Pearson Edexcel

Examiners' Report
Principal Examiner Feedback

Summer 2019

Pearson Edexcel International Advanced Subsidiary Level
In Chemistry (WCH02) Paper 01 Application of Core Principles of Chemistry

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Introduction

Section A

The mean mark for the multiple choice section was 12.6. The answer most commonly correct was Q2 which approximately 85% of candidates scored correctly. The only two items correctly answered by less than 50% of candidates were Q6a (38%) and Q12 (46%).

Section B

Question 15

In part (a) a good range of marks were seen. An explanation of the trend in thermal stability of the carbonates of Group 2 is a question which has been asked in this specification on a number of occasions. Candidates were often aware that it is the size of the metal ions which is the significant factor. Many were able to use this to explain the trend, but relatively few did so by mentioning that the polaristion of the anion by the cation results in weakening of the bonds in the carbonate ion which happens to a lesser extent as you descend the group.
15(b) concerned a titration. The expected indicator was either phenolphthalein or methyl orange, with the expected colours pale pink and orange respectively. Both marks were most commonly scored. The calculation was of a relatively challenging type, though it was separated into four parts to provide some help in working through to the final answer. The question proved very discriminating. Most candidates could score at least one of the eight marks available. The mean score was just over 4 marks of the 8 marks available. The final part of the calculation proved the most challenging with a number of candidates who had scored the previous 5 marks unable to make any progress. Many candidates knew that magnesium ions did not alter the colour of the flame, with many offering further information about the emitted energy not being in the visible region of the electromagnetic spectrum.

Question 16

The name of the chlorofluorocarbon, dichlodifluoromethane, was known by about half the candidates. Common wrong answers included the use of numbers including 2, presumably as a replacement for di-. Answers such as 1,1-dichloro-1,1-difluoromethane were allowed as this name is correct but with unnecessary numbers. Another common error was to name the compound as a chlorofluorocarbon, for example dichlorodifluorocarbon. (a)(ii) was known by about half of learners as well. Here the most common mistake was to put a + sign instead of the dot. (a)(iii) was poorly answered. Most said that the dot represented a radical or a free radical, this is not correct. The whole symbol, including the Cl of the chlorine represents a radical. The dot represents an unpaired electron which makes it a free radical. I would suggest that candidates here did not read the question with sufficient care. In the final part of (a), it was common to see 0 marks or 2 marks with 1 mark rather uncommon. If candidates knew one of the equations they either knew, or could work out, the second.

Part (b) was not answered with sufficient precision. Answers often referred to global warning or the lack of formation of radicals. It was rarely correctly stated than chlorine radicals would not form.

Question 17

This question, concerning an unfamiliar practical, gave an opportunity for all to score some marks, whilst providing an opportunity for the more able candidates to demonstrate their ability. In part (a), about half of the candidates scored the marks available in the two items. Most knew the answer in (a)(ii) but did not answer with sufficient precision. It is true that the test with bromine water allows the deduction of the unsaturation in a molecule, but the question asks about the results and so deductions needed to be made about A, B and C. In (b), some candidates did not read the question and added bromine to A rather than hydrogen bromide, perhaps because it was mentioned in the previous question. A good range of marks were seen with some good candidates scoring all five. The mean score was just over one and a half. In (c)(i), good answers were often seen. The second item was not well known with many candidates changing the temperature or pressure, but relatively few knowing that the solvent was the key factor. The mechanism was well known by many candidates, but the usual mistakes were seen including the lack of appropriate dipoles and lone pairs and poorly positioned curly arrows.

Question 18

Common mistakes in (a)(i) were to omit the acid required by the potassium dichromate(VI) or to use heat under reflux. Intermolecular forces and their effect on boiling temperature is often found to be challenging and this paper was no exception. Omission of one or more of the types of intermolecular force was a common source of error. Chemical tests to distinguish propan-1-ol and propanal were well known. In the final equation for the oxidation of propan-1-ol, some candidates could give the correct equation but others could not formulate the correct organic product or did not balance the number of oxygens on the left hand side.

Section C

Question 19

Poor use of the specific terminology required in (a) meant some marks were lost. The calculation in (b) was particularly difficult to see what candidates were trying to do as few labelled the calculations to say what they are calculating. As a result, method marks were difficult to award. Practice at laying out calculations so it is clear what is being done would be of great benefit. In (c)(i), the first ionic half equation, that of the oxidation of iodide ions to iodine was quite well known. In the second equation candidates often did not include hydrogen ions in the equation, despite being told it was an acidic solution. This equation was relatively harder to work out, and I suspect as a result a few candidates forgot to include electrons. Despite not getting the mark for the second equation, some were able to deduce the overall equation. Others were able to score through balancing one or more incorrect but close equations produced in (c)(i) and (c)(ii). Even with the correct

equations the final observation was challenging. Incorrect observations including brown solution going colourless, the formation of purple vapour or grey solid were not uncommon. In (c)(v), hydrogen peroxide was often identified as the oxidising agent, but some candidates did not quote any oxidation numbers, as asked to by the question. The final part of (c) was a challenging question. Few candidates explained their answers with sufficient clarity. The first option, suggesting iodide ion is a better reducing agent, was most commonly seen, but candidates did not often explain how this resulted in no formation of bromine or chlorine. The second option was seen, but again candidates did not clearly explain that any bromine or chlorine that was formed would react with the remaining ions in a displacement reaction to produce iodine and return to being bromide or chloride ions.

Solubility is another commonly asked idea in this specification. It is important to consider the forces of attraction between the solvent molecules and the substance being dissolved. In the two parts of 19(d) the most common answers given were the stock phrase ‘like disolves like’ and ‘water is polar but iodine and cycohexane are non-polar’. Whilst these are useful as a memory aid, they do not explain the relative solubility of the substances in the different solvents.

In 19(e) some candidates had clearly seen or done this practical and embellished their answers with accurate descriptions such as pale pink over brown before and darker pink over paler brown after. This was an obvious advantage. The most common mistake here was to not recall that the colour of iodine in organic solvent such as cyclohexane is pink, so putting brown on the top layer after.

19(f) was not well answered. The flammability of cyclohexane was mentioned but the sublimation of iodine if heated was rarely seen.

Paper Summary

In order to improve their performance, candidates should:

- never leave unanswered multiple choice questions
- read the question carefully, preferably twice, to ensure that they are answering the question that has actually been asked
- practise writing ionic half-equations and combining them to give ionic equations both for those reactions mention in the specification and for examples where information is given and must be interpreted
- practise drawing organic mechanisms including all relevant dipoles and lone-pairs being particularly careful about the positioning of the curly arrows
- show all working in calculations and identify clearly what is being calculated
- be clear about the correct terminology to use, for example the use of orbital, sub-shell and shell when discussing electrons.

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