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Examiners' Report/ Principal Examiner Feedback

Summer 2010

GCE O

GCE O Chemistry (7081) Paper 02

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Chemistry 7081 / 02 Report - Summer 2010

Candidates found it difficult to score very high marks on the Section A questions, but there were many high marks awarded for the Section B questions. There were many excellent scripts and it was clear that the candidates had been well prepared for this paper. Positive comments about candidates' ability to tackle calculations have been made in the past; unfortunately, there were a high proportion of candidates who were unable to use the equation in the calculation on question 3(d). The writing of balanced equations remains a concern.

Question 1

There was a disappointing response to part (a); many candidates did not understand that the manganese(IV) oxide oxidises the concentrated hydrochloric acid in part (i) and catalyses the reaction in part (ii). The tests in part (b) were generally well known. The calculation in part (c) often produced full marks; although many candidates failed to realise that a ratio of 1 to 1.5 gives an empirical formula of Mn_2O_3 and not MnO_2. Part (d) was well answered

Question 2

In part a(ii) many candidates found it difficult to draw a tetrahedral structure for methane; the lines on the diagram should show only the 4 C–H bonds. It was not appreciated in part a(iii),that members of an homologous series show similar chemical properties but graded physical properties, e.g. the boiling point increases with extra carbon atoms. Candidates should appreciate in part (b) that the different isomers have the same molecular formula**;** the isomers required in (b)(ii) were 1,2- and 1,1-dichloroethane. Weaker candidates did not understand that the empirical formula must show only the ratio of each type of atom present in the molecule.

Question 3

Generally this was a low scoring question. A colour change was required in part (b) and not the final colour of the indicator; candidates should realise that litmus and universal indicators are not suitable indicators for acid-base titrations. The precautions required were those taken during the actual titration itself, and not before or after the titration. All the data in the calculation in part (d) was given to four significant figures and candidates were penalised by one mark for giving answers which were less accurate. Many candidates did not use the mole ratio of sulphuric acid to sodium hydroxide in the equation.

Question 4.

There were many high marks on this question,
In part a(iv), the reaction uses the heat given out in the exothermic reaction. Most candidates correctly calculated the number of moles of NO in 0.150g but were then unable to calculate the volume of 1 mole of the gas. The Avogadro constant was generally well known, but some candidates then attempted to use the numerical value of the constant in part d(ii) instead of simply using the ratio of 480 to 24000 to give the answer 0.02L.

Question 5.

This question tested the ability of candidates to understand why certain operations are carried out in traditional salt preparations. Generally there were very disappointing responses given and as a result marks were low. The mixture is warmed to ensure a faster rate of reaction, the oxide is added in excess to ensure that all the acid reacts and that the excess oxide has to be removed by filtration. In order to form the crystals, the solution must be concentrated sufficiently to form a saturated solution, and if the solution is evaporated completely, the anhydrous salt is obtained. The calculation was well done, but there was evidence of some poor arithmetic.

SECTION B.

Question 8 was by far the most popular of the Section B questions, closely followed by question 9. Question 7 was the least popular and also scored the lowest marks. There were many pleasing responses to the Section B questions and the marks often compensated for low or average marks on Section A.

Question 6.

Candidates found it more difficult to score marks on parts a(iii) and c. In this question candidates were expected to answer part (a) from the data given at the start of the question. Thus in part (a)(iii), candidates should have recognised that although neon remains as a gas and can be removed, the nitrogen and oxygen liquefy and are then separated by fractional distillation. High marks were often scored on part (b). Most candidates could set up the apparatus, make suitable observations and conclusions to the experiment. However, it was not fully appreciated that the air had to be shunted back and forth over the hot copper until there was no further change in volume and that the final volume of gas is measured after cooling to room temperature. In part c(i) it was generally known that a fuel is a source of energy. In c(ii) marks were lost through failure to write a balanced equation. There was much guesswork to part c(iii) in which candidates should have realised that carbon dioxide dissolves in water to produce hydrogen ions and thus lowers the pH.

Question 7

This was the least popular and the lowest scoring question. In parts a(i) and (ii), the electrolysis questions were spoilt by carelessly written electrode equations. Although candidates understood the definition of reduction, the mark was often lost by stating that 'magnesium' and not 'magnesium ions' gained electrons. It was rare to see that hydrogen and not magnesium is the cathode product when the electrolysis is carried out in aqueous solution. Part a(iii) and part (b) were well answered. In c(i) marks were scored for the alkaline hydrolysis when an oil or fat is heated with the alkali, but it was rare to see mention of the salting out of the soap or the removal of the soap. In c(ii), many candidates could not write the structure of the ester despite having good knowledge of the carboxylic acid and the alcohol used in its preparation. The question in part (d) has been asked on many past papers and it is very disappointing to read answers that make no reference to the movement of the delocalised electrons in order to explain conductivity in metals.

Question 8

This question was by far the most popular and generally scored high marks. Marks were lost in part a(i) by the failure of candidates to distinguish between physical and chemical differences between metals and non metals and, in part a(ii) by failing to write a balanced equation. In a(ii), weaker candidates thought that sulphur reacted with dilute acid to give a variety of products. The formation of the ionic bond in part b(i) and the covalent bond in b(ii) were generally well known. In order to score full marks in part (c), candidates must make reference to the ease of loss of the outer shell electrons.

Question 9.

There were many excellent answers to this question but marks were lost through failing to write balanced equations. In part a(i), the use of aqueous sodium hydroxide to identify the Fe^{2+} ion and of barium chloride in the presence of hydrochloric acid to identify the SO_4^{2-} were well known but it was rare to see a balanced ionic equation for the precipitation of the iron(II) hydroxide. Part a(ii) was not as well answered as part (i). Examiners were looking for the use of a stated alkali to identify the NH_4^+ ion and the use of a stated acid to identify the CO_3^{2-} ion. As in part (a)(i), marks were lost through failure to write balanced ionic equations. Part (b) was well answered, although there was some confusion over which halide ion was present in part (i), and the sulphite ion or sulphate ion in part (ii). Candidates who correctly identified the ions in part (iii) often could not write a balanced equation for the metal-acid reaction. Part (c) was well answered, but candidates must understand that if an attempt is made to write an equation using structural or displayed formulae they must show the double bond in the alkene and write down the correct structure of the product, in this case, 1,2-dibromopropane.

CHEMISTRY 7081, GRADE BOUNDARIES

Grade	A	B	C	D	E
Lowest mark for award of grade	**75**	**63**	**51**	**46**	**29**

Note: Grade boundaries may vary from year to year and from subject to subject, depending on the demands of the question paper.

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