AQA
Realising potential

A-level
Chemistry

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

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General comments

Overall, students found this paper slightly more demanding than last year's. The standard of observations in Task 2 was better than in previous years and a higher proportion of students gained full marks. As usual, even the best students found Section C demanding.

Administration

Most schools and colleges submitted scripts and the associated paperwork by the 15 May deadline.

Few schools and colleges did not complete the paperwork properly. The main deficiencies continue to be schools and colleges:

- forgetting to include teacher results for the tasks, or including the teacher results for the wrong EMPA
- with more than one student group forgetting to indicate which teacher result applied to each individual student, or labelling in a manner which made it unclear
- schools and colleges forgetting to include a signed Centre Declaration Sheet, although this was again a very small number this year.

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 result should be. Each student group should be given standard solutions of slightly different concentration, and the teacher should carry out the titration exercise with each set of chemicals, at a different time to the students, and record these clearly.

A number of schools and colleges do not seem to realise 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. The teacher results from a small number of centres appeared to be little more than a summary of the students' answers, which is clearly unacceptable.

Task 1

A2 students rarely struggle with a titration exercise in a task, and this year was no exception. The vast majority of students scored full marks. Despite the use of an unusual indicator, students were able to achieve concordant titres with very few problems and teachers followed instructions in giving them samples of each colour to use to find their end points. It was pleasing to note that few students failed to score the marks for recording and precision.

A small number of schools and colleges did not trial the task before the students undertook it. When this resulted in impossible titres, the students were usually permitted 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. This also resulted in a few issues with centres unable to buy in the EDTA required for the practical at short notice. Again, this would have been resolved by centres studying the teacher notes and undertaking the practical task sufficiently in advance of the students' practical.

Task 2

The observation exercise proved less demanding than in previous years. The vast majority of students scored at least half marks, and full marks were not uncommon. The usual omissions were the observations when excess reagent was added, with students simply recording the initial observation and when the solution had been left to stand. Students also frequently wrote contradicting observations such as no visible change with effervescence. A large number of teacher results also did not have the required number of observations and some of the tests did not work as expected in a number of schools or colleges, resulting in missing observations. Schools and colleges 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. Despite the guidance given in previous Reports and Mark Schemes, students persist in using vague terms such as 'the ppt. disappears' and 'goes colourless'. Many students also insist on using impossible terms, such as 'cloudy solution'. This type of contradiction effectively ruins the answer. It is noted that many of these mistakes and omissions were also noticed on Teacher 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 the solution that remains with water.

The Written Test

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

Section A

The vast majority of students scored Question 1 as there was no limitation on the precision required. A very small number of students lost the mark when they included a non-concordant titre in the average.

Question 2 was answered well, with only a small number of students choosing to use the incorrect values in their calculation. A small number of students did not show any working for their calculation and so were not able to access full marks in this question as it was stated that the working was required.

Nearly all students scored at least 1 mark in Question 3, with the most common error being students not realising that they had to calculate the volume to be added to 250cm^3 water, and simply calculating the total volume required. This was enough to gain them one mark out of the two.

All sections of Question 4 were answered relatively poorly. A number of students did not have any awareness of the practical skills necessary to carry out a titration, or of the possible errors which would have a large impact on their results and how these could arise and should be minimised. It was common for all of the students in a centre to give similar, incorrect, responses to questions, especially Question 4(b) where students frequently described operator errors instead of errors associated with the burette itself. It is very important that students are taught all of the background

theory and essential skills of the practical techniques they meet throughout the specification as a secure knowledge and understanding of how to carry out these practicals is essential.

Question 5 was generally well answered, although some unusual calculations and methods were seen.

Question 6 differentiated between students extremely well. A large number of students were unaware of what an anion was and so identified the other ion present in solution P. Many students were not able to link their observations to the ions present and so lost marks where their observations did not match the ions they identified. Where colour changes were not observed by students on the addition of water to solution P, the marks could be awarded for Question 6(c) based on correct identifications in parts 6(a) and 6(b).

Question 7 was again a good differentiator with many students again not able to link their observations to their answer. Where students only identified one of multiple solutions, which gave them a positive result, the mark for solution was not awarded.

Section B

Question 8(a) proved very difficult for students to answer. A lot of students referred to equilibrium changed, which would not result in chlorine concentration decreasing over time. Few students realised that the chlorine could evaporate from the flask and even fewer were able to identify the equation in which oxygen was produced as a gas, preventing any backward reaction.

The most common errors in Question 8(b) were due to students misinterpreting the question and referring to the concentration of chlorine in the sample that had already been removed, rather than in the vase water.

Question 8(d) was generally well answered, although it was disappointing to see a number of students still not using the standard electrode potential data to explain their answer, as is required by the question.

Question 9(a) proved surprisingly difficult as a large number of students failed to use an appropriate precision due to the Mr of the sample being an integer.

Question 9(b) was generally well answered, with relatively few students failing to take into account both the nitrogen atoms in the compound.

All parts of Question 9(c) proved difficult, with many students writing unclear answers which lacked in technical language. Answers were often ambiguous and vague. Not many students had even a basic understanding of the principles of a colorimeter.

Section C

This section tested the understanding of the skills and techniques acquired during the A-level course. It again proved very challenging, relying as it does on experience of a wide area of practical chemistry. Full marks for this section were rare, and it was not uncommon to see scores of zero or one for this section as a whole.

This year the section C focused on a PSA practical, which had been used in a previous ISA, but still showed disappointingly low scores.

The vast majority of students were unaware that propan-1-ol cannot have a concentration and so immediately lost both marks in 10(a) due to the chemical error of using a concentration.

Answers to Question 10(b) were often vague and, whilst a lot of students did score the second mark for deducting one value from the other, most did not score the first mark. Common incorrect answers saw students stating that sodium carbonate would only react with the carboxylic acid present, and so measuring the volume of carbon dioxide released, or measuring the pH of the mixture in the hope that they could use that to determine the amount of propanoic acid, despite the presence of concentrated hydrochloric acid.

Answers to Question 10(c) often started well, with students giving valid explanations of how failing to seal the container could result in evaporation. They frequently then incorrectly went on to describe how this would change the actual value of Kc for the equilibrium, rather than just leading to the calculation being incorrect.

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 www.aqa.org.uk/umsconversion