Admission Criteria for M.Sc. (Chemistry) course:

The candidates who have passed B.Sc. with Chemistry as one of the major subject at the final year with minimum of 55% in aggregate (50% for the reserve category candidates). The admission shall be done through written test conducted by the institute. The syllabus of the Entrance test is as follows:

Syllabus of the Entrance examination for M.Sc. (Chemistry) programme

(a) Inorganic Chemistry

1. Periodic table: Periodic classification of elements, periodicity in properties. General methods of isolation and purification of elements.
2. Chemical bonding: Types of bonding. VSEPR theory and shapes of molecules. Hybridization, dipole moment. Ionic solids - lattice energy. Structure of diamond and graphite.
3. Main group elements (s and p blocks): Chemistry with emphasis on group relationship and gradation in properties; structure of electron deficient compounds of main group elements and application of main group elements.
4. Transition metals (d block): Characteristics of d-block elements. Coordination compounds of first row transition elements, bonding in coordination compounds – VBT and CFT of tetrahedral and octahedral complexes. Application of CFT to spectral and magnetic properties. Electronic spectra of coordination compounds.
5. Organometallic compounds: Concept of hepticity, 18 electron rule. Carbonyl compounds of first row of transition metals.
6. Non aqueous solvents: General characteristics, reactions with reference to ammonis and liquid sulphur dioxide.
7. Acids and Bases: Lewis and HSAB concepts
8. Nuclear Chemistry: Radioactivity, nuclear reactions, applications of isotopes.

(b) Organic Chemistry

1. Nomenclature of Organic compounds.
2. Mechanism of Organic reactions: Electronic effects in Organic molecules – Inductice effect, polarazability effect, resonance, hyperconjugation. Formal charge. Generaltion, structure and general reactions of reactive intermediates –Carbocation, carbanion, carbon radical.
3. Stereochemistry: Types of isomerism. Projection formulae,chirality, assigning stereochemical descriptors to chiral centres and geometric isomers. Optical isomerism in compounds containing one and two asymmetric centers. Conformations of cyclohexanes.
4. Aromaticity and Huckel's rule: Mono and bicyclic carbocyclic aromatic hydrocarbons and their electrophioic substitution reactions.
5. Synthetic chemistry: Methods of preparation and characteristic reactions of alkanes, alkenes, alkynes (including their cyclic analogues), arenes and their simple functional derivatives, such as alkyl, halo, nitro, hydroxyl, alkoxy, formyl, carboxyl (and carboxylic acid

derivatives. Functional group interconversions. Grignard reagents, acetoacetic and malonic ester chemistry. Synthesis of simple compounds. Structure determination and synthetic problems using chemical reactions.

6. Mechanism (with stereochemistry): Aliphatic nucleophilic substitution, elimination, enolate reactions, Claisen condensation, esterification and ester hydrolysis, Cannizzaro reaction, benzoin condensation, Perkin reaction, Claisen rearrangement, Beckmann rearrangement, Wagner-Meerwein rearrangement.

7. Carbohydrates: Classification, nomenclature. Open and cyclic formulae. Chemistry of glucose.

8. Amino acids and peprides: Structure, stereochemistry, and characteristics reactions of amino acids. Structure of peptides.

9. Heterocyclic chemistry: Monocyclic 5- and 6-membered aromatic compounds with one hetero atom (S,O,N). Their nomenclature, electronic structure, aromaticity, characteristic properties and general reactions.

(c) Physical chemistry

1. Atomic structure: Fundamental particles. Bohr's theory of hydrogen atom; Wave-particle duality; Uncertainty principles; Schrodinger's wave equation; Quantum numbers, shapes of orbitals; Hund's rule and Pauli's exclusion principle.

2. Theory of gases: Kinetic theory of gases. Real and ideal gases, critical phenomenon.

3. Chemical thermodynamics: Reversible and irreversible processes. First law and its application to ideal and nonideal gases. Thermochemistry. Second law. Entropy and free energy, Criteria for spontaneity.

4. Chemical and Phase equilibria: Law of mass action; Kp , Kc, Kx and Kn ; Effect of temperature on K; Ionic equilibria in solutions; pH and buffer solutions; Hydrolysis; Solubility product; Phase equilibria–Phase rule and its application to one-component and two-component systems; Colligative properties.

5. Electrochemistry: Conductance and its applications; Transport number; Galvanic cells; EMF and Free energy. Liquid junction potential and concentration cells. Application of emf measurement for determination of K, ΔG, ΔH, ΔS. Stability of complexes.

6. Chemical kinetics: Reactions of various order, Arrhenius equation, Collision theory; Theory of absolute reaction rate; Chain reactions - Normal and branched chain reactions; Enzyme kinetics; Photophysical and photochemical processes; Catalysis.

7. Quantum chemistry: Elementary quantum chemistry, state function, operators, eigen values and eigen functions.

(d) Analytical Chemistry

Classification of analytical methods. Performance characteristics of analytical methods. Errors and their types. Acid-base titrations and acid-base indicators, redox titrations, conductometric and potentiometric titrations.