

ST. JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS) VISAKHAPATNAM

II SEMESTER

CHEMISTRY

TIME: 3Hrs/Week

CH-Ma1-2201(3) GENERAL AND INORGANIC CHEMISTRY Marks:100

W.e.f. 2023-24 admitted batch (23AK) SYLLABUS

Course Objective: To enable students to understand and learn certain fundamental concepts pertaining to atomic structure, periodic classification, different types of chemical bonds and acids & bases.

Course Outcomes: At the end of the course the student will be able to-

- Understand the nature and properties of ionic compounds.
- Identify the structure of a given inorganic compound
- Explain the existence of special types of compounds through weak chemical forces.
- Define acids and bases and predict the nature of salts.

Syllabus:

UNIT – I: ATOMIC STRUCTURE AND PERIODIC TABLE (9h)

Electronic configuration: Bohr theory, dual nature of electrons, Heisenberg uncertainty principle, the Schrodinger equation, significance of wave functions, normalization of wave function, radial and angular wave functions, Pauli's exclusion principle, Hund's rule, sequence of energy levels (Aufbau principle).

Periodicity: periodic law and arrangement of elements in the periodic table, IUPAC nomenclature and group number, horizontal, vertical, and diagonal relationships in the periodic table. General properties of atoms: size of atoms and ions-atomic radii, ionic radii, covalent radii; trend in ionic radii, ionization potential, electron affinity; electronegativity-Pauling, Mulliken-Jaffe, Allred-Rochow definitions; oxidation states and variable valency; isoelectronic relationship; inert-pair effect;

UNIT– II: IONIC BOND (9h)

Properties of ionic compounds, factors favouring the formation of ionic compounds-ionization potential, electron affinity, and electronegativity. Lattice energy: definition, factors affecting lattice energy, Born-Haber cycle-enthalpy of formation of ionic compound and stability. Stability of ionic compounds

in terms of ΔH_f and U_0 . Solubility and thermal stability of ionic compounds. Covalent character in ionic compounds-polarization and Fajan's rules; effects of polarization-solubility, meltingpoints, and thermal stability of typical ionic compound.

UNIT3: THE COVALENT BOND

(9 h)

Valence Bond theory-arrangement of electrons in molecules, hybridization of atomic orbitals and geometry of molecules- BeCl_2 , BF_3 , CH_4 , PCl_5 , SF_6 - VSEPR model-effect of bonding and nonbonding electrons on the structure of molecules, effect of electronegativity, isoelectronic principle, illustration of structures by VESPR model- NH_3 , H_2O , SF_6 , ICl_4^- , ICl_2^- , SF_4 , SF_6

Molecular orbital theory -LCAO method, construction of M.O. diagrams for homo-nuclear and hetero-nuclear diatomic molecules (N_2 , O_2 , CO and NO)

UNIT4: METALLIC AND WEAK BONDS

(9h)

The Metallic bond: metallic properties, free electron theory, Valence Bond Theory, band theory of metals. Explanation of conductors, semi conductors and insulators.

Weak bonds: hydrogen bonding-intra-and intermolecular hydrogen bonding, influence on the physical properties of molecules, comparison of hydrogen bond strength and properties of hydrogen bonded N,O and F compounds; associated molecules-ethanol and acetic acid; Vander Waals forces, ion dipole-dipole interactions.

UNIT5: ACIDS AND BASES

(9h)

Theories of acids and bases: Arrhenius theory, Bronsted-Lowry theory, Lewis theory, the solvent system, Non aqueous solvents: classification-protonic and aprotic solvents, liquid ammonia as solvent-solutions of alkali and alkaline earth metals in ammonia.

Types of chemical reactions: acid-base, oxidation-reduction, calculation of oxidation.

LIST OF REFERENCE BOOKS:

1. J.D.Lee, Concise Inorganic Chemistry, 5th ed., Blackwell Science, London, 1996.
2. B.R.Puri, L.R.Sharma, K.C.Kalia, Principles of Inorganic Chemistry Shoban Lal Nagin Chand and Co., 1996.
3. D.F.Shriver and P.W.Atkins, Inorganic Chemistry, 3rd ed., W.H.Freeman and Co, London.