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Inorganic Chemistry
Instructor: M. Eswaramoorthy

Periodic properties of the elements and Introduction to Bonding: Arrangements of the elements in group in the periodic table and their general properties, chemistry of main group elements, periodic trends, acid-base behavior, inorganic thermodynamics, oxidation-reduction, symmetry and structure, ionic bond, covalent bond, metallic bond, crystal structures.
Coordination Chemistry: Bonding of transition metal complexes; Valence bond, Crystal Field and MO theory, and their limitations; d-orbital splitting in octahedral, square planar, square pyramidal, trigonal bipyramidal, and tetrahedral complexes; Effect of CFT on O_h and T_d symmetries, Jahn-Teller distortion, molecular orbital in coordination complexes (acceptor and donor), isomerism, magnetism and spectra, reaction mechanism in inorganic compounds/complex, stereochemistry, inner and outer sphere electron transfer mechanism. Electronic Spectra - UV-Vis, charge transfer, colors, intensities and origin of spectra, term symbols, selection rules for electronic transitions, Orgel and Tanabe-Sugano diagram.
Supramolecular Chemistry: Introduction, noncovalent interactions, concepts of supramolecular synthons, supramolecules and host-guest chemistry, applications in molecular biology and material chemistry.
Bioinorganic Chemistry: Metalloporphyrin (hemoglobin, myoglobin, chlorophyll), metalloenzymes (electron transfer protein), Na/K ion pump, Iron-Sulfur protein, Vitamin B12, Nitrogen fixation. O_2 binding properties of heme (haemoglobin and myoglobin) and non-heme proteins hemocyanin& hemerythrin), their coordination geometry and electronic structure, co-operativity effect, Hill coefficient and Bohr Effect.
Biomineralization: Biomineral types of functions, general principles of biomineralization, chemical control of biomineralization, bio-inspired material chemistry.
Organometallic Chemistry: Valence electron count (16/18 electron rules); structure and bonding in mono and polynuclear metal carbonyls; substituted metal carbonyls and related compounds; synthesis and reactivity of metal carbonyls; vibrational spectra of metal carbonyls; dinitrogen and dioxygen as ligands in organometallic compounds. Reactions of organometallic complexes: Substitution, oxidative addition, reductive elimination, insertion and deinsertion; Catalysis- Hydrogenation, Hydroformylation, Monsanto process, Wacker process, alkene polymerization, Ziegler-Natta polymerization; Metal carbonyls and other transition metal complexes with pi acid ligands.

Reference Books:

1. Inorganic Chemistry: Principles of Structure and Reactivity (Fourth Edition) James E. Huheey, Ellen A. Keiter, R. L. Keiter, (Addison-Wesley Publishing Company)
2. Concepts and Models of Inorganic Chemistry (Third Edition) Bodie Douglas, Darl McDaniel, John Alexander
3. Inorganic Chemistry (Third Edition) D.F. Shriver and P. W. Atkins
4. Advance Inorganic Chemistry F. A. Cotton, G. Wilkinson, (6th or 7th Edition) Wiley, New York.
5. Concise Inorganic Chemistry J. D. Lee, Fifth Edn., Blackwell Science.

6. Biomineralization; Principles and Concepts in Bioorganic Materials Chemistry S. Mann
7. Descriptive Inorganic Chemistry, Rayner-Canham and Overtone (4th Edition)