Examiners' Report
Principal Examiner Feedback

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Pearson Edexcel
International Advanced Subsidiary Level
In Chemistry (WCH03)
Paper 01 Chemistry Laboratory Skills

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General comment

The paper had an emphasis on practical techniques and there were good opportunities for all learners to demonstrate their chemical understanding. Question 3 was the most demanding as learners had to apply their knowledge to a novel situation and carry out associated calculations. Many found this very challenging and it was sometimes difficult follow the logic of learners' calculations to give credit. Occasionally good answers were left incomplete as the learner had not read the question carefully enough.
There was no evidence of learners running out of time.

Q1

The opening question on the flame test in (a)(i) was answered well by the majority of learners. There was the occasional mention of chromium or nickel for the wire and a few did not specify any metal. Most knew that hydrochloric acid needed to be used and several answers referred to the creation of the more volatile chloride and some also described how the wire was cleaned before use. For scoring point 3 there were several references to "fire" or just "Bunsen" and in some cases the learners failed to mention that the wire needed to be coated with the "white compound" before placing in the flame. Nevertheless, three marks were scored by the majority.

In (a)(ii) the majority of learners correctly identified the strontium ion, however a number just gave Sr with no charge so did not score. Other common wrong answers were calcium or magnesium.

Many learners recognised a white precipitate was formed in (b)(i), but a signifiacnt number referred to effervescence and so did not score. Occasionally the correct response was given with a wrong answer so no mark was awarded.

For the ionic equation in (b)(ii), many learners did not score both marks, either for incorrect charges, or omitting or giving incorrect state symbols. A number of learners used calcium which allowed access to both marks.

Although better prepared learners had no difficulty in scoring the full five marks for correctly identifying the five substances in(c), a significant number could not work out the identity of X. Virtually all learners knew that oxygen was the gas responsible for relighting a glowing splint and many scored the mark for nitrogen dioxide. However, a number thought that the brown gas was bromine. Learners should be reminded that if they provide a name and a formula in an answer then they must both be correct to be awarded the mark.

Generally (d)(i) was well done, but a common wrong answer was 'see when no more gases were being given off', or, somewhat surprisingly, "when the temperature no longer changed". There was also the occasional vague answer "until there is no change" and the use of cobalt chloride paper to test for water, neither of which scored.

Many learners found the calculation in (d)(ii) challenging, the majority only scoring 1 mark for calculating the M_r of W.

Q2

The excellent answers to (a)(i) and (b)(i) showed that the PCl_5 test is well known, but it was apparent that the majority of learners did not understand why the HCl forms misty fumes in moist air as the correct answer to (a)(ii) was rarely seen. The majority just suggested the HCl reacted with water and so did not score. A number of learners got confused with the white smoke that is produced when HCl reacts with NH_3 and some even suggested that NH_3 was present in the air.

The reaction of sodium metal with alcohols was clearly understood and (c) was well done by the majority of learners with a number giving all three scoring observations. It is pleasing that answers such as "hydrogen is given off" or "gas given off" is seen less infrequently than in the past. However, some did make this mistake so learners need to be reminded of what an observation is.

In (d) some learners lost marks because they forgot to include the positive charges on the ions and negative charges were also occasionally seen. The learners who identified the molecular ion peak were usually able to deduce the correct structures for P and Q and score both marks in (e). However, in a small number of cases carboxylic acid and carbonyl compounds were given, despite the fact the learner had often already deduced P and Q were alcohols.

Q3

Although few learners had probabaly seen or used an electrical compensation calorimter, the concepts should have been fairly starighforward. The question required learners to apply their knowledge of energetics to an unfamilar situation and many found this quite demanding.

In (a)(i) the majority of learners scored a mark for making a reference to less heat loss with the electrical compensation calorimter. The second mark was rarely awarded as learners often gave vague answers referring to accuracy and speed of reaction rather than realising the energy change was calculated directly using this apparatus.

Many learners found the calcualtions in (a)(ii) and (b)(i) very challenging.
The majority did not score in (a)(ii) as they did not recognise the experiment was performed using 0.1 moles of reactant. Instead they simply divided 1260 J by 1 giiving -1.26 kJ mol^{-1}, which did not score.

The calculation in (b)(i) was occasionally completely correct for three marks, but many learners only scored two marks, as they failed to subtract 9cm^3 from 100 cm^3. An answer of 90 cm^3 was frequently seen by learners who did not use to the number of moles (0.1) in (a)(ii). In most cases they also failed to subtract this from 100 cm^3 to give 10cm^3 so only scored a single mark. This is an example where learners need to be reminded that they answer the question set. A number also seemed confused and performed calculations using the M_r of $Na_2S_2O_3.5H_2O$.

In (b)(ii) many learners scored the first mark, but only a small minority got the second. For the second mark a number of learners incorrectly talked about using a higher voltage, implying they simply compared the enthalpy change values rather than the signs.

The calculation in (b)(iii) was often correctly managed if the answer to (a)(ii) was correct, but an "inverted answer", such as +55.7 kJ mol^{-1} was often given. Many learners also scored transfer error marks here using their answer in (a)(ii) but they need to be reminded not to mix units of kJ mol^{-1} with J mol^{-1}.

Learners answered (c)(i) particularly well, although a significant number forgot to multiply by 2. Rounding errors were rare. Unfortunately in (c)(ii) hardly any learners related this part of the question to the error in the thermometer they had just calculated. They simply and compared the relative merits and accuracy of a burette and measuring cylinder, so scored no marks.

Q4

Almost all learners appreciated that water had to be removed to form crystals from the solution. However, most did not realise the obvious disadvantages of boiling off all the water to obtain dry crystals and so did not score in (a)(i). Common wrong responses included "to remove water" "form crystals" or "to decrease the solubility".

In (a)(ii) the majority of learners correctly identified the process and property used to separate miscible liquids. However, a few omitted to state the property, despite it being asked for.

It would appear that washing crystals with distilled water was not a technique that the majority of learners were familiar with and in (b)(i) there were a variety of wrong answers given. When marks were awarded, learners tended only to get one of the marks for either "cold" or "minimum quantity". The use of "low water pressure" was quite a common wrong answer.

The use of a suitable reagent to neutralise acidic impurities was quite well known, with about a third of learners giving a correct carbonate or hydrogenate in (b)(ii). The two most common wrong answers were sodium hydroxide and calcium carbonate.

The majority of learners knew that a separating funnel was the piece of apparatus required in(c)(ii) and they also knew the technique depended on the densities of the liquids.

The use of filter papers to dry crystals was also understood by many learners, but incorrect drying agents, such as anhydrous copper sulfate were also seen fairly often in (d)(i). Drying in the sun or just leaving was also quite a common wrong answer.

The use of calcium chloride as a drying agent in (d)(ii) was the most common correct answer, although the other correct substances were also seen. Some learners seemed to be confused and gave either anhydrous copper sulfate or cobalt chloride to test for water. Sulfuric acid was also seen on occasions.

Summary of advice to learners

- This is a practical paper so make sure you learn and understand the procedures in the core practicals.
- Always read the question carefully and follow the instructions which are given.
- When carrying out calculations shown your working and think carefully about units, significant figures and rounding.
- Practise the interpretation of mass spectra data and remember to include charges.
- Revise Hess's Law diagrams carefully, paying particular attention to the direction of the arrows.

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