Examiners' Report
Principal Examiner Feedback

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Pearson Edexcel International Advanced Subsidiary Level
In Chemistry (WCH13)
Paper 01 Practical Skills in Chemistry I

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Introduction

The paper had an emphasis on practical techniques, including a number of core practicals and organic prepartions. There were opportunities for all candidates to demonstrate their chemical knowledge and understanding. The more demanding questions were those which either required an evaluation of expemental methods and results or an understanding of what actually takes place in a chemistry practical. The standard of mathematical calculations was generally very good, though not always easy to follow and unfortunately marks were regularly lost because the candidates did not read the question carefully enough. However, it was pleasing that there was no evidence of candidates running out of time.

Question 1

The opening question was a straightforward start to the paper and the identification of the sodium ion by a flame test in (a)(i) was answered well by almost all candidates. However, very few got the second mark in (a)(ii), with O^{2-}, being the most common wrong response. A number appreciated that compound A was sodium nitrate but ignored the request for the formula of the anion and gave an answer of $NaNO_3$ which did not score.

The overwhelming majority recognised that hydrogen was formed in (b)(i), and most candidates correctly identified the cation. Likewise, most identified the white precipitate as AgCl and the solution as HCl in (b)(ii). However, AgBr was occasionally seen which did not score, but allowed access to a TE mark.

Question 2

Almost all candidates correctly identified hydrogen chloride and carbon dioxide in parts (a) and (b). However, a number did not appreciate that the carboxylic acid was confirmed by the sodium carbonate test in (c)(i). In (c)(ii)-(iii) many candidates ignored the question stem which stated the functional group was at the end of the chain, resulting in propanone, a common incorrect answer in (c)(ii). Similarly, longer carbon chains were also seen at times. Most candidates were familiar with Fehling's, Benedict's or Tollens' tests. However, many failed to score both marks with Fehling's or Benedict's as the state of the product was not mentioned. Surprisingly, a significant number of structures with pentavalent carbons were seen. Candidates should be reminded not to use –COH to represent the aldehyde group.

The majority were clearly familiar with the practical procedure in (d)(i) and the question was answered accurately and concisely by the better candidates. However, weaker candidates did not understand that only measurements were required. Another concern was that it was not always clear which substance the candidate was referring to, with "solution" being commonly seen as a description for either the water or the alcohol. "Measure the amount" was another vague statement that did not gain credit, and many struggled to describe how to measure the mass of alcohol burnt during the experiment.

Responses on ways to improve the accuracy of the experiment in (d)(ii) were varied.
Most candidates recognised the need to prevent heat loss, but often careless language prevented marks being scored. A common mistake was the use of a polystyrene cup and many candidates also suggested modifications such as using a greater volume of water, stirring the water or adjusting the distance between the burner and the beaker, all of which did not score.

Question 3

In (a) relatively few candidates appreciated that the hydrogen/air mixture was explosive. Most candidates attempted an answer here but vague statements about giving enough time for the hydrogen to reach the other end, or time needed for reaction to occur were insufficient to gain credit.

Completing the table in (b)(i) was done correctly by most candidates and the majority also calculated the number of moles and the resultant empirical formula in (b)(ii). Although the number of significant figures and incorrect rounding were not penalised here, candidate need to be reminded of their importance when doing calculations. A ratio of 0.04 : 0.04 moles was often seen and instead of rounding many candidates simply read off the calculator to the number of decimal places they felt was appropriate. For example, 0.039685 became 0.039, 0.396 or 0.3968.

In (c) many candidates appreciated that the copper would reoxidise but very few were able to explain how this would affect the appearance of the solid. The majority of candidates did not appear to know the colour of either copper or copper(II) oxide and blue and white were frequently mentioned (presumably from their experience of hydrated and anhydrous copper sulfate). The best candidates were able to logically work through the effect of an increased mass of copper oxide, and apparent increase in the mass of copper, on the calculated formula. However, this was rare as the majority related the increase in mass of copper oxide to an increase in the apparent mass of oxygen. A number even suggested the Cu^{2+} was oxidised to Cu^{3+} Candidates need to spend time thinking about the impact of changes to experimental procedures.

Question 4

Whilst there were some excellent and full descriptions of making up a standard solution in (a), it was apparent that many candidates were clearly not familiar with this technique and a number gave an explanation of how to perform a titration instead.   For candidates who had some understanding, most failed to score full marks. Common mistakes were to omit distilled or deionised water, the need to dissolve the solid and invert the final solution.

Part (b) was well done by the majority of candidates and most realised that the first titration should be ignored. Many candidates benefited from transferred errors and gained credit by using the correct stoichiometry and mole calculations. . A significant number, presumably thinking that the acid was in the burette used 25.0 cm^3, rather than their mean titre, to calculate the moles of sodium hydroxide. The scaling by a factor of 10 was often omitted. It was also common to see the final mark lost for using too many significant figures. Again, it was fortunate for many candidates that incorrect rounding was not being penalised at this point.

Although the uncertainly mark in (c)(i) was achieved by most candidates, a few failed to multiply by 2, despite the 'each' in the question being in bold. Incorrect rounding was penalised here, but it was pleasingly that few marks were lost. In (c)(ii) only the better candidates seemed to appreciate that the question required a response about percentage uncertainty. They realised they had to increase the titration volume and generally explained successfully how they would achieve this. However, many answers simply addressed issues of procedure, including minimising the uncertainty in individual measurements, usually in relation to the burette.

Question 5

Most candidates were familiar with the reflux apparatus in (a) and the majority of candidates labelled the water flow through the condenser correctly. However, the quality of the diagrams was generally poor, and it was common to see the flask and condenser drawn as a single piece of apparatus. Other common mistakes were gaps between the flask and condenser, and a stopper or thermometer on top of the condenser. Although the majority of candidates correctly completed and labelled the separating funnel diagram, a number got the layers the wrong was round and some drew more than 2 layers. In (b)(ii) only a minority of candidates mentioned the need to shake or invert the separating funnel and a number just referred to the immiscibility and different densities rather than actually how to separate the layers. It was also quite common to see the required solution being left in the separating funnel and a few candidates referred to subsequent steps, such as drying the organic layer or distillation.

In part (c) most candidates were able to convert mg to g and correctly calculate the % yield. In (d) there were few problems calculating the number of moles, but surprisingly, few made the link between the mole ratio of limonene and bromine. Most did not state that each limonene molecule contained two C=C and simply suggested that limonene had to have a double bond or made some general reference to unsaturation, neither of which scored.

Paper Summary

Summary of advice to candidates:

- This is a practical paper so make sure you learn and understand the procedures in the core practicals.
- Always read the question carefully, follow the instructions which are given and make use of the information in the question. Pay particular attention to bold text.
- When carrying out calculations shown your working and think carefully about units, significant figures and rounding.
- Practise drawing diagrams of chemical apparatus
- When evaluating practical work ask yourself ‘what if’ questions.

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