

Syllabus of Course Work for Ph. D.(Chemistry)

Total Hours 90 (6 Credits)

Max. Marks 100

Unit I

(16hrs)

Principles and applications of UV-Vis, IR, NMR (^1H , ^{13}C), mass, ESR and NQR spectroscopy for the structural elucidation of compounds. Two Dimensional NMR Spectroscopy: COSY, NOSEY, INDOR and SPI, DEPT spectra, CIDNP techniques and MRI.

Thermal Methods of Analysis: Principle and applications of TGA, DTA and DSC.

Unit II

(18hrs)

Separation techniques Purification: Crystallization, sublimation, fractional crystallization, distillation techniques (simple distillation, steam distillation, distillation under reduced pressure, fractional distillation) Solvent extraction Chromatography: Thin layer chromatography, Column chromatography, Paper chromatography, Gas liquid chromatography, Ion exchange chromatography, High pressure liquid chromatography (HPLC) Gel Permeation Chromatography: Size exclusion chromatography (Gel filtration) with special reference to separation of proteins, carbohydrates and nucleic acids.

Unit III

(18hrs)

Nanomaterials: Definition Methods and of Preparation, Properties of Nanomaterials: Physio-Chemical and optical, Electrical and Electronics properties. Phosphorescent Materials. Luminescence, Types of Luminescence, Fluorescence, Phosphorescence, Frank Condon Principle, Jablouski, diagram, Organic Electroluminescence, Organic Light Emitting diode, Structure and working of OLED, Application of OLED.

Unit IV

(20hrs)


Solid State Chemistry: Crystal and molecular structure studies of organic and inorganic compounds by x-ray crystallography (single crystals), crystal growth, Bond-lengths and bond angles, torsion angle, Hydrogen bonding interactions, Packing, Disorder, Polymorphism & pseudo polymorphism. Electrochemistry: Electrochemical oxidation and degradation of organic compounds, Photo degradation, catalytic reactions and electrical, Effect of inhibitors on the rate of corrosion.


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Formation of C-C bonds via organometallic reagents: (i) Organo-lithium Reagents, (ii) Organo-magnesium Reagents, (iii) Organo-titanium Reagents, (iv) Organo-cerium Reagents, (v) Organo-copper Reagents, (vi) Organo-chromium Reagents, (vii) Organo-zinc Reagents, (viii) Organo-boron Reagents, (ix) Organosilicon Reagents and (x) Palladium-Catalyzed coupling reactions. Aromatic C-C bond formation using Organo-boronic derivatives (The Suzuki reaction protocol): (i) Homocoupling of aryl boronic acids catalyzed by palladium (ii) Suzuki cross coupling of aryl boronic acids with aryl halides, (iii) Recent improvements in the Suzuki reaction for aryl-aryl bond formation and (iv) Use of new technologies in Suzuki cross coupling of aromatic substrates.

References:

1. Organic Spectroscopy, William Kemp, English Language Book Society, Macmillan, 1987.
2. Application of Absorption Spectroscopy of Organic Compounds, John R. PrenticeHall Dyer of India Private Limited., New Delhi, 1974
3. Spectrometric Identification of organic Compounds, 4th edition, Robert M. Silverstein, Clayton Bassler and Terence. Morrill, John Wiley & Sons, New York, 1981.
4. An International to Practical Organic Chemistry – Robert, Vingrove etc.
5. Fundamental of Analytical Chemistry, Skoog, West, Hollar and Crouch, 8th Ed.
6. Modern Analytical Chemistry by David Harvey, 3rd Ed.
7. K. Albert, L. Lehninger, D.I. Nelson, M.M. Cox, Principles of Biochemistry, CBZ publishers, 1st edition, New Delhi, 1993.
8. Encyclopedia of Chemical Technology- Kirck – Othmerseries.
9. Inorganic Chemistry (4th edition): J.E. Huheey, E.A. Kelter and R.I. Kelter.
10. Advanced Inorganic Chemistry (5th edition): F.A. Cotton and G. Wilkinson: Wiley
11. An Introduction to X-ray Crystallography, Michael M. Woolfson
12. Crystal structure Determination, Werner massa & Robert O. Could


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