Pearson Edexcel

Examiners' Report
Principal Examiner Feedback

January 2023

Pearson Edexcel International Advanced Level In Chemistry (WCH16) Paper 01: Practical Skills in Chemistry II

Introduction

This paper proved accessible to many candidates who were able to demonstrate a good knowledge and understanding of the chemistry encountered in this examination. Some parts of the paper were more challenging, particularly for some of the candidates, and it is clear that some would certainly benefit from a greater experience of practical techniques, and a firmer grounding in the methods used in practical work. Knowing why a practical is done in a particularly way, rather than just what can be deduced from the results, is an important aspect of this examination.

Question 1

This question centred around the reactions of two green solutions. In (a) candidates often were able to identify three of the four possible ions and gain full marks. 86% of candidates were able to identify at least two of the three required. A good proportion were able to answer the questions on the reaction of the coloured solutions in A, B and C, with many candidates clearly well prepared for questions on the reactions of transition metal solutions. Hazard and risk, dealt with in (c)(iii) and (c)(iv) was well understood, with three quarters of candidates identifying gloves as a sensible safety precaution in (iii). Part (iv) was a novel approach to a question on safety symbols, and although the marjority of candidates were able to describe some of the symbol only 1 in 10 were able to describe the symbol sufficiently well to score both marks. Most candidates used a diagram, which was a perfectly acceptable approach. In (d) most candidates identified the chloride and bromide ions as being the possible ions in (i) but the second part, which was known by many candidates in outline, was not understood in sufficient detail to score full marks. Candidates appeared to confuse aqueous with dilute and so did not identify the concentration of the ammonia which needed to be used.

Question 2

The second question concerned a titration technique being used to measure the rate of a chemical reaction. The question focused mainly on the rates aspect of this question. This practical is a fairly standard one. (a)(i) asked for the colour change at the end-point of the titration. These types of questions are usually answered very well, but only about 20% were successful in this case. A wide range of colour changes were suggested, including those expected using phenolphthalein as an indicator. For those who were more familiar with methyl orange many different combinations of colours were offered for the colour change. Candidates should have experience of doing titrations using methyl orange and should be aware of the colour changes. (a)(ii) was not well answered, with some candidates able to score marks with very minimal answers which only just showed enough understanding to score. Relatively few candidates really understood this question with only 15% scoring 2 marks. Part (a)(iii) was similar with less than 10% achieving full marks. These two items were questions associated with the ideas behind practical techniques, which are important in both this paper and in WCH13 at AS level. Part (b) which looks at the use of results was more confidently attempted. Approximately a quarter of candidates scored all the marks in part (b) while over half scored at least 3 of the 5 marks available. Common mistakes included to not subtract the first half-life from the total time taken to get to a quarter of the concentration, meaning their answer for the second half-life was the sum of the first two half-lives. While the plotting of graphs was very accurate it is not desirable

that candidates use very small points on graphs. These are difficult to see and can lead to marks not being awarded at it is not obvious the point is there. A good sized cross is the ideal marker for a graph.

Question 3

This question also contained a practical involving titration. This question centred on the titration itself. Part (a) again required an understanding of the reason why a practical activity is carried out in a particular way. Again, this proved challenging, with only 1 in 10 candidates recognising in (a)(i) that a lack of acid would result in the formation of a brown precipitate of manganese(IV) oxide. The use of sulfuric rather than other acids was tested in (a)(ii) again demonstrating a lack of preparation for questions about practical activities rather than their results, with only 4% of candidates knowing why neither hydrochloric acid or nitric acid could be used. As usual, in (b), the use of the results in a calculation was a strong point, with 50% of candidates able to gain full marks with some very neatly laid out, and clear to understand, calculations. Part (c) showed a good distribution of marks, but many candidates perhaps did not read the question with sufficient care, and did not focus on the techniques used to give a more accurate reading. Instead they focussed on the elimination of errors, or suggested changes to the experiment, such as changing the concentration of the solutions. Though some of these answers showed a very good understanding of chemistry they did not really answer the actual question asked and so could not score.

Question 4

The final question concerned the synthesis of 2-ethanoylaminobenzoic acid. The first part, (a), concerned the reason for heating under reflux. This is quite commonly asked, both at this level and in the equivalent AS paper. The answers focus on both heating and reflux as there are two marks available. Some candidates correctly answered one or the other and did not attempt to explain the second. As a result the most common mark here was 1. Most candidates, however, did get some credit in this part. Far fewer were able to score in (b) with only 2% able to get both marks, although over a quarter of candidates scored 1 mark, usually for recognising the reaction was exothermic. The diagrams in (c) and (d)(i) were of a better standard than in some recent papers. The use of a ruler is to be encouraged, as is the labelling of the important parts of the apparatus. The melting point experiment was less well known than the suction filtration. (d)(ii) showed a good spread of marks, quite envenly distributed. Quite a number of candidates did not recognise the need to address both the melting point range, for purity, and the actual value, to identify the sample. A number compared the melting point value to a Data Book, without actually saying how – that they needed to be the same! As in 3(b) the final calculations were well answered. There were a good spread of scores over these final two calculations, but 40% of candidates finished the paper strongly with full marks. The remaining candidates were evenly distributed over the other possible marks.

Summary

To improve their performance, candidates should:

- read and then re-read the question to make sure they are answering the actual question being asked

- check the marks allocated to each item. The number of marks will be equal to the number of points which need to be made. This can be seen by comparing past paper questions with the mark schemes where each bullet point represents one of the marks available
- carry out as much practical work as possible and include revision of techniques through the use of online videos or simulations. It is important to understand why we do things, as well as what the results mean!
- show all working on calculation questions
- practice drawing the common experiment types, such as heating under reflux and distillation. Past papers contain many suitable diagrams. Also practice drawing some of the techniques which are part of series of steps, such as filtration or washing an organic product
- make use of good sized crosses on graphs to show the position of the points so that marks for graph plotting can be awarded.