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# Examiners' Report/
# Principal Examiner Feedback

January 2016

Pearson Edexcel International A Level in Chemistry (WCH06) Paper 01

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## General

This paper was a reasonable balance of standard and higher demand questions, the latter often requiring students to apply their knowledge and understanding in unfamiliar situations. It was similar in style and standard to previous Unit 6 papers on this specification and a range of skills and knowledge was assessed. The levels of difficulty allowed good discrimination between the different grades, while allowing well prepared students at all levels to demonstrate their abilities. This paper is primarily designed to assess practical knowledge as far as this is possible with a written paper, but students were much more comfortable dealing with theoretical concepts than laboratory techniques. Thus calculations were often completed confidently and were generally well-presented, with the logical steps easy to follow, while all too often procedures were muddled or simply incorrect. In multi-step calculations there are still students who round intermediate values for use in the subsequent stages of the problem; while this practice is not itself penalised, it leads to inaccurate final values and is a frequent source of transcription error. Truncating intermediate values was also common and this is penalised. It was evident that, even at this level, students do not take sufficient care in reading questions and context material before framing their responses.

## Question 1

This proved a challenge for many students, with many having difficulty in identifying the ions present and those that did were often unable to describe appropriate tests. The blue colour led a number of students to suggest a chromium ion and these often suggested that the yellow solution was due to the chromate(VI) ion even though the question requires a cation. Most students identified chlorine, and hence the chloride ion although a surprising number deduced that the ion was bromide or iodide. Hydrogen chloride was often suggested as the pale green gas. Clearly, students were in difficulty trying to identify the white solid if the cation in A was not known but some of the suggestions (e.g. Cu, CuO, Mg) were not very sensible; many students gained the mark for oxidation though. There were some excellent descriptions of the tests for the copper(II) and chloride ions. Some students suggested slightly unusual tests for copper(II), notably the addition of zinc or magnesium; while these gained full credit, this approach is hardly to be recommended.

In 1(g), a number of students added sodium hydroxide as well as nitric acid and silver nitrate and some acidified with hydrochloric acid. A significant number of students tested for hydrogen chloride using ammonia gas, presumably testing for the gas in 1(d) rather than the anion. In 1(h) the $CuCl_4^{2-}$ was more likely to be identified and the mark for the species responsible for the green colour was usually gained by one of the 'allow' responses.

## Question 2

The functional group tests required by 2(a) were well-known but, although 'Name' was in bold type, many students gave C=O and C=C as the functional groups. If potassium manganate(VII) is used to test for the alkene group, it must be acidified. A negative test for the aldehyde group is not, on its own, an acceptable test for ketones. In 2(b)(i) the command word 'explain' was frequently ignored by students who correctly stated that the peak would be a singlet. While there were many admirably precise answers, a number used non-standard terms (neighbouring and nearby) for 'adjacent'. 2(b)(ii) proved highly discriminating: the first marking point was the more likely to be awarded and a common error was to suggest that all three methyl groups had the same proton environment.

## Question 3

Most students scored full marks for 3(a)(i), with incorrect units being the most common error. In contrast, the responses to 3(a)(ii) rarely included the key points that the filtration was to remove impurities and that these had to be solid (or insoluble). Students who had not read the stem with sufficient care overlooked the information that the acid was in excess and assumed that there would be some residual iron. Others suggested that the filtration was to remove unreacted sulfuric acid. Crystallisation of an inorganic salt from a solution seemed unfamiliar; instead students provided detailed descriptions of recrystallisation of an impure solid. The calculation of the yield in 3(a)(iv) was well understood. A common error in this and other calculations was incorrect rounding, for example truncating 0.0896 to 0.089. Although the preparation of a standard solution should be a familiar procedure, 3(b)(i) proved discriminating at all levels with only the best students giving a clear and precise sequence. Students often failed to include the addition of washings and to mix the solution after making it up to the mark. A small number of students used a measuring cylinder or even a beaker rather than a volumetric flask. While there were some excellent responses to 3(b)(ii) many students had little idea of what might happen if sulfuric acid was not used in the preparation of the solution or what explanation to offer. Less than half the students were able to describe the end-point of the titration; some gave the colour as purple rather than pink, some gave the colour change as purple to pink but the majority of incorrect answers gave the reverse colour change. There were many fully correct calculations in 3(b)(iv). A common error was the omission of the factor of ten in the second stage of the calculation but few students seemed to review the sequence in the light of an improbably large molar mass. Some calculations stopped at the (correct) molar mass with the students seemingly uncertain how to proceed. While there were some excellent responses 3(c)(i), most students used the number of moles of water of crystallisation as the basis for their answer, gaining no credit. Some realised that they needed to work with molar mass but chose the calculated value from 3(b)(iv) as their reference point. Less than 20% of students scored the mark for 3(c)(ii) and most of these gave a response in terms of the oxidation of iron(II) rather than the simpler idea that the crystals would be damp.

## Question 4

Just over half the students realised the left-hand flask in the steam distillation must contain water; and many alternative reagents were suggested. In 4(a)(ii) the vent B allows gases to escape but, crucially, it prevents the pressure in the apparatus building up in the, otherwise, sealed apparatus. 4(a)(iii) also proved unexpectedly testing and even those students who realised that water and nitrobenzene would form separate layers in the flask, often labelled the top layer as nitrobenzene. Few students understood the common laboratory procedure required for 4(b), and, despite the question requiring a purification to precede distillation, responses involving distillation were often suggested. Most students identified the two hazard symbols required in 4(c)(i) but far fewer could suggest an alteration to the method to reduce the risk of both, instead opting for electrical heating or a water bath.

## Advice

- Read the questions carefully and check that your answers match the requirements of the questions.
- Practise retaining intermediate values in your calculator when carrying out calculations.
- Familiarise yourself with the sequences involved in standard laboratory procedures.

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