Scholarship

2010 Assessment Report

Chemistry

COMMENTARY

The 2010 paper had five questions, in contrast to the 2009 paper which had six. Many candidates found the paper to be long with a large number failing to complete the final question. Candidates should be aware that questions can cover a range of content from Level 2 and Level 3 Chemistry standards, and require both an understanding of the content as well as the ability to solve problems and think critically about the chemistry ideas.

Candidates who were not successful failed to answer more than two or three questions in the paper and/or did not use the information provided when answering questions. It is important that candidates at this level are well prepared, not only in their content knowledge but also in their ability to analyse information, solve problems (including calculations), and write well-reasoned explanations. This included the appropriate use of equations and chemical terms.

The write-on nature of the question books should act as a guide as to how much writing is required for each question. Candidates who needed to use the pages at the back of the book should be encouraged to indicate when work is appearing on a later page.

SCHOLARSHIP WITH OUTSTANDING PERFORMANCE:

Candidates who were awarded Scholarship with Outstanding Performance typically:

- analysed the information given to correctly solve problems involving calculations
- used well-reasoned answers to identify unknown elements and to explain trends in data, including the rationale that the inability of molecules to pack closely together is likely to be the reason for anomalously low melting points when other contributing factors are similar
- linked the given values of pK_a to appropriate structures of species present at different pH values
- showed a depth of understanding of functional group chemistry, including the basic nature of amine groups
- linked appropriate data values, such as $E°_{cell}$ to the underlying concepts in chemistry
- critically analysed titration information to identify potential sources of error as well as the choice of an appropriate primary standard.

SCHOLARSHIP

Candidates who were awarded Scholarship but not Scholarship with Outstanding Performance typically:

- used the correct procedure to solve problems involving calculations
- applied Le Chatelier's principle or the "common ion" effect to predict variations in solubilities
- identified the different types of intermolecular forces present in samples of different compounds
- discussed the effect of different electronegativities on the strength of hydrogen bonding
- provided explanations for why deviations occurred in the trend of ionisation values for only some of the elements, but generally failed to discuss the trend in second ionisation energies in relation to the distance of valence shell electrons from the nucleus
- linked the pH in the buffer region of a solution of nicotinic acid to pK_a = 4.9
- showed understanding of functional group organic chemistry by identifying all five structures in the synthesis of loperamide
- demonstrated understanding of isomerism by drawing correct structural formulae of cyclic compounds and the products of elimination reactions
- used the information provided, with justification, to identify some unknown elements

- showed understanding of titration analysis by recognising a source of error in the titration methods or criteria for the selection of a suitable primary standard.

OTHER CANDIDATES

Candidates who were not awarded Scholarship or Scholarship with Outstanding Performance typically:

- attempted only two or three questions in the paper
- misinterpreted or failed to use the information provided when answering questions
- failed to identify an element using its atomic number or to write a correct ionic formula given the name of the compound
- showed a poor understanding of the nature of intermolecular forces
- claimed that atoms are "highly unstable" and spontaneously "want to/happily" lose electrons to become "more stable with full valence shells", rather than realising that this process was endothermic with the amount of energy required for ionisation indicating the relative stability
- used concepts incorrectly, such as electronegativity, VSEPR, or that electrons "move" within the atom to give electronic configurations for chromium and copper atoms as their reason for anomalies in the trend of ionisation values
- identified only two or three structures in the synthesis of loperamide
- showed little or no understanding of the nature of acid-base reactions in organic chemistry
- wrote equations that were not correctly balanced
- calculated $E°_{cell}$ values incorrectly
- failed to identify that silver, in a compound, had an oxidation number of +1
- failed to recognise that HCO_3^- is amphiprotic, reacting with both HCl and NaOH
- demonstrated confusion as to how indicators work, including the incorrect claim that the p*K*a of the indicator needs to be very similar to the p*K*a of the product forming in a reaction.