

1st Semester

MCYC101 Inorganic Chemistry

(3-1-0) 4 credits

Module I

Stereochemistry and Bonding in Main Group Compounds

VSEPR, Walsh diagrams, $d\pi$ - $p\pi$ bonds, Bent rule and energetics of hybridization, some simple reactions of covalently bonded molecules.

Metal - Ligand Bonding

Limitations of CFT, MOT: sigma bonding and energy level diagram in octahedral, tetrahedral and square planar complexes; pi-bonding and energy level diagram in octahedral complexes, angular overlap model.

Module II

Electronic Spectra of Coordination Compounds

Spectroscopic ground states, term symbols for d^n ions, Racah parameters, selection rules and intensities of bands, Orgel diagram, correlation and Tanabe-Sugano diagrams, spectra of 3d metal-aqua complexes of trivalent metal ions (d^1 - d^9), divalent Mn, Co and Ni, $CoCl_4^{2-}$, calculation of Dq , B and β parameters, CT spectra.

Spectral properties of lanthanide and actinide metal complexes.

Module III

Metal-ligand Equilibria in Solution

Stability of metal complexes, Stepwise and overall stability constant, factors affecting the stability constant, determination of stability constants and their applications, compositions of metal complexes by Job's method..

Inorganic Reaction Mechanism

Reactivity of metal complexes, inert and labile complexes, factors affecting the reactivity of complexes, mechanisms of substitution (acid, base and anation) reactions of octahedral complexes, isotope effects, Berry's pseudo rotation, Swain-Scott equation, substitution reactions of square planar complexes, trans-effect – theories and applications in synthesis of metal complexes, Redox reactions: mechanism of one electron transfer reaction (inner sphere and outer-sphere), Marcus theory for outer-sphere reactions.

Selected Text/Reference Books:

1. D. F. Shriver, P. W. Atkins, *Inorganic Chemistry*, 3rd Edn., Oxford University, Oxford, 1999.
2. N. N. Greenwood, A. Earnshaw, *Chemistry of the Elements*, Pergamon Press, 2nd Edn., 2002.
3. B. Douglas, D. McDaniel, and J. Alexander, *Concepts and Models of Inorganic Chemistry*, 3rd Edn., John Wiley, New York. 1993
4. D. Katakis, and G. Gordon, *Mechanism of Inorganic Reactions*, John Wiley & Sons: N. Y (1987).
5. J. E. Huheey, E. A. Keiter, R. L. Keiter & O. K. Medhi, *Principles of Structure and Reactivity (1st impression)*, Pearson Education, 2006.
6. F. Basolo & R. G. Pearson, *Mechanism of Inorganic Reactions*, Wiley Eastern, 1967.
7. F. A. Cotton, G. Wilkinson, C. A. Murillo & M. Bochmann, *Advanced Inorganic Chemistry*, 6th Edn, John Wiley, 1999.
8. R. G. Wilkins, *The Study of Kinetics and Mechanism of Reactions of Transition Metal Complexes*, Allyn & Bacon, Boston, 1974.
9. Robert B. Jordan, *Reaction Mechanisms of Inorganic and Organometallic Systems*, Oxford University Press, 1998.
10. A.K. Das and M. Das, *Fundamental Concept of Inorganic Chemistry*, Vol. 4 and 5, CBS Publisher & Distributor Pvt. Ltd., New Delhi, 2014.