

Inorganic Chemistry Semester III

| | | Total Hours:- | 90 hrs. |
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| 1 | Applications of Spectroscopy | | 21 Hrs |
| I | Electron Spin Resonance Spectroscopy | | 8 Hrs |
| | Hyperfine Coupling, spin polarization for atoms and transition metal ions, spin-orbit coupling and significance of g-tensors, application to transition metal complexes (having one unpaired electron) including biological systems and to inorganic free radicals such as PH_4 , F_2^- and $[\text{BH}_3]$. | | |
| II | Nuclear Magnetic Resonance Spectroscopy | | 7 Hrs |
| | Applications of multinuclear NMR with emphasis on ^{11}B , ^{19}F , ^{31}P , ^{125}Te , ^{119}Sn and ^{195}Pt NMR. | | |
| III | Mössbauer Spectroscopy | | 6 Hrs |
| | Basic Principles, spectral parameters and spectrum display. Application of the technique to the studies of (1) bonding and structures of Fe^{+2} and Fe^{+3} compounds including those of intermediate spin, (2) Sn^{+2} and Sn^{+4} compounds – nature of M-L bond, coordination number, structure and (3) detection of oxidation state and in equivalent MB atoms. | | |
| 2 | Bioinorganic Chemistry | 28 Hrs(1 Hr/ week) | |
| I | Metal Ions in Biological Systems | | 17 Hrs |
| | (a) Essential and trace metals. | | |
| | (b) Na^+/K^+ Pump. | | |
| | (c) Vitamin B_{12} , methyl cobalamine, Biomethylation. | | |
| | (d) Heme proteins and oxygen uptake, structure and function of hemoglobin, myoglobin, homocyanins and hemerythrin, model synthetic complexes of iron, cobalt and copper | | |
| II | Electron Transfer in Biology | | 6 Hrs |
| | Structure and function of metalloproteins in electron transport processes-cytochromes and ion- sulphur proteins, synthetic models. | | |
| III | Nitrogenase | | 5 Hrs |
| | Biological nitrogen fixation, molybdenum nitrogenase, spectroscopic and other evidence, other nitrogenases model systems. | | |
| 3 | Environmental Chemistry | | 16 Hrs |
| I | Inorganic Pollutants | | 16 Hrs |
| | a. Aquatic pollution: water quality parameters viz. dissolved oxygen, biochemical oxygen demand, heavy metals Cl^- , SO_4^{2-} , NO_3^- , PO_4^{3-} contents. | | |
| | b. Soil pollution (including agricultural, viz. pesticides, fertilizers, plastics and metals), Waste treatment. | | |
| | c. Industrial pollution, viz. cement, sugar, distillery, drug, paper and pulp, thermal power plants, metallurgy. | | |
| | d. Domestic pollution viz. sewage, detergents, oil pollutants and its management | | |

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| 4 | Selected Topics | 25 Hrs |
| I | Chemistry of less familiar metals: Os, Ir, Ru, Rh, Pd, | 6 Hrs |
| II | Platinum phosphine complexes | 3 Hrs |
| III | General method of preparation and important reactions (insertion reactions, metathetical reactions, Lewis acid-base reactions, reactions with protic compounds) of metal and metalloid amides. | 4 Hrs |
| IV | Preparation of important radio isotopes (${}^3_1\text{H}$, ${}^{14}_6\text{C}$, ${}^{22}_{11}\text{Na}$, ${}^{32}_{15}\text{P}$, ${}^{35}_{16}\text{S}$) and applications of coordination compounds of Tc^{99} as imaging agents in Nuclear Medicine. | 5 Hrs |
| V | Principle, instrumentation and applications of TGA and DTA Ion exchange- preparation, mechanism, of exchange capacity of ion exchangers, Principle and applications of photometric and colorimetric techniques in inorganic analysis. | 7 Hrs |

Books Suggested

1. Structural Methods in Inorganic Chemistry, E.A.V. Ebsworth, D.W.H Rankin and S. Craddock, ELBS.
2. Progress in Inorganic Chemistry vol., 8 ed., F.A. Cotton, vol.,15, ed. S.J. Lippard, Wiley.
3. NMR, NQR, EPR and Mössbauer spectroscopy in Inorganic Chemistry, R.V. Parish, Ellis Horwood.
4. Practical NMR Spectroscopy, M. L. Martin, J. J. Delpeuch and G. J. Martin, Heyden.
5. Principles of Bioinorganic Chemistry, S.J. Lippard and J.M. Berg, University Science Books.
6. Bioinorganic Chemistry, I. Bertini, H.B. Gray, S.J. Lippard & J.S.Valentine, University Science Books.
7. Inorganic Biochemistry vols I and II. ed., G.L. Eichhorn, Elsevier.
8. Progress in Inorganic Chemistry, vols 18 and 38 ed. J.J. Lippard, Wiley.
9. Environmental Chemistry, A.K. De, Wiley Eastern.
- 10 Environmental Pollution Analysis, S.M. Khopkar, Wiley Eastern
- 11 Advanced Inorganic Chemistry, F.A. Cotton and G. Wilkinson.
- 12 Inorganic Chemistry, J.E. Huheey.
- 13 Nuclear and Radiochemistry, G. Friedlander and J.W. Kennedy
- 14 Essentials of Nuclear Chemistry, H.J. Arniker.
- 15 Quantitative Inorganic Analysis, A.I. Vogel.