outer electrons to be drawn and the third shell in a potassium ion is the outer shell. Although it is not penalised, candidates should be discouraged from wasting time by showing inner-shell electrons particularly for larger elements like bromine, which must present a real challenge for most candidates.

In (d) most candidates recognised that water has covalent bonds or a simple molecular structure as well as no free-moving charged particles, scoring the first two marking points.

The majority knew that sodium chloride was ionic, but some of these went on to lose the third marking point by referring to atoms, molecules or intermolecular forces.

Too often the conductivity of aqueous sodium chloride was attributed to free-moving electrons and the lack of conductivity to the absence of them in the solid, which limited many candidates to three marks. Overall this question discriminated well among the candidates across the whole mark range.

There were many correct half-equations in (e)(i). Incorrect answers included giving Cl instead of Cl_2 or adding electrons to $2Cl^-$ to give Cl_2. Candidates should be encouraged to check that charges on both sides of a half-equation are the same.

The most common error in (e)(ii) was to state that chlorine loses electrons. Even though this type of question has been asked many times before candidates are still making the same fundamental error. When referring to a substance losing or gaining electrons the correct species must be referred to otherwise marks will be lost.

Question 5

In (a)(i) only a minority of candidates could give the correct formula of potassium ethanoate, but most knew that CO_2 and H_2O are formed and so scored one mark.

Most candidates gave a correct observation of fizzing or bubbling in (a)(ii). A few explained the observation instead, with statements such as 'gas given off' or 'carbon dioxide formed' which, although true, did not answer the question and so failed to score. A small minority thought there was a colour change in the reaction and some just said that water was formed.

In (b)(ii) about half the candidates stated that the mixture or one or more of its components is flammable or catches fire and so scored the mark. A roughly equal number focused on the water bath heating the mixture evenly or allowing better control of temperature. These answers, being more appropriate to procedures where the temperature is being measured, were not credited.
In (b)(iii) apart from a minority who thought there would be a colour change or a precipitate formed, candidates mainly focused on the smell of the product. Most stated that it has a fruity or pleasant smell, but answers which didn't qualify the smell in this way did not score.
A few candidates noted that the ester would form a layer on top of the mixture, which also gained the mark.
As was to be expected the displayed formula of the ester proved the most difficult in (c)(i), but an encouraging number of candidates were still able to draw a correct structure. Apart from this, the main error was to omit the O-H bond from one or both of the alcohol and acid structures.
In (d) most candidates knew that esters are ingredients of perfumes or food flavourings, although a few lost the mark for thinking they were used as food colourings. Another common error was to state that esters were used to make polyesters or plastic bags.

Question 6

In (a)(i) most knew that a pipette would be used to measure the sodium hydroxide solution, although some thought a measuring cylinder or burette would be suitable and in (a)(ii) most candidates realised that the colour of the wine, being similar to that of the indicator, would make any colour changes difficult to see. Part (a)(iii) was very well answered with most candidates realising that the flask was swirled to mix the reactants. 'To be more accurate or more precise' was a common answer in (a)(iv) but this was too vague to gain the mark. A fair number however did say that this was done to avoid adding too much wine or to avoid overshooting the end point.
In (b) a small minority read the burette from the bottom up and so gave both readings incorrectly, but these usually gained an error carried forward mark for a correct subtraction. The main error however was to miss off the zero in the first reading, writing 22.7 instead of 22.70, which lost them a mark. A few wrote the first two readings the wrong way round, which also lost them a mark.
Most candidates ticked the correct boxes in (c)(i) and knew how to calculate an average in (c)(ii), but a significant number of these gave their answer to one decimal place, losing them one mark. Those who gave an incorrect answer to 6ci were often able to score in (c)(ii) by finding an average using their ticked results. Candidates need to be advised to always give readings and averages from titration results to two decimal places, otherwise marks will be needlessly lost.

The majority of candidates correctly calculated 0.00125 in (d)(i), scoring both marks.
The most common error was to omit the volume conversion, giving an answer of 1.25 which was awarded one mark. A few used 19.50 here as the volume instead of 25.00, but they could also gain one mark for multiplying this by 0.05 and dividing by 1000 and evaluating this correctly. Most candidates knew to base their answer to (d)(ii) on the 1:1 reacting ratio of acid and alkali, however some candidates wasted time attempting to calculate the moles of ethanoic acid. When a question is just worth one mark and starts with the command word 'deduce' this usually means that no calculation is necessary. Most candidates scored both marks for (d)(iii) either for an answer of 0.0641 or error carried forward marks by correctly using an incorrect value from (d)(ii). Some, however, lost a mark by giving the answer to only one significant figure and others lost a mark by omitting the volume conversion, if this had not already been penalised in (d)(i). Overall part (d) was well answered with many candidates scoring all five marks.

Question 7

In (a) the majority recognised the symbol for a reversible reaction.
Many candidates scored both marks for (b)(i), noting the increased yield of hydrogen and explaining it correctly. There were fewer attempts than in recent years to base the explanation solely on Le Chatelier's principle so that the majority, even when stating that the change favours the forward reaction, noted that the reaction was endothermic. A small number missed the point and gave responses to do with reaction rate and a few thought the forward reaction was exothermic.
In (b)(ii) many candidates again scored both marks, noting the decreased yield of hydrogen and explaining it correctly. Again, there were fewer responses than usual basing their explanation solely on Le Chatelier's principle. A few thought the yield would be unchanged or that the equilibrium would shift to the side with the greater number of moles. A small number talked about increasing the pressure increasing the rate of reaction.
In (c) only about a third of the candidates converted tonnes into grams successfully, so that the majority lost the first marking point. Most however, whether or not they had scored the first mark, successfully multiplied their first answer by 3 and correctly converted this to a volume in dm^3, meaning that the majority of candidates scored the second and third marking point. A few failed to multiply the moles of methane by 3 and some divided by 24 instead of multiplying. Some lost the final marking point by not converting their answer to standard form, even though the question stated that they needed to do this. Overall this question discriminated well, giving the full range of marks.

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