

Syllabus

M.Sc. (Chemistry) Programme

(SEMESTER – I)

Inorganic Chemistry – I

Programme Code- (MSCCH -21)

Course Code – (MSCCH -501)

Block I Stereochemistry and Bonding

Unit 1: Stereochemistry and Bonding in Main Group Compounds

VSEPR, Walsh diagram (triatomic and penta-atomic molecules), $d\pi$ - $p\pi$ bond, Bent rule and energetics of hybridization, some simple reactions of covalently bonded molecules.

Unit 2: Phosphorus-Nitrogen and Sulfur-Nitrogen Compounds

Synthesis, structure, bonding and uses of cyclo and linear phosphonitrilic compounds, phosphorus- sulphur compounds, sulphur-nitrogen compounds, ring and chain compounds $S_2N_2, S_4N_4, (SN)_x$ etc.

Unit 3: Organometallic compounds of Alkali and Alkaline Earth metals

Organometallic compounds of Li, Mg, Be, Ca, Na: Synthesis, properties, structure, bonding, uses.

Unit 4: Alkyls and Aryls of Transition Metals

Types, routes of synthesis, stability and decomposition pathways, organocopper compounds in organic synthesis.

Block II Metal π -Complexes and Metal Clusters

Unit 5: Metal π -Complexes-I

Metal carbonyl, preparation, properties, structure and bonding, vibrational spectra of metal carbonyls for bonding and structural elucidation, important reactions of metal carbonyls; preparation, bonding structure and important reactions of transition metal nitrosyl, dinitrogen and dioxygen complexes; tertiary phosphine as ligand.

Unit 6: Metal π -Complexes-II

Alkene, alkyne, allyl, diene and cyclopentadienyl complexes. Arenes and other alicyclic ligands.

Unit 7: Metal Clusters

Higher boranes, carboranes, metalloboranes and metallocarboranes. Compounds with metal-metal multiple bonds. Isopoly and heteropoly acids and salts (or anions) with special reference to vanadium, molybdenum and tungsten. Nomenclature, classification and preparation.

Unit 8: Metal-Ligand Equilibria in Solution

Stepwise and overall formation constants and relation between them, trends in stepwise formation constants, factors affecting the stability of metal complexes with reference to the

nature of metal ion and ligand. Formation functions n , α_c , ϕ ; Evaluation of stepwise stability constants. Chelate effect and its thermodynamic origin, determination of binary formation constants by pH-metry and spectrophotometry.