NZQA
New Zealand Qualifications Authority
Mana Tohu Matauranga O Aotearoa

Assessment Report

New Zealand Scholarship
Chemistry 2018

Standard 93102

Part A: Commentary

Successful candidates were those who were able to approach questions constructed from all areas of the Level 3 Chemistry curriculum. These candidates could interpret the intent of the questions and use critical thinking skills to develop clear and logical answers. Candidates who could apply their understanding to complex and unfamiliar situations had more success in providing the necessary justifications to address the question as intended.

Candidates who could interpret and use the mathematical data provided in the questions to carry out calculations, with detailed and logical working, were more likely to develop quality answers. Candidates who attempted parts of calculations with logical steps and detailed working were given credit. The appropriate use of units and significant figures throughout answers supported the communication of key steps and final values.

It is not anticipated that candidates will complete all aspects of the assessment comprehensively, but those candidates who attempted all questions were able to demonstrate a greater range of knowledge than those who left portions of the assessment not attempted. Candidates who had taken the time to read the questions carefully were less likely to make mistakes in their final answers. For example, thallium oxides were said in an assessment question to be ionic, but a number of candidates discussed these compounds as if they were molecular.

Candidates who considered and challenged their initial assumptions were more likely to develop answers with greater levels of perception and insight. Candidates at this level should be prepared to provide answers with greater clarity and depth than that expected of answers to NCEA Level 3 examinations. For example, while organic compounds in Level 3 assessments are often straight chain, candidates should be anticipating compounds at Scholarship level to potentially include branched or ring structures.

It is also important that candidates are prepared for questions which use content material from Level 3 internal assessments in different contexts and applications. Lack of understanding of oxidation-reduction principles, the use of oxidation numbers, and application of reduction potential data to a given scenario, were all areas of weakness in candidate answers in this examination.

Part B: Report on Performance

Candidates who were awarded Scholarship with **Outstanding Performance** commonly:

- interpreted and correctly used thermochemical data provided to calculate the energy released from the given reaction
- identified differences in the ionic radii of metal cations with different oxidation states
- related the radii of ions in ionic compounds to their relative melting points
- determined organic isomers which matched the information provided
- identified the correct isomer to use in completion of the organic reaction scheme
- applied knowledge of spectroscopy to the information given
- calculated the lower limit for titre values in the given quantitative analysis procedure
- elaborated on the possible impact of reactions occurring due to vigorous mixing or delayed titrating in the given quantitative analysis procedure
- comprehensively discussed the relationship between the electronegativity of elements and the acidity of compounds, and could apply such relationships to unfamiliar compounds

- calculated the mass of sodium hydroxide needed to change the pH of the acid solution
- applied hypothetical ideas to unfamiliar molecules
- explained in depth the different types of intermolecular forces present between molecules
- gave concise answers to discussion questions
- gave answers that demonstrated a logical approach to discussing unfamiliar molecules
- completed calculations with logical, well laid out, detailed working, with units.

Candidates who were awarded **Scholarship** commonly:

- determined the oxidation states of elements in an ionic compound and used oxidation state changes to justify oxidation-reduction
- balanced chemical equations correctly
- could convert enthalpy of combustion values into enthalpy of formation values
- determined the empirical formula for ionic compounds using mass percentage data given
- developed a scheme which illustrated changes to organic compounds based on the reagents and conditions used
- calculated the concentration of a standard solution
- applied dilution principles, and the relationships n=m/M and n=cV correctly in determining significant values in a given quantitative analysis procedure
- understood the relevance of reduction potentials and cell potentials in determining the spontaneity of side reactions in the given quantitative analysis procedure
- discussed the impact of electronegativity on the acidity of given compounds
- calculated the percentage mass of acid in the dry solid based on the pH of the solution
- linked strength of temporary dipole to the size of the electron cloud and explain how the linear nature of a molecule allowed for closer packing
- understood the relationship between functional groups which can form hydrogen bonds, and the intermolecular attractions between molecules.

Other candidates

Candidates who were **no**t awarded Scholarship commonly:

- did not read the question
- made incorrect assumptions about the chemistry in questions
- did not attempt all the questions
- were not able to balance redox equations
- could not determine oxidation states of elements
- used thermochemical data incorrectly in calculating enthalpy changes
- considered thallium oxides to be molecular
- could not relate ion charge to attractive forces
- could not determine isomers or propose changes to functional groups based on the information given
- could not determine the concentration of a standard solution
- were unable to use the relationships $n=m/M$ or $n=cV$ correctly
- used reduction potentials incorrectly, or did not use reduction potentials at all in answering the question
- were unable to determine the consequences of vigorous mixing or delays in titrating the given reaction mixture
- did not use the term electronegativity correctly
- were unable to discuss electronegativity and the influence of atoms on the bonding of a molecule
- could not understand pK_a values
- did not show adequate working for calculations
- were disorganised in the carrying out of calculations
- did not use units to indicate the meaning of calculation values
- made poor use of chemical terminology
- could not understand the relationships between the structure of molecules and the resulting melting points of the substance.

Subject page

Previous years' reports
2016 (PDF, 203KB)

2017 (PDF, 43KB)