Version 1.0

General Certificate of Education (A-level)
January 2012

Chemistry CHEM1

(Specification 2420)

Unit 1: Foundation Chemistry

Report on the Examination

Set and published by the Assessment and Qualifications Alliance.

The Assessment and Qualifications Alliance (AQA) is a company limited by guarantee registered in England and Wales (company number 3644723) and a registered charity (registered charity number 1073334).
Registered address: AQA, Devas Street, Manchester M15 6EX.

General Comments

Students were able to access all of the marks on the paper.

There was still a lack of understanding over the difference between decimal places and significant figures in the mathematical aspects of the paper. Several students still truncated answers rather than correcting to the required precision.

Handwriting was often very poor or very faint, introducing the possibility of ambiguity. Many students were still not using a black pen as instructed in the rubric on the front of the paper.

The questions on bonding again showed that there were many students who confused the different types of bonding with intermolecular forces. Marks were also lost by using chemical terms (such as atom, ion and molecule) incorrectly.

Question 1

Part (a) was generally answered well although many students did not refer to a shared pair of electrons in the covalent bond. The required number of bond pairs and lone pairs in parts (b)(i) and (ii) were reasonably well known although many students did not appreciate that the lone pairs would repel each other and the bond pairs as far apart as possible and hence lost the marks for the bond angles. Some students incorrectly gave B as the symbol for bromine. The answers to part (c) differentiated well. Weaker students generally scored zero due to chemical errors. Where students identified ionic bonding, marks were lost by not stating oppositely charged ions or by referring to incorrect ions eg K^+ and F^-. The type of intermolecular force in part (d)(i) was well known. Weaker students did not know the formula HF in part (d)(ii) and many students lost marks due to careless omissions of the partial charges or the lone pairs. Students generally realised that van der Waals' forces were present in fluorine and hence the boiling point was low. However many answers did not refer to van der Waals' forces acting between molecules and some answers referred incorrectly to the breaking of weak covalent bonds.

Question 2

Answers to parts (a) and (b)(i) were generally well known. Many students recognised boron as the deviant in part (b)(ii) but some did not read the question and gave the answer oxygen which was outside the range of elements given. There were quite a number of students who thought that the deviant element was beryllium. A few students who identified boron thought that the electron was removed from the 3p orbital. Many students identified the correct element in part (c) but very few correctly showed the melting point of nitrogen in part (d). Part (e) was generally well answered. Most students knew that carbon had covalent bonding and could therefore access all the marks although a few thought that the bonding was ionic or metallic and scored zero.

Question 3

The majority of students knew the answers to parts (a)(i) and (a)(ii) although a common wrong answer to part (a)(ii) was cracking. Deducing the number of structural isomers in part (b)(i) caused problems for many students and several students showed a lot of working but then did not write a number in the box as instructed in the question. The type of structural isomerism in part (b)(ii) was well known but many wrong answers for the molecular formula were seen in part (c)(i). Many students lost marks in part (c)(ii) by identifying the wrong type of cracking. Even when thermal cracking was identified correctly, some students lost a mark by not stating the full conditions.

Most students scored the mark in part (c)(iii) although a few still gave answers in terms of usefulness rather than demand. Most students realised that the product in part (d)(i) was corrosive although 'acidic' was often seen. The atom economy was well answered in part (d)(ii) although weaker students did not give the correct number for the denominator or forgot to multiply by 100. The name in part (e) proved difficult for students with many omitting the numbers or giving the wrong numbers and many putting the chloro and methyl in the wrong order. The empirical formula was generally answered better although a lot of students just gave the molecular formula.

Question 4

Most equations gave the correct formulae in (a)(i) although there were many examples where the coefficient for oxygen was given as 17 rather than 8.5. The reason for incomplete combustion in part (a)(ii) was generally correct. There were a variety of answers in part (b)(i) with only the more able giving the correct equation. Weaker students formed atomic nitrogen or used oxygen as a reactant to form NO_2. Many equations were incorrectly balanced. The catalyst and reason in part (b)(ii) was well known. Part (c)(i) was also answered well with only a few students giving 'greenhouse effect' as the answer. Answers to part (c)(ii) were not so good. Whilst many knew that calcium oxide or calcium carbonate is used to remove the gas, many did not link this to a neutralisation reaction. Marks were also lost by referring to reaction with sulfur rather than sulfur dioxide or sulfur compounds.

Question 5

A lot of correct answers were seen in part (a) although many students found this difficult and answers giving incorrect charges ranging from -1 to +4 were seen. Some students lost marks by trying to write an equation rather than just stating the ion. In part (b), many students did not refer to an ion in their answer. Many students did not appreciate the -ide ending in part (c) and produced formulae such as $LiNO_3$. Many of those who realised that the formula contained only Li and N gave incorrect formulae such as LiN, LiN_3, Li_4N etc. In the empirical formula calculation in part (d), there were many students who could get no further than the 2.02 :1.35 ratio and weaker students divided the percentage of nitrogen by 28 rather than by 14. A small number of students used incorrect fractions by dividing the relative atomic mass by the percentage and getting Ca_2N_3. The equation in part (e) proved demanding with many students writing atomic nitrogen, N and molecular silicon eg Si_2, Si_8. A few incorrect symbols for silicon were seen ie S rather than Si.

Question 6

Many students found the unstructured calculation in part (a) difficult. Weaker students divided the mass by 3 x 207.2 and many did not use the 8/3 ratio. Some students obtained the correct volume of nitric acid but then failed to give their answer to the required precision. The calculation in part (b) was generally well answered by the more able students but many weaker students found the conversion of volume into the correct units difficult. The balancing of the equation in part (c)(i) was generally well done although many students attempted to correct their work by writing one number over another leading to unclear answers. It is better to cross out and rewrite numbers. There were many correct answers to part (c)(ii) although answers to part (c)(iii) showed that many students did not realise that it is hard to separate gases. A few students thought that oxygen would be difficult to separate from PbO.

Question 7

The majority of students calculated the relative atomic mass of krypton but then failed to quote their answer to the precision stated in the question. The last mark in part (a) proved more difficult with many students suggesting errors in measurements or precision. Part (b) gave a good spread of marks. The first three marks were gained by most students but some failed to give state symbols in their equation. The last two marks were more difficult and many references to the atom being split in two were seen rather than being ionised twice.

UMS conversion calculator www.aqa.org.uk/umsconversion
Results statistics http://web.aqa.org.uk/over/stat.php?id=01&prev=01