



**General Certificate of Education (A-level)  
June 2012**

**Chemistry**

**CHM3X**

**(Specification 2420)**

**Unit 3: Investigative and Practical Skills in AS  
Chemistry**

***Report on the Examination***

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## General Comments

Marks on this year's paper were roughly comparable to 2011. In Task 1 and Task 2, marks were high with nearly half the students scoring full marks.

### Task 1

In Task 1, there are a decreasing number of mistakes such as only recording the initial and final titres and/or putting  $50.0\text{cm}^3$  as the initial volume. Accuracy levels were high; titration as a skill seems well established.

### Task 2

In Task 2, there were some very good cooling curves. This made extrapolation easy but a few centres disadvantaged their students by not using the  $0.1^\circ\text{C}$  thermometers requested - this led to highly speculative lines of best fit and poor accuracy marks. Centres would also be advised to train their students in the use of timers that display values to 0.01 s. In this experiment, values to the nearest second were the most appropriate and those to the nearest hundredth of a second were penalized as showing little understanding of suitable precision in this context.

### Written Test: Section A

In Section A, the processing of results was very well done with over half the students achieving at least 13 out of the 16 marks. The common errors were as follows:

Question 1 - averaging all titres including non-concordant

Question 2 - transposing the volumes and concentrations

Question 3 - poor use of graph paper by starting the y-axis at  $0^\circ\text{C}$

Question 4(a) - forgetting to include the temperature of the acid in the average

Question 4(b) - averaging the lowest and highest temperature values on the graph

Question 4(c) - ignoring the precision requirement with answers given to 0 or 2 decimal places

Question 5 - putting the mass down as 1 g and adding 273 to the temperature change

Question 6 - using 0.05 for the amount in moles though the exothermic nature of the reaction was frequently recognised.

### Written Test: Section B

Section B proved more demanding. In Question 7, the calculation had similar faults to Question 5 but some students failed to read that the answer was to be in Joules - an answer in kJ was penalized unless there was a clear correct answer in the working. Questions 8 and 9 were well done though the alternative answer to Question 7 was frequently used in these. In Question 10, only a few students failed to highlight the need for the bag to split or the chemicals to come into contact with skin/hands. Question 11(a) indicated that a considerable number of students found difficulties with the equation; common errors were the wrong formula for iron (III) oxide, the inclusion of ions on the reagent side of the equation and using  $\text{Fe}_2$  for the metal. Question 11(b) contained many good partial answers but there was a significant failure to focus finally on why longer times might not be an advantage. In Question 12(a), the main errors were to re-state the question about being reusable or to indicate that there would be no waste following use of these handwarmers. There were some vague answers to Question 12(b) which referred to 'heating' the bag or 'keeping it in a warm place' and, for some, the contents were removed before further treatment. Nevertheless, sensible answers were frequently seen.

### **Written Test: Section C**

Section C turned out to be the most difficult part of the Written Test. This section tests the student's understanding of practical chemistry, particularly the practical techniques experienced as part of the PSV programme. In Question 13(a) many wrong answers suggested that the granules affected the chemical reaction rather than the boiling process or 'evening out the heat'. Similarly, 'acting as a catalyst' was occasionally seen. Responses to Question 13(b) demonstrated that the distillation and reflux processes are not widely understood and the operation of the condenser was not clear. The diagrams showed many examples of blocked tubes where the vapour condenses and open tubes where the water circulates. Question 14 was expected to challenge the student's ability to use information to plan a simple identification task. Most were aware of the lack of reactivity of tertiary alcohols and how to distinguish primary from secondary - very few knew that distillation of the initial oxidation mixture was needed and the use of Fehling's/Tollens' reagents directly on the alcohols was also a common error.

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