

# In.M.Sc, Applied Chemistry (5 years)

## 6th Semester

FCYC602	Inorganic Chemistry-V	4-0-0	4
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### Module-I

#### Magnetic properties of coordination compounds

Types of magnetic behaviour, magnetic susceptibility and its determination by Gouy, Faraday and VSM method, Pascal's constants and constitutive corrections, paramagnetism, Curie-Weiss law, Van Vleck's equation (derivation excluded) and its applications, spin-orbit coupling, ferro- and anti-ferromagnetism coupling, super paramagnetism, high and low spin equilibria.

Anomalous magnetic moments, magnetic exchange coupling and spin crossover.

Magnetic properties of Lanthanide and Actinide metal complexes.

### Module-II

#### Organometallic chemistry-I

Stability and 18 electron rules (covalent and ionic),

Alkyls/aryl and hydrides: alkyls and aryls (metal alkyls stabilized carbanion,  $\beta$ -elimination, stable alkyls, agostic alkyls, reductive elimination, preparation of metal allyls).

Metal hydrides: synthesis, characterization, reactions, bridging hydrides.

Pi-complexes: Synthesis, bonding, properties and applications of alkenes and alkynes, allyls, diene, cyclopentane, dienyl, arenes.

Introductory idea on transition metal-carbon multiple compounds: carbene and carbyne.

### Module-III

#### Organometallic chemistry-II

Reactivity of organo-transition metal complexes: Coordinative unsaturation, substitution reactions (nucleophilic and electrophilic addition and abstraction), oxidative addition and reductive elimination, insertion reactions (insertion of CO, SO<sub>2</sub> and alkenes).

Catalysis by organo-transition metal complexes: Alkene isomerisation, hydrogenation and hydroformylation; Zeigler-Natta polymerization of ethylene, reduction of carbon monoxide by hydrogen (Fischer-Tropsch reaction).

#### Fluxional Organometallic Compounds

Fluxionality and dynamic equilibria in compounds such as  $\eta^2$ -olefin,  $\eta^3$ -allyl and dienyl complexes.

### Selected Text / Reference Books:

1. Robert H. Crabtree, The Organometallic Chemistry of the Transition Metals, by, Wiley 2014
2. John F. Hartwig, **Organotransition Metal Chemistry: From Bonding to Catalysis** by, University Science Books, 2009
3. Anthony F. Hill, Organotransition Metal Chemistry, Royal Society of Chemistry,
4. Tutorial Chemistry Text, 2002. Chapters 1 to 7.
5. Organometallics: A concise Introduction, Ch. Elshbroich and A Salzer, VCH, 2006.
6. Organotransition Metal Chemistry: Applications to Organic Synthesis, S.G.Davies, Pergamon 1982.

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7. A.K. Das and M. Das, *Fundamental Concept of Inorganic Chemistry*, Vol. 4 and 5, CBS Publisher & Distributor Pvt. Ltd., New Delhi, 2014.
8. R.C. Mehrotra and A. Singh, *Organometallic Chemistry*, New Age International Publishers, 2<sup>nd</sup> Edn, 2000.
9. R.L. Dutta and A. Samal, *Elements of Magnetochemistry*, S. Chand & Company Ltd., 1982.