Assessment Report

Level 3 Chemistry 2017

Standards 91390 91391 91392

Part A: Commentary

Candidates who achieved Merit and Excellence tended to give concise and specific explanations. They used Chemistry vocabulary with confidence, and clearly understood key terms and concepts.

Candidates are advised to include working in their calculations and read questions carefully to avoid giving irrelevant information. The use of pre-prepared answers is discouraged since they generally do not appropriately answer the question.

An understanding of the type of reaction occurring should assist candidates with completing reaction schemes and equations.

Part B: Report on standards

91390: Demonstrate understanding of thermochemical principles and the properties of particles and substances

Candidates who were awarded **Achievement** commonly:

- defined key concepts such as sublimation, electronegativity, and ionisation energy
- wrote electron configurations
- identified periodic trends
- recognised the type and strength of attractive forces between some molecules
- used a recognised process to calculate an enthalpy change using Hess's Law
- related bond polarity to the polarity of a molecule.

Candidates who were assessed as **Not Achieved** commonly:

- did not define key terms
- could not write electron configurations using s, p, d notation
- linked the number of electrons in an energy level to an atom's electronegativity
- confused the concept of polarity with respect to both molecular shape and solubility
- did not understand the concept of entropy
- confused bonding within a molecule with intermolecular forces between molecules.

Candidates who were awarded **Achievement with Merit** commonly:

- explained periodic trends accurately
- explained the type and strength of intermolecular forces between different molecules
- recognised that a positive entropy change can cause an endothermic reaction to occur spontaneously
- explained the polarity of a molecule in terms of its shape and spread of charge
- linked entropy in the system or surroundings to the arrangement of particles
- recognised that the solubility of a substance in water is dependent upon its attraction to water
- used Hess's Law to calculate an enthalpy change with a minor error.

Candidates who were awarded **Achievement with Excellence** commonly:

- evaluated all factors that affect a periodic trend
- calculated an enthalpy change using Hess's Law with correct units and sign
- compared and contrasted the strength of intermolecular forces between different molecules
- understood how the entropy of the system and the surroundings affects the entropy change of the reaction
- explained clearly why a reaction can be spontaneous despite a positive enthalpy change.

Standard specific comments

Many candidates demonstrated a lack of understanding of the types of intermolecular forces, where they exist, and the impact of molar mass on their strength.

Candidates should be able to work backwards from an electron configuration in s, p, d notation to determine the identity of an atom or ion.

91391: Demonstrate understanding of the properties of organic compounds

Candidates who were awarded **Achievement** commonly:

- drew structural formulae
- named functional groups and molecules, including linkages within a polymer
- partially completed reaction schemes
- understood some properties of optical isomers and their 3D arrangement
- recognised a condensation reaction
- joined two amino acids to form a dipeptide
- drew a monomer from a given section of a polymer chain
- identified one product from each of acidic and basic hydrolysis of a condensation polymer.

Candidates who were assessed as **Not Achieved** commonly:

- could not draw or name structural formulae or functional groups
- could not draw structural formulae or provide appropriate reagents to complete a reaction scheme
- did not understand either the formation or hydrolysis of condensation polymers
- lacked any basic understanding of the properties of optical isomers and their 3D arrangement.

Candidates who were awarded **Achievement with Merit** commonly:

- completed reaction schemes, including reagents and reaction types, with only minor errors
- drew 3D arrangements for enantiomers and partially explained the requirements for optical isomerism

- described how to produce an aldehyde from alcohol oxidation, including practical requirements
- explained how to distinguish between an aldehyde and a ketone
- gave both possible dipeptides from joining two amino acids
- drew both products from either acidic or basic hydrolysis of a polymer
- drew both monomers from a section of a polymer chain.

Candidates who were awarded **Achievement with Excellence** commonly:

- completed all sections of a reaction scheme, including identification of major and minor products of an addition reaction
- explained how to distinguish optical isomers
- explained how to produce an aldehyde from an alcohol, using chemical and physical properties
- explained fully how to use Benedict's solution to distinguish between an aldehyde and a ketone
- understood the formation of a condensation polymer, including identification of the monomers
- recognised all the products from the hydrolysis of a polymer.

Standard specific comments

3D drawings of enantiomers should show a tetrahedral arrangement (109.5°) around the chiral carbon rather than 90°or 180°bond angles.

Candidates are advised to show carefully which atoms are connected to which bonds. For example, an amine group on the left-hand end of a molecule should be drawn as H_2N.

91392: Demonstrate understanding of equilibrium principles in aqueous systems

Candidates who were awarded **Achievement** commonly:

- wrote equation for acid dissociation
- related $K_a$to strength of an acid
- could list relative concentrations of species
- recognised mobile charged particles are required for electrical conductivity
- wrote equation for a saturated solution and the $K_s$expression
- recognised the buffering capability of a mixture of a base and its conjugate acid
- recognised the process for calculating the solubility of an AB_2type solid
- identified the relationship between equivalence point pH and indicator pK_a
- calculated number of moles or a simple dilution
- identified some of the species present at the equivalence point of a titration.

Candidates who were assessed as **Not Achieved** commonly:

- could not distinguish between complete and partial dissociation/ionisation
- did not use correct formulae for pH calculations
- could not apply Le Chatelier's principle when explaining changes to the position of an equilibrium, and confused left/right when referring to direction
- confused the equivalence point with the buffer zone
- identified electrons as required for electrical conductivity in a solution
- forgot to use equilibrium arrows in equations.

Candidates who were awarded **Achievement with Merit** commonly:

- understood the relationship between degree of dissociation and electrical conductivity

- calculated the pH of a weak base
- applied Le Chatelier's Principle to partially explain the shift in position of an equilibrium when product is added
- compared the effectiveness of a buffer to its relative acid/base ratio
- calculated solubility of an AB_2 type compound
- calculated moles and concentration of the given acid and base used in a titration
- recognised all the species present at the equivalence point.

Candidates who were awarded **Achievement with Excellence** commonly:

- linked degree of dissociation and electrical conductivity to the concentration of ions in solution
- explained fully, using Le Chatelier's Principle, how and why an equilibrium system will shift to minimise changes
- calculated the pH of a buffer solution based on either the ratio or concentration of acid and conjugate base present
- understood that the salt produced at the equivalence point could be acidic or basic, and will therefore influence the pH at the equivalence point.

Standard specific comments

Candidates should be familiar with the acids and bases listed in the Level Three Assessment Specifications.

When explaining changes to the position of an equilibrium, candidates should outline why the equilibrium shifts rather than simply state the changes.

Candidates are encouraged to use the K_a method to solve pH calculations since candidates typically demonstrate greater success using K_a rather than K_b.

Chemistry subject page

Previous years' reports
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