ANNAMACHARYA UNIVERSITY RESEARCH ADMISSION TEST (AURAT)-2024-25

09- CHEMISTRY

UNIT-I

Inorganic chemistry: Chemical periodicity- Structure and bonding in homo- and heteronuclear molecules, including shapes of molecules (VSEPR Theory). Concepts of acids and bases, Hard-Soft acid base concept, non-aqueous solvents. Main group elements and their compounds: Allotropy, synthesis, structure and bonding. Transition elements and coordination compounds: structure, bonding theories, spectral and magnetic properties, reaction mechanisms. Inner transition elements: spectral and magnetic properties, redox chemistry, analytical applications.

UNIT-II

Analytical chemistry: Characterization of inorganic compounds by IR, Raman, NMR, EPR, Mössbauer, UV- vis, NQR, MS, electron spectroscopy and microscopic techniques. separation, spectroscopic, electro- and thermos analytical methods. Molecular spectroscopy: Rotational and vibrational spectra of diatomic molecules; electronic spectra; IR and Raman activities – selection rules; basic principles of magnetic resonance.

Unit-III

Physical Chemistry: Basic principles of quantum mechanics: Postulates; particle-in-a-box, harmonic oscillator and the hydrogen atom, including shapes of atomic orbitals; orbital and spin angular momenta. Electrochemistry: Nernst equation, redox systems, electrochemical cells; Debye-Huckel theory; electrolytic conductance – Kohlrausch's law and its applications; ionic equilibria; conductometric and potentiometric titrations. Chemical kinetics: Empirical rate laws and temperature dependence; complex reactions; steady state approximation; determination of reaction mechanisms; collision and transition state theories of rate constants; unimolecular reactions; enzyme kinetics; salt effects; homogeneous catalysis; photochemical reactions.

UNIT-IV

Organic Chemistry

IUPAC nomenclature of organic molecules including regio- and stereoisomers. Principles of stereochemistry. Aromaticity: Benzenoid and non-benzenoid compounds– generation and

reactions. Organic reaction mechanisms involving addition, elimination and substitution reactions with electrophilic, nucleophilic or radical species. Common named reactions and rearrangements – applications in organic synthesis. Organic transformations and reagents: Functional group interconversion including oxidations and reductions. Synthesis and reactivity of common heterocyclic compounds containing one or two heteroatoms (O,N,S). Structure determination of organic compounds by IR, UV-Vis, ^{1}H & ^{13}C NMR and Mass.

UNIT-V

Bio inorganic and Natural products chemistry

Bioinorganic chemistry: photosystems, porphyrins, metalloenzymes, oxygen transport, electron- transfer reactions; nitrogen fixation, metal complexes in medicine. Chemistry of natural products: Carbohydrates, proteins and peptides, fatty acids, nucleic acids, terpenes, steroids and alkaloids. Biogenesis of terpenoids and alkaloids.