

Course Code	Course Title	C	H	I	E	T
17P4CMC11	INORGANIC CHEMISTRY-IV	4	4	25	75	100

**UNIT I KINETICS AND MECHANISM OF COORDINATION COMPOUNDS** 12 Hrs

Substitution reactions - lability - inertness - substitution in octahedral complexes – Acid hydrolysis, base hydrolysis - anation reaction - square planar substitution reactions - factors affecting reactivity of square planar complexes - trans effect, theories of trans effect mechanisms of electron transfer reaction – outer and inner spheres reactions. Complementary and non-complementary reactions.

**UNIT II INORGANIC PHOTOCHEMISTRY** 12 Hrs

Excited states of coordination complexes - properties of excited states - photochemical pathways - energy transfer and charge transfer in photo chemistry - photoredox reaction - photo substitution reactions. Photoanation, photo aquation, photo rearrangement. Ruthenium polypyridyls - chromium polypyridyls. Photo chemical reactions of complex. Role of TiO<sub>2</sub> in solar energy conversion - Photochemical conversion and storage of solar energy.

**UNIT III LANTHANIDE AND ACTINIDES** 12 Hrs

The chemistry of lanthanides and actinides: Comparative study of lanthanide and actinide and comparative study of f and d block elements. Extraction of lanthanides from monazite minerals. Separation of lanthanides – Modern technique -ion exchange method, solvent extraction and paper chromatography. Lanthanide contraction and its consequence-Oxidation state; colour, spectral and magnetic properties - nuclear and non-Nuclear applications. Actinides contraction –separation of actinides-Ion-exchange methods. Applications of actinides.

**UNIT IV ORGANOMETALLIC CHEMISTRY** 12 Hrs

Introduction – EAN rule -importance of 18 and 16 electron rule in organometallics and its correlation to stability–metal carbene and carbyne complexes. Synthesis, structure and bonding in metal carbonyls, poly carbonyls, nitrosyls and dioxygen. IR study of metal carbonyls. Isolobal fragments. Synthesis, structure and bonding in  $\pi$ -complexes formed by olefin, acetylene, cyclopentadienyl complexes.

**UNIT V ORGANOMETALIC CATALYSIS** 12 Hrs

Oxidative addition, reductive elimination, insertion reaction (migration) and  $\beta$  - elimination. Catalytic mechanism in the following reactions: Homogeneous and heterogeneous catalysis-

Hydrogenation of olefins (Wilkinson's catalyst) – Tolman catalytic loops – hydroformylation (oxo process) – acetic acid from methanol – oxidation of alkenes to aldehydes and ketones (Wacker process) – synthetic gasoline (Fischer – Tropsch and Mobile process – olefin polymerisation (Ziegler – Natta catalyst) – cyclo oligomerisation of acetylenes (Reppé's or Wilke's catalyst).

### **Text Book(s):**

1. James Huheey, Inorganic Chemistry, Fourth edition, Harper – Collins, New York, 1993.
2. Cotton, F.A., Wilkinson, G., Murillo, C.A. and Bochmann, M., “Advanced Inorganic Chemistry”, Sixth Edition, John Wiley & Sons (Asia), Singapore, 2004.
3. Basolo, F. and Pearson, R.G., “Mechanism of Inorganic Reaction”, Second Edition, Wiley, New York, 1967.
4. Emeleus, H.J., and Sharpe, A., Modern Aspects of Inorganic chemistry, Fourth Edition, Routledge and Kegan Paul, United Kingdom, 1975
5. Beck, M.T., Chemistry of complex equilibria, Ellis Horwood series in inorganic chemistry, Second. Edition, Van Nostrand, 1970.
6. Rossotti, H., The study of Ionic equilibria, Longman, London, 1978.
7. Moeller, T., Chemistry of Lanthanides and Actinides, Pergamon Press, Oxford, 1973.
8. Barnard, A.K., Theoretical basis of Inorganic Chemistry, Tata-McGrawhill, New York, 1965.
9. J.C. Bailar Ed. Comprehensive Inorganic chemistry, Vol V, Pergamon Press, Oxford, 1973.
10. William Porter Field, Inorganic Chemistry- A unified approach, Academic Press inc., Elsevier, London, 1993.
11. Geoffery, G.L., Weighton M.S., Organic Metallic photochemistry Academic, Academic, New York, 1979.

### **Reference Books:**

1. D. Benson Mechanism of inorganic reactions in solutions, McGrawHill, London, 1968.
2. Langford, C.H., and Gray, H.B., Ligand substitution processes, Benjamin, Inc. , New York, 1966.
3. Adamson, S., “Concept of Inorganic Photochemistry”, Fifth Edition, John Wiley & Sons (Asia) Pvt. Ltd., Singapore, 1975
4. C.J. Ferradi - Elements of Inorganic Photo chemistry, John Wiley & Sons, New York, 1975.