A-LEVEL
CHEMISTRY

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

2420
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General comments

Overall, students found this paper slightly less demanding than the previous year's. Many students again struggled with Task 2, where the standard of observations was often poor, and very few students gained full marks. As usual, the majority of 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:

- forgetting to include teacher results for the tasks, or including the teacher results for the wrong EMPA
- schools and colleges 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 a very small number this year.

Although most were fine, some of the teacher results documentation was a little lacking. A few teachers had failed to record values to the appropriate precision in Task 1 and some had mistakes in their calculations. Some descriptions of the observations in Task 2 were also sometimes vague. 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 schools and colleges 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. Students are finally 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.

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, a simple experiment, 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 students scored at least half marks, full marks were rare. 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. A 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 negates the answer. It is noted that many similar mistakes and omissions were also noticed on Teacher Results Sheets.

Many students struggled with observing correctly the colour of a precipitate formed in a coloured solution. Some simple procedures can 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 need to record to the appropriate precision meant that a few students failed to score the mark in Question 1. A very small number of students lost the mark when they included a non-concordant titre in the average. In the calculation in Question 2(a), a few students incorrectly used the figure given in the question for solution X, rather than their answer from Question 1. The calculations in Questions 2(b) to 3(b) were answered very well.

Most students were able to score two of the marks in Question 3(c), with a number missing the third mark due to not using their answer from Question 2(b) or for not recording their answer to the nearest integer. A small number of students had an answer to Question 3(b) which was larger than the mass stated in Question 3(c), which resulted in a negative mass of water. Students should be reminded that, whilst they do need to use their own results wherever possible, if these lead them to obviously incorrect values, they are provided with alternative values to use for their calculations.

Question 4 proved to be challenging, with less than half of students scoring the mark. Answers were often vague or poorly phrased and a significant number of students misunderstood the question and instead referred to the magnitude of the errors when using a measuring cylinder.

A large number of students were able to correctly state the reagents required to test for the absence of iodide ions in Question 5. Most, however, then went on to state the observation if iodide ions **were** present, or simply which observation could not be made. The question demanded that students state what **would** be observed if iodide ions were not present, which is more challenging.

In Question 6(a), students were required to refer to their own observations in Test 2 of Task 2 in order to interpret the equation. A number of students knew what the observations for these species should be and recorded these instead, when these were clearly contradicted by their own results. Question 6(b) caused little issue to the majority of students. In Question 7, students were required to refer to their observations. The most common wrong answer to this question was from

students identifying the species as aluminium ions when they had recorded a precipitate that did not re-dissolve on their Candidate Results Sheet.

Section B

Questions 8(a) and 8(b) were answered well. About half of the students were able to draw a correct line of best fit in Question 8(c) or a suitable tangent with the necessary calculations for Question 8(d). Lines and curves of best fit should not be doubled or kinked and should not deviate towards anomalous values. Whilst the majority of students could draw a tangent to their curve, marks were most commonly lost by incorrect reading of the axis for two values on this tangent.

Questions 9(a), 9(c) and 9(d) were generally very well answered. In Question 9(b), the most common wrong answers referred to the catalyst providing a surface for the adsorption of reactants. Where students did talk about the opposite charges of the ions, they often did not specifically talk about attraction between these ions.

Section C

This section tested the understanding of practical skills and techniques acquired during the A-level course. It again proved 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.

Question 10 proved very challenging, with many students failing to draw apparatus for filtering under reduced pressure. Of those who did choose appropriate equipment, it was common to see sealed flasks and funnels, rendering them incapable of being used.

About half of the students were able to state a suitable piece of apparatus in Question 11. However, only a very small number were able to describe clearly the process of heating slowly near to the melting point. A number of very vague answers were seen in response to this question, as well as simple restating of the question itself.

Questions 12(a) and 12(b) were the best answered in this section, although vague answers were still very common. Misinterpretation of Question 12(a) was very common with many students assuming the washing was in order to clean the apparatus. It is important that students are taught the correct practical techniques for carrying out a titration, including the reasons for doing each stage of the procedure.

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