GAYATRI VIDYA PARISHAD
COLLEGE FOR DEGREE AND PG COURSES (AUTONOMOUS)
Affiliated to Andhra University | | Accredited by NAAC and NBA
VISAKHAPATNAM

DEPARTMENT OF ORGANIC CHEMISTRY

M.Sc. (PREVIOUS) CHEMISTRY SYLLABUS
SEMESTER-I
PAPER-II: INORGANIC CHEMISTRY-I
(Effective from the admitted batch of 2022-2023)

Credits: 4		**Theory: 4 Hours**
Max Marks: 100	**External: 80**	**Internal: 20**

Course Outcomes (COs)/Course Specific Outcomes (CSOs):

CO 1: Acquire the knowledge on applications of VSEPR, Molecular orbital theories in explaining the structures of simple molecules.

CO 2: Understand the concept of MO theory to square planar ($PtCl_4^{2-}$) and Octahedral complexes (CoF_6^{3-}, $Co(NH_3)_6^{3+}$). Walsh diagram for H_2O molecule.

CO 3: Apply the knowledge and understanding of understand the Orgel and Tanabe-Sugano diagrams for d^1 –d^9 octahedral and tetrahedral transition metal complexes of 3d series stonewly prepared metal complexes.

CO 4: To understand the concept of Term symbols and Electronic spectra and Magnetic properties of complexes.

CO 5: Develop interest in the areas of magnetic properties of transition and inner transition metal complexes – spin and orbital moments – quenching of orbital momentum by crystal fields in complexes.

Course learning outcome (LOs):

At the end of the course, the learners should be able to:

LO 1: Explain idea of structure and bonding theories of inorganic compounds.

LO 2: Interpret Walsh diagram for other liner and bent molecules

LO 3: Introduce electron counting rules for higher boranes.

LO 4: Analyze the preparation and structures of heteropoly acids.

LO 5: Understanding structure and bonding in coordination compounds.

LO 6: Explain selections rules, Tanabe-Sugano diagrams. Orgel diagrams.

LO 7: Experimentally identify the covalence in metal complexes.

LO 8: To calculate the magnetic susceptibility of metal complexes.

LO 9: To understand and analyse structure-property correlation of coordination compounds

LO 10: design new coordination compounds based on a fundamental understanding of their electronic properties

UNIT-1 **[12 Hours]**

Structure & Bonding: VSEPR theory and applications (PCl_5 SF_6, IF_7, ClF_3 and SF_4) Molecular orbital theories in explaining the structures of simple molecules C_2, N_2, O_2, F_2, CO and NO.

Bent's rule, Non-valence cohesive forces. Walsh diagrams for linear (BeH_2) and bent (H_2O) molecules.

UNIT-II **[12 Hours]**

Inorganic cage and ring compounds – preparation, structure and reactions of boranes (special reference to B_{12} icosahedra), carboranes, metallocarboranes, Boron–Nitrogen ($H_3B_3N_3H_3$), Phosphorus–Nitrogen ($N_3P_3Cl_6$) and Sulphur-Nitrogen (S_4N_4, (SN)x) cyclic compounds. Electron counting rules in boranes – Wades rules (Polyhedral skeletal electron pair theory).
Polyacids: Introduction to polyacids- Types of polyacids-Structures of Polyacids $[Mo_7O_{24}]^{6-}$, $[V_{10}O_{28}]^{6-}$ and $[W_4O_{16}]^{8-}$, Heteropolyacids- properties of heteropolyacids, structures of heteropolyacids and theories , Pauling's theory and keggin's theory.

UNIT-III **[12 Hours]**

Coordination compounds: Crystal field theory - crystal field splitting patterns in octahedral, tetrahedral, tetragonal, square planar, square pyramidal and trigonal bipyramidal geometries. Calculation of crystal field stabilization energies. Factors affecting crystal field splitting energies – Spectrochemical series, Jahn – Teller theorem (static and dynamic Jahn-Teller theorem),
Molecular Orbital Theory of bonding for Octahedral, tetrahedral and square planar complexes. π-bonding and MOT-Effect of π - donor and π -acceptor ligands on Δo. Application of MO theory to square planar ($PtCl_4^{2-}$) and octahedral complexes $(CoF_6)^{3-}$, $(Co(NH_3)_6)^{3+}$.

UNIT- IV **[12 Hours]**

Electronic spectra of transition metal complexes: Term symbol-Energy Levels: Configurations, Terms, States and Microstates, calculation of Microstates for p^2 and d^2 Configuration, Russell- Saunders Coupling Schemes, derivation of terms for various configurations p^2 and d^2 configuration, spectroscopic Ground state, Hole Formalism, Energy ordering of terms (Hund's Rules).
Selection rules: Laporte orbital selection rule, spin selection rules. Splitting of energy levels and spectroscopic states: Orgel diagrams of d^1 to d^9 metal complexes. Interpretation of electronic spectra of aquo complexes of Ti(III), V(III), Cr(III), Fe(II), Co(II), Ni(II) and Cu(II).

UNIT- V **[12 Hours]**

Tanabe- Sugano diagrams for d^1 –d^9 octahedral and tetrahedral transition metal complexes of 3d series. Calculation of Dq, Racah Parameter (B), nephelauxetic effect and nephelauxetic parameter (β), Charge transfer (L→M and M→L) spectra of metal complexes.
Magnetic properties of metal Complexes: Types of magnetic behavior, Temperature independent paramagnetism. spin and orbital moments – quenching of orbital momentum by crystal fields in complexes. Orbital contribution to magnetic moment (Oh and Td Complexes)

Text books:

1. Advanced Inorganic Chemistry by F.A. Cotton and G. Wilkinson, IV Edition, John Wiley and Sons, New York, 1980.
2. Inorganic Chemistry by J.E. Huheey, III Edition, Harper International Edition, 1983.
3. Theoretical Inorganic Chemistry, II Edition by M.C. Day and J. Selbin, Affiliated East-West press Pvt. Ltd., New Delhi.

P Uma Devi
Head of the Department
Department of Organic Chemistry
G.V.P College for Degree & PG Courses (A)
Visakhapatnam-530 045