A-level
CHEMISTRY

CHM6X Investigative and Practical Skills in A2 Chemistry (EMPA)
Report on the Examination

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General Comments

Overall, students found this paper equally as demanding as last year's. Many students again struggled with Task 2, where the standard of observations was frequently poor. As usual even the best students failed to score high marks in Section C. Students tackled the double end point titration exceptionally well and a higher number of full marks were seen in Task 1 than in previous years.

Administration

Most schools submitted scripts and the associated paperwork well within the May 15 deadline. Few schools did not complete the paperwork properly. The main deficiencies continue to be:

(a) schools forgetting to include teacher results for the tasks
(b) schools with more than one student group forgetting to indicate which target value applied to each individual student
(c) schools forgetting to include a signed Centre Declaration Sheet.

In titration exercises it is essential that students completing the task at a later date do not have an unfair advantage by knowing what the results should be. Each student group should be given standard solutions of slightly different concentration. Similarly students should not be given the same mass of a reagent when the Teacher Notes specifies a range.

It is vital to note that the teacher results for an observation exercise provide a check that the correct solutions have been given to the students. The marker will accept a teacher alternative as long as it is reasonable. If the great majority of students in the group obtain the expected result the teacher result will be ignored if it is unlikely. Where teacher results miss key observations the expected observations will be used. Teacher results are not an opportunity to increase the number of creditworthy answers. The teacher results from a few schools appeared to be a summary of the students' answers. This is clearly unacceptable.

A large number of the students within a school gave nearly identical answers, some of which were unusual, occasionally wrong, and some of which all stated identical numerical values in descriptions where these were unneccesary. Schools are reminded that it is their responsibility to ensure the fairness of the test.

Task 1

A2 students rarely struggle with a titration exercise in a task. High marks were extremely common, despite the requirement for two sets of concordant results for the two end points. A small number of students failed to read the instructions for the task properly and so recorded the wrong values in their results tables and a smaller number of teachers did the same on their Teacher Results sheets.

Students are realising that a complete table will require columns for *Initial volume*, *Final volume* and *Titre* and all non-zero volumes must be recorded to 0.05 cm^3. It was pleasing to note that few students failed to score the marks for recording and precision. The usual limits for concordancy presented few problems as they were based entirely on the second end point and so the usual percentages resulted in generous ranges of values.

A few schools again failed to trial the task before allowing the students to undertake it. When this resulted in impossible titres the students were usually allowed to repeat the task but this should not be necessary. If a full trial of the titration is impossible, using a measuring cylinder to determine the approximate volume of one reagent to react with 25 cm^3 of the other reagent should only take a few minutes.

Task 2

The observation exercise proved demanding. Although the majority of the students scored at least half marks, full marks were rare. Some of the tests did not work as expected in a significant number of schools, resulting in missing observations. Schools are reminded that two scoring points **cannot** be awarded to a student making one observation, even when the teacher obtained the same result.

The inability of many students to record correct observations in the appropriate language continues to be disappointing. Very few were able to achieve full marks. Despite the guidance given in previous Reports and Mark Schemes, students persist in using used vague terms such as 'the ppt. disappears' and 'goes colourless'. Many students insist on using impossible terms such as 'cloudy solution'. It is particularly disappointing to note that many of these mistakes and omissions were also noticed on the Teacher Results Sheets supplied and that incorrect observations in the teacher Results Sheets were frequently mirrored word-for-word in the Candidate Results Sheets.

Many students struggled with determining the colour of a precipitate formed in a coloured solution. All students should be taught some simple procedures to help here such as decanting the liquid and diluting the colour of what remains with water. There were also a wide variety of shades and names for colours, sometimes ambiguous, which sometimes undermined the students' observations by causing a contradiction.

Written paper

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

Section A

Question 1 caused no problems to students. It was common, however, for students to contradict themselves in question 2a by calculating a correct answer and then going on to use an incorrect mole ratio and contradict themselves. Most students were able to answer question 2b, however the requirement for precision still caught a lot out.

A large number of students were unable to look up the correct set of results in their observations table and so wrote equations for the wrong reactions and gave the wrong set of observations for question 4 and question 5.

Questions 6a and 6b were generally very well done, but students still find it difficult to express their answers clearly and using suitable vocabulary in electrochemistry questions.

Section B

The graph plotting in question 7a and 7b were generally exceptionally well done. A few students continue to try to use unusual scales on their graphs and often catch themselves out by then mis-

plotting points. A few students tried to be answer by not plotting the anomalous point, however they then could not score the marks for plotting all of the points or for their line of best fit missing the anomalous point so it is better, on the whole, to simply follow the instructions given.

Question 7c was extremely well done, with the vast majority of students able to calculate a value for Ka. Question 7d, however, was variable with some students clearly never having calibrated a pH probe before whilst others were able to state extremely detailed methods for this process.

Most students were able to score 1 mark out of 2 for question 7e but, again, this was a question where students found it hard to express their ideas clearly and succinctly. Question 7f was, on the whole, poorly attempted. Many students stated the use of a white tile or colorimeter without realising that, if the solutions are still being added in the same increments, this would have no effect on the accuracy of the titration. Others correctly identified the need to add the alkali drop wise, but then went on to contradict themselves by listing several other, incorrect, methods as well.

Section C

Question 8a discriminated extremely well between students. Some of the weaker students failed to pick up on the product being a solid and wrote extensive methods about the use of a colorimeter to find the concentration of the solution produced. Others tried to titrate the complex produced against various acids and alkalis.

A number of students were able to write extremely detailed methods for how to carry out this practical and had obviously had the opportunity to undertake this experiment in their classroom. This serves to, once again, highlight the importance of carrying out practical work as part of the GCE Chemistry course. The majority of students were able to write a method of sorts, but lacking the details of some important steps in the procedure.

Question 8b proved more challenging than was expected. Many students had no idea why each of the statements was important, whilst others made several suggestions for each and, due to the list principle, contradicted themselves. Only a small number of students were able to correctly and clearly explain the importance of each of the underlined points in the recrystallization method.

Mark Ranges and Award of Grades

Grade boundaries and cumulative percentage grades are available on the Results Statistics page of the AQA Website.

Converting Marks into UMS marks

Convert raw marks into Uniform Mark Scale (UMS) marks by using the link below.

UMS conversion calculator