GCE

Chemistry

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

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General comments

Overall, students found this paper as demanding as last year's. There were three main reasons for this. The need to prepare a standard solution before the titration in Task 1 resulted in many uncharacteristically low marks. Many students again struggled with Task 2, where the standard of observations was often poor. 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, although happily there were few instances this year
- with more than one student group forgetting to indicate which teacher result applied to each individual student
- schools and colleges 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 result 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 Teachers' Notes specifies a range.

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, but this year was something of an exception. High marks were relatively rare, although occasionally virtually all of the students in a school or college scored full marks. While all students completed the task, poor preparation of the standard solution resulted in a number of zero marks for accuracy. 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. The unusual limits for concordancy presented few problems.

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.

Task 2

The observation exercise proved demanding. Although the majority of the students scored at least half marks, full marks were very rare. The usual omission was the description of the intermediate changes in Test 6. 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 need to record to the appropriate precision meant a number of students failed to score the mark in Question 1. A few students lost the mark when they included a non-concordant titre in the average. The calculations in Questions 2 to 4(c) were done well. Weaker students often forgot the factor of ten in Question 3(b) and the 2:1 ratio in Question 4(b).

The great majority of students were able to complete the equation in Question 5 but a surprising number failed to give the hexaaqua ion in Question 6. Questions 7 and 8 were answered well but in Question 9, very few students realised that the initial reaction in Test 4 of Task 2 involved ammonia neutralising the excess acid. Some unusual answers were seen to Question 10, including K_3I, but most students were able to identify an aldehyde in Question 11 regardless of whether this matched their actual observation from the test.

Question 12 required students to apply the results of one of the reactions in Task 2 to explain the effectiveness of Bordeaux mixture as a fungicide. Few good answers were seen. Many students struggled when trying to explain what happens when copper(II) sulfate dissolves in water, while a number thought that copper(II) sulfate is insoluble in water. A number of students spoiled promising answers by making no reference to the plant.

A wide range of environmental problems were cited in Question 13 but very few students addressed the issues caused by prolonged use of the mixture. A surprisingly high number of A2 students seem to think that any sulfur-containing compound will cause acid rain.

Section B

In Question 14(a), most students were able to identify two appropriate atoms in the structure, but the ionic nature of Zineb resulted in many students failing to calculate its M_r correctly in Question 14(b). Question 14(c) proved to be demanding too, ester being the most common error. The simple calculation in Question 15 proved straightforward for most students.

Question 16 highlighted the difficulties students face when applying theoretical ideas. Many students ignored the specific references to Zineb and ETU and wrote at length about the theory of chromatography. It was not uncommon to see long answers that did not specify the type of chromatography to be used, or make any mention of Zineb or ETU. Students were similarly reluctant to use the information in the questions to predict the outcomes for this particular separation. Such non-specific answers received few marks. A significant number of students chose gas chromatography, and even then could not make any use of the information at hand.

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.

Question 17(a) was usually well answered. The usual mistakes were to make some reference to impurities without specifying aluminium oxide or contradicting an answer by giving an incorrect formula. Answers to Question 17(b) were variable. Students familiar with the standard hydrogen electrode gave good answers, although many omitted to name the acid used. In Question 17(c), most students realised that a reaction would occur but gave impossible products and lost the mark. The consequences of reaction were not well understood. A number of students gave answers implying that a salt bridge would not be necessary or describing details of one specific use of a standard hydrogen electrode, which did not relate to the question being asked.

Question 18 proved very difficult. Many students did not realise that methylamine would duplicate most of the reactions of ammonia and suggested methods that would not work reliably. Many students gave methods which would not be sensitive enough to be able to distinguish between the two compounds. Some students ignored the word ‘simple’ and used complex procedures which would not be readily available. Full marks for this question were very rare.

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 http://www.aqa.org.uk/exams-administration/about-results/uniform-mark-scale/convert-marks-to-ums