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General Certificate of Education

Chemistry 1421

CHEM1 Foundation Chemistry

Report on the Examination

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General Comments

Centres are asked to remind candidates to read carefully the instructions given on the front of the examination paper. These instructions clearly state that answers should be written using either black ink or a black ball-point pen and that answers should not be written in the margins or on blank pages. Sufficient space is allowed for candidates to answer the questions on the lines provided but many candidates used most of the lines to repeat the stem of the question. There should be no need for any additional sheets.

The paper allowed candidates to demonstrate their ability and understanding of Foundation Chemistry. All marks were accessible. The standard of numerical answers was variable and some candidates failed to gain marks because their answers were ambiguous.

Candidates should take note of how many marks can be scored in each part of a question. They should ensure that their response has that number of merit-worthy points in it e.g., 1b (ii), 1(d).

The use of additional sheets led to some candidates, who had scored maximum marks on their paper, writing more and then contradicting themselves. This caused previously awarded marks to be lost.

Question 1

The electronic configuration in part (a) was generally well known. In part (b)(i) the removal of 2 electrons from the neutral atom was a common incorrect answer and in (b)(ii) many candidates missed the effect of change of shielding. Often candidates referred to s and p orbitals with no reference to the number of the principal energy level. Part (b)(iii) was disappointing and showed that many candidates find it difficult to apply concepts to different situations. Part (c) was generally well known although many candidates did not score the second explanation mark. In part (d) many candidates did not realise that metallic bonding, or an explanation of it, was required in the answer. Many thought that van der Waals forces were involved or mentioned losing electrons causing ionisation. In part (e) there were many unclear diagrams and many candidates had the wrong number of lone pairs of electrons. Answers to the shape of the molecule were often incorrect or contradictory e.g. bent-linear. Part (f) was well answered.

Question 2

This was generally well done and candidates appear to be able to do simple numerical questions. There was confusion over the number of decimal places in the answers with some candidates simply writing all the digits from their calculator. In general, answers should be to the same number of significant figures as given in the question. The major problem with part (b) was the conversion of pressure into the correct units and the subsequent effect on the units of the answer. Part (c) was done well by the majority of candidates. It should however be stressed that the answer to an empirical formula calculation is a formula and not simply the ratio of the elements.

Question 3

This question was not as well done as others on the paper. The answer to (a)(i) often did not refer to a covalent bond being the sharing of a pair of electrons. Part (a)(ii) was done quite well although dipole-dipole forces was often incorrectly given as an answer. The diagrams in part (b) were often unclear and had many errors including partial charges on the wrong atoms, incorrect number of lone pairs and multiple hydrogen bonds to the same atom. The equation in part (c)(i) showed that many candidates could not balance this correctly since they did not notice the O in ethanol. There were several vague answers given in part (c)(ii) and many candidates talked about carbon dioxide being a green house gas rather than the products of incomplete combustion and their associated problems. The economic requirement in part (c)(iii) was poorly answered with many vague answers e.g., less efficient which did not fully answer the question. In part (d)(i) many candidates did not know how the sulfur dioxide is removed with many incorrectly giving water as the answer. Answers to part (d)(ii) produced several interesting but incorrect answers.

Question 4

This question showed that many candidates had a good knowledge of simple organic chemistry. Answers to part (a) were generally well done although few candidates simply referred to same formula rather than same general formula. Displayed formulae in part (b)(i) must show all bonds in the molecule. Errors here included the chlorine atoms on the 2 and 5 carbons rather than both on the second carbon. There was some confusion over the empirical and the molecular formula. In part (b)(ii) candidates are aware that the structural isomers have a different structure but some did not mention that they must have the same molecular formula. Atom economy in part (c) was quite well done with the commonest errors being the incorrect calculation of M_r values. Part (d)(i) was generally well done although many candidates simply referred to the size of the molecule and then failed to link this to more van der Waals forces. The process in part (d)(ii) was often incorrect with the most common incorrect answer being cracking.

Question 5

Many candidates produced good answers here but it must be stressed that the definition of relative atomic mass must be absolutely correct for the award of both marks. Many candidates left out ‘average’ mass or the factor of 12.

Having to find the RAM of one of the isotopes challenged many of those who were unable to manipulate the equation but candidates regularly scored the first two marks and only lost the third calculation mark due to lack of dexterity with rearranging and algebra. The idea of isotopes having the same electron arrangement was generally well known although lots of answers included references to protons and/or neutrons.

Part (b) was well answered with the most common error being the confusion of electric and magnetic field. The processes were very well known. In part (c) there was confusion over metallic and ionic bonding. In part (d) most candidates had the idea of a 3D lattice but errors arose from multiple charges or negative charges on the Ag or like charges next to each other at some point in the lattice. Most candidates realised that ionic bonding was present, but some then contradicted their answers by mentioning intermolecular forces.