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Chemistry CHM6X

(Specification 2420)

Unit 6X: Investigative and Practical Skills in A2 Chemistry

Report on the Examination

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General Comments

Overall, students found this paper a little more difficult than last year's. There were two main reasons for this. Quite a few students struggled with Task 2, where the standard of observations was frequently poor. In addition, even good students struggled to get high marks in Section C where a general experience of practical chemistry underpinned by the PSVs is required.

Task 1

A small number of schools and colleges expressed their concern regarding the length of time taken to complete Task 1. This experiment was extensively trialled before being set with no reported difficulties of this nature. Though complex in instructions with consequent demands on practical skill at the higher A2 standard, the repetition of steps was thought to help students after the first run. For the large majority of students, the total time spent waiting for the blue-black colouration was under 20 minutes. There are several possible explanations for the long times experienced by some centres. It could have been a lack of familiarity with equipment or a lack of familiarity with this type of rate experiment or very cold reagents which caused the problems notified - the latter is especially relevant if the teacher-run occurred at a very different time to that of the group. It is also possible that the hydrogen peroxide reagent had partly decomposed. However, results were almost always very good with most students obtaining good straight lines. The gradient generally observed seemed to be around 0.93. Student accuracy was based on either the teacher value or the group average if this differed markedly from the teacher value.

Task 2

In Task 2, the ability of students to write down correct observations continues to be disappointing. Very few were able to achieve full marks. Despite the guidance given in previous Reports and Mark Schemes, students again used vague language such as 'goes cloudy', 'ppt. disappears' and 'goes colourless'. Contradiction was often seen such as 'black solution', 'white solution' and 'goes milky with no change'. In Test 1, 'black ppt.' was penalised because the MnO_2 had not formed from a reaction. A large number of students still erroneously equate 'colourless' with 'clear' and many marks were lost here. Especially where colour changes occur, it is vital that the two colours are stated and whether a solution or a precipitate is involved. In some cases, only the final observation was given following a series of steps within a test. It is particularly disappointing to note that many of these omissions were also noticed on the Teacher Results Sheets supplied.

Written Test: Section A

In Section A, the processing of the results was generally good with students coping with the slightly harder mathematics involved. In Question 1, there were occasional rounding errors but most gained full marks. In Question 2, the graphs were usually good with the main problems being plotting the *y*-axis as positive values and using a poor scale (not using half the available grid). In Question 2(b), it was not always clear where the values in the working had come from because there was no indication on the graph itself. Question 3 was very poorly answered with many students relying on vague statements about the properties of catalysts rather than on the practical steps required. Where a student had the right method the second mark was often lost because the solid needed to be dry before the final weighing. In Question 4, there were many indications that this bit of theory was well known but the failure to give a 'reagent' was common; iron(II) ions alone was not a sufficient answer.

Question 5 was poorly answered with few examples of correct equations and many outright guesses at novel formulae for the solid. Question 6 was very well answered though a few contradictions were seen where students mentioned colour changes that they had not recorded in Task 2.

Written Test: Section B

The Section B questions were found more demanding though there were many good answers to Question 7 and Question 8(a). In Question 7, changing the 'amount' of a reagent was regarded as too vague and in Question 8(a) there were a few students who based their error calculation on a denominator of 0.963 rather than 1.0. Question 8(b) caused some problems with some students merely explaining how the 2.1% arose with no reference to technique. Questions 9(a) and 9(b) were well done with consequential answers allowed. Question 10(a) was well known but Question 10(b) often elicited answers requiring dehydration of the fat - this is a chemical process which was not acceptable. In Question 10(c) many students obtained a mark for the fact that the antioxidant was used up but failed to mention which of the two reactions involved they were referring to. There was a mistaken reliance on the ideas that catalysts can only speed up reactions and on antioxidants raising the activation energy of the (unspecified) reaction. Question 10(d) saw many full marks but a considerable number lost credit because they did not compare like with like in their final percentage calculation. Nearly all students were able to gain the first two marks.

Written Test: Section C

Section C continues to prove the most demanding part of the paper, relying as it does on experience of a wide area of practical chemistry. Question 11(a) was very poorly answered with quite a few relying on the need for the reaction to 'go to completion' without showing what this meant. In Question 11(b), a surprising number of students thought that the ethanoic acid was an oxidizing or a reducing agent. Question 11(c) was well known though not always well expressed. Question 12(a) was straightforward for those students who had experienced the technique but it appeared that a considerable number of students had never done or discussed a melting point determination. Question 12(b) proved extremely difficult. Many correctly deduced that heating too fast could cause problems but either did not discuss the consequences or deduced that a too high melting point would result.

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