Examiners' Report
Principal Examiner Feedback

January 2025

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

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Introduction

Many excellent responses to all questions were seen, and it was pleasing to see most candidates attempting all questions. In general, the presentation of work, quality of handwriting and use of English could be improved, as could the overall standard of diagrams. The candidates were most confident in performing calculations and in answering questions relating to well-practised ion tests, such as flame tests. The questions candidates found most challenging involved the evaluation of experimental procedures and results.

Question 1

Candidates were well-practised in describing flame tests with most scoring well in (a)(i). Common mistakes included the use of an unsuitable wire (eg just Ni or Cr) or omitting the use of hydrochloric acid. Careless precision of scientific language was frequently seen, for example saying the sample should be burnt rather than placed in the flame. Almost all candidates knew the colour of the precipitate in (a)(ii) though fewer were able to give a completely correct ionic equation, omitting state symbols or failing to cancel the spectator ions. In (b)(i), most understood the inference had been made because of the litmus paper turning blue, though many found it harder to explain that this was due to the formation of ammonia, incorrectly giving ammonium as the cause. Candidates found it challenging to link the sequence of observations to the anions present in the solution in (b)(ii), perhaps confused by the colour of the pale-yellow precipitate (which was a mixture of silver bromide and silver carbonate) and failing to recognise that effervescence with dilute nitric is indicative of carbonate ions. The silver bromide precipitate was better understood.

Question 2

Most candidates were able to calculate the amounts of magnesium and hydrochloric acid in (a), with many going on to successfully consider the stoichiometry of the reaction to show the latter was in (a large) excess. It was disappointing to see many candidates using an imprecise relative atomic mass of 24 for magnesium. In (b), many candidates struggled to understand the concept of the experiment and/or the diffusion of liquids in a narrow tube and did not appreciate the magnesium would initially be surrounded by water only when the burette was inverted. Many commented on the magnesium oxide impurity (referred to in part (e)) but did not understand this would have reacted very quickly when in contact with the hydrochloric acid. A surprisingly large number of candidates found it challenging to read the burette accurately in (c) and it was disappointing to see so many fails to record their readings to the nearest 0.05 cm^3. Many did not seem to understand the question in (d), opting to calculate the expected volume of hydrogen produced from 0.030 g of magnesium at room temperature and pressure instead of calculating the molar volume from the experimental results. Candidates found part (e) very challenging, failing to consider the effect of the magnesium oxide impurity on their calculated answer to (d) – that a smaller number of moles used in the calculation (for the same volume of gas collected) would give an even larger molar volume and so could not possibly account for the difference from the Data Book value. A general lack of ability to connect theory to experiment was apparent. Roughly half of the candidates were able to calculate the percentage uncertainty in (f)(i) with a common mistake being to ignore the information and not use the total uncertainty for **two** readings. Again, candidates found it challenging to evaluate the experimental design in (f)(ii) with many failing to understand that doubling the mass of magnesium would result in the volume of hydrogen produced being too large to be measured by the burette. A variety of incorrect answers relating to percentage uncertainty, the magnesium being in excess or too large to fit in the burette, or the reaction being too fast were frequently seen.

Question 3

A surprising number of candidates failed to score the mark in part (a), either mistaking an accurate concentration for a **known** concentration, or simply making vague reference to standard conditions or a primary standard. Some excellent responses were seen in (b) though it was evident many candidates had limited practical experience of preparing a standard solution, instead giving accounts of recrystallisation, titration or unnecessarily removing the water of crystallisation by heating to constant mass. Most candidates were able to calculate the required mass of hydrated crystals though many did not include use of a **volumetric** flask or **distilled**/**deionised** water or gave methods that did not involve the rinsing of apparatus and transfer of washings or would have resulted in a volume greater than the specified 100 cm^3. Approximately one third of the candidates did not give the correct answer in (c)(i) with burette, measuring cylinder and funnel all being common incorrect answers. The colour change at the endpoint of the titration was well-known in (c)(ii) though many gave the correct colours in reverse. Unsurprisingly, many found it challenging to identify the precipitate in (c)(iii) with barium carbonate being a frequent incorrect answer where candidates failed to appreciate this would be unlikely to form in an acidic solution. Overall, the calculation in (c)(iv) was done well though many found it difficult to convert the units from mol dm^{-3} to g dm^{-3} and/or failed to follow instruction and give their answer to an **appropriate** number of significant figures. As for magnesium in part (a), it was not uncommon to see candidates use an imprecise relative atomic mass (of 137) for barium.

Question 4

In part (a), candidates found it difficult to demonstrate a sound understanding of **safety** in practical procedures, simply stating that hydrochloric acid was corrosive or toxic, for example, or incorrectly saying that the apparatus would explode. While most candidates understood how to identify the layers in (b), the overall quality of diagrams was poor with many filter funnels seen, or separating funnels with either no stem below the tap or without a narrowing top. Candidates found part (c) the most challenging question on the paper with the majority failing to connect sodium hydroxide with reactions of halogenoalkanes. Common incorrect answers related to safety and/or rate of reaction. Most candidates knew that sodium sulfate was used as a drying agent in (d), though dehydrating agent (implying a chemical reaction) was a popular incorrect response. Both a lack of practical understanding and a difficulty in expressing ideas clearly resulted in many candidates failing to score high marks in (e), with many giving answers that were either ignored (eg adding a heat source) or too inaccurate (eg confusing evaporation with the escape of vapour) to receive any credit. While the calculation in (f) was completed competently overall, careless mistakes with premature rounding were not uncommon.

Summary

Based on their performance on this paper, candidates should:

- present work clearly, making sure their handwriting is legible
- complete as many of the experiments, including the Further suggested practicals, stated in the specification as possible
- use the relative atomic masses given in the Periodic Table in the question paper (eg 24.3 for magnesium and 137.3 for barium)
- practise taking and recording burette readings to the nearest 0.05 cm^3
- be encouraged to evaluate experimental procedures and the results obtained from experiments
- be encouraged to link experimental procedure to safety where relevant

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