



General Certificate of Education

Chemistry 1421

**CHM3X Externally Marked Practical
Assignment (EMPA)**

Report on the Examination

2009 examination - June series

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Set and published by the Assessment and Qualifications Alliance.

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General Comments

The first externally marked practical assignment (EMPA) for the new Specification has been completed successfully and centres are to be congratulated on their excellent and much appreciated efforts. The very great majority of centres adapted easily to the new format for assessment. This EMPA discriminated effectively between able and less able candidates. Candidates found this year's assignment accessible and many good scripts were seen. The great majority of candidates scored at least half marks.

Administration

The new scheme retained some of the administrative features of the legacy Specification; most centres submitted all of the paperwork well before the May 15 deadline.

Nevertheless it was very disappointing indeed to note how many centres **failed to provide details of the teacher results**. Much time was wasted chasing this up, often to no avail. A considerable number of centres simply failed to respond to frequent enquiries. While this omission did not have a particularly adverse affect on the marking of Task 1, markers were faced with a real problem in assessing accuracy in Task 2. It seems ironic that having failed to complete their small section of the EMPA assessment some centres expected the marker to do his/her best to rescue something for the candidates. This simply cannot be regarded as satisfactory from the candidate's point of view. Centres owe it to their candidates to provide a set of properly completed teacher results. If there is more than one student group, it is essential that the centre indicates which teacher results apply to each individual candidate.

In addition centres are reminded that each candidate must complete and sign a Candidate Record Form. Centres are also reminded that the Practical Skills Verification (PSV) section of the Candidate Record Form must be completed. Failure to complete this section will lead to a mark of zero being awarded to the candidate for the whole of this unit.

Task 1

The observation exercise in this task gave candidates an opportunity to demonstrate a routine practical skill but high marks were quite rare. In many centres neither the teacher nor the candidates seemed familiar with the need to make at least two observations when a reagent is added to excess. The great majority of candidates failed to record that the white precipitate in Tests 1 and 3 was insoluble in an excess of the reagent. Many candidates did not use the term 'precipitate' unless distinct particles could be seen in the reaction mixture.

The marker will accept the teacher's results as long as they are reasonable. If a number of candidates obtain the expected results, the marker will usually assume that the solutions used were the correct ones.

Task 2

The titration exercise in this task also gave candidates an opportunity to demonstrate their practical skills and high marks were quite common. In one or two centres the average titres recorded were much lower than usual. Centres are reminded that when this happens the markers will not increase the tolerance boundaries for the accuracy marks.

Candidates should be reminded that a full table for a titration must have *Initial reading*, *Final reading* and *Titre* values for at least two sets of results. A significant number of candidates lost the mark for *precision of recording*, although as usual success in this area varied between centres. It is still not uncommon to see all of the candidates from a particular centre record

every reading to only one decimal place. Some candidates gave highly improbable readings such as 21.32 cm^3 and also failed to score this mark.

Written paper

This paper proved to be demanding and a wide range of marks was seen. The main problem areas are given below.

Section A

In Questions 1 and 2 candidates often lost the mark because they did not refer to a specific test in their answer.

In Questions 3 to 9 many candidates completed the mole calculations confidently and correctly. The only mark lost was a failure to give the M_r value in Question 8 to one decimal place. For weaker candidates the calculations proved too demanding and these candidates tended to score the more straightforward marks in Questions 3 to 5 only. It was surprising to note the significant number of candidates who could not use the M_r of the salt to calculate the number of molecules of water of crystallisation.

In Question 9 an answer of 2 molecules of water of crystallisation was accepted to avoid penalising candidates who referred back to the Task Sheet in answering this question.

Section B

In Question 10 the candidate was required to draw a graph. This generated the usual problems of plotted points which did not cover half the paper and graphs containing incorrectly plotted points. If the candidate's graph included the origin, then the candidate's line had to pass through the origin to score the line of best fit mark.

A surprising number of candidates used a non-linear scale for the x-axis, and some lost a mark for drawing a doubled line of best fit.

To score the mark in Question 14 the candidate had to provide a definite link between the answer to Question 13 and the M_r of $\text{MgCO}_3 \cdot 2\text{H}_2\text{O}$. A large number of candidates simply stated the M_r value and left it to the marker to draw the appropriate conclusion, thereby losing the mark.

Candidates' answers to Question 15 usually missed the point. Very few realised the significance of the number of molecules of water of crystallisation being a whole number.

In Question 16 many candidates lost a mark because they did not comment on the quality of their line of best fit. Answers such as 'the graph shows a positive correlation' need to be expanded to be worth a mark. Most candidates were able to identify the anomalous result.

In Question 17 many candidates lost a mark by referring to a loss of water from the sample, rather than appreciating that the decomposition went further.

A number of candidates still struggled to express themselves in Question 18(a). Many stated that 'small amounts were hard to weigh' or 'couldn't be weighed', rather than focussing on the significance of the percentage errors in obtaining the mass of small amounts. In Question 18(b) 'the experiment takes too long' or 'the experiment is too expensive' were popular choices which were not worth a mark.

Candidates found several valid approaches to answering Question 19 and many scored full marks.

If candidates understood the meaning of atom economy, they tended to score full marks on this question. It was surprising however to see how many could not calculate two simple M_r values.

Question 21 proved to be the most difficult question of all. There was a wide range of ingenious answers but hardly any candidates made reference to the pressure from a gas produced in the stomach causing discomfort.

Section C

This section tested the understanding of the skills and techniques acquired during the AS course. It proved very challenging, and full marks for this section were rare.

Question 22(a) was well answered. The usual mistake was to assume that the aim of the experiment was to determine the effect of an external factor on the rate of reaction, and suggest that the concentration or amounts of reagent were kept constant.

In contrast Question 22(b) was poorly answered. Most candidates were familiar with the graph of the results but did not appreciate the use of a gradient to determine initial rate.

In Question 23 the great majority of candidates scored the first mark, although a surprising number opted to use sulfuric acid for some reason. The second mark was much more elusive. Very few candidates mentioned filtration, one of the simplest and most familiar of all practical techniques. A surprising number talked about 'draining' or 'sieving'. Similarly many candidates discussed removing the strontium chloride by evaporation or distillation.

Very few candidates scored the mark in Question 24(a). The fire risk in heating ethanol was not well known, most candidates referring to even or gentle heating. Similarly few correct answers were seen to Question 24(b).

Overall the new scheme seems to have gone well. Given the pressures on centres to deliver the teaching programme, this was a very positive and encouraging outcome. Centres are warmly commended and their efforts are much appreciated by the examiner team.