Chemistry

Subject code: 18BSCH03 **Total hours: 60**

Credits : 3:1:0 **Hours/week: 5**

Module 1. Thermodynamics, Electrochemistry and corrosion (12 Hours)

Thermodynamic functions: Energy, entropy and free energy. Estimations of entropy and free energies. Use of free energy considerations in metallurgy through Ellingham diagrams.

Electrochemistry: Electrode potentials: Origin of electrode potential using Nernst electrolytic pressure theory, Introduction to single electrode potential, Derivation of Nernst equation, Electrochemical cell: Construction and working of Daniel cell using Zn and Cu electrodes, electrochemical series, types of electrodes (Hydrogen, Calomel electrode, glass electrode). Numerical problems based on determination of EMF.

Corrosion- causes- factors- electrochemical theory of corrosion, types-chemical, electrochemical corrosion (galvanic, differential aeration), corrosion control - material selection and design aspects - electrochemical protection – sacrificial anode method and impressed current cathodic method.

Module 2. Periodic properties and Molecular structure (12 hours)

Classification as s, p, d & f block elements, variation of atomic volume, atomic and ionic radii ionization potential, electron affinity and electronegativity along periods and groups, Effective nuclear charge, penetration of orbitals (shielding and de-sheilding), polarizability.

Crystal field theory and the energy level diagrams for transition metal ions and their magnetic properties. MO Theory and Energy level diagrams – Bonding and antibonding orbitals – Application of MO Theory to H_2, He_2, N_2, O_2, HF and CO.

Module 3. Stereochemistry, Organic reactions and synthesis of a drug molecule (12 Hours)

Structural isomers and stereoisomers, configurations and symmetry and chirality, enantiomers, diastereomers, optical activity, absolute configurations, conformational

analysis of alkanes and cycloalkanes.

Introduction to reactions involving substitution, addition, elimination, oxidation, reduction, cyclization and ring openings. Synthesis of a commonly used drug molecule (Aspirin, paracetamol, phenacetin).

Module 4. Nanomaterials and their spectroscopic characterization (12 Hours)

Introduction, preparation of nanomaterials: Top down and bottom up approaches, mechanical grinding, wet chemical synthesis (Sol-gel method). Properties of nanomaterials: optical properties, electrical properties, magnetic properties, Applications of nanomaterials.
Principles, instrumentation and applications of UV-Vis spectroscopy (UV-VIS), Infra-red spectroscopy, X-ray diffraction (powder) and scattering (Scanning Electron Microscope) methods.

Module 5. Environmental Pollution and waste management (12 hours)

Air Pollution: Types of pollutants, source effects, sink and control of primary pollutants – CO, Nox, HC, Sox and particulates, effects of pollutants on man and environment – photochemical smog and acid rain.

Water Pollution: Classification of pollutants, their sources, waste water treatment – domestic and industrial.

Soil Pollution: Composition of soil, classification and effects of soil pollutants and their control.

Solid Waste Pollution: Classification, waste treatment & Disposal methods (Composting, sanitary landfilling, thermal processes, recycling and reuse). Hazardous Wastes: Classification – radioactive, biomedical and chemical, treatment and disposal – physical, chemical and biological processes.

References

Module	Reference	
1	Principles of Physical Chemistry by B.R. Puri , L.R.Sharma & M.S.Pathania Physical Chemistry, by P. W. Atkins J.C. Kuriacose, J. Rajaram, Chemistry in Engineering and Technology, Volume I/II, Tata McGraw-Hill Publishing Co. Ltd.New Delhi, 1988. Engineering Chemistry by Jain & Jain DhanpatRai & Co.Publications.	Thermodynamics Electrochemistry, Corrosion
2	Concise Inorganic Chemistry (4th Edition) By J. D. Lee Principles of inorganic chemistry, 2017	Periodic properties and molecular

	by B.R. Puri and L.R. Sharma & K.C. Kalia	structure
3	Stereochemistry: Conformation and Mechanism - P. S. Kalsi Organic chemistry by Morrison and boyd A Guidebook to Mechanism in Organic Chemistry by Peter sykes A Text Book of Organic Chemistry, Arun Bahl & B.S.Bahl	Stereochemistry Organic synthesis
4	C. N. R. Rao, Chemistry of Nanomaterials, Volume I and II, Wiley Publication, 1996. Engineering Chemistry, Shikha Agarwal. –2015,Cambridge university bridge Fundamentals of Molecular Spectroscopy, by C. N. Banwell Scanning Electron Microscopy and X-ray Microanalysis, Goldstein, J., Newbury, D.E., Joy, D.C., Lyman, C.E., Echlin, P., Lifshin, E., Sawyer, L., Michael, J.R.	Nano-materials Spectroscopy
5	Environmental Chemistry 1st Edition (English, Paperback, S. C. Bhatia)	Pollution and waste management

Subject Code: 18BSCH03L **Duration**: 2 hrs/week

PART-A

1A. Determination of Active Chlorine Content in Bleaching powder.

2A. Adsorption of Acetic acid on Charcoal.

3A. Determination of saponification/acid value of an oil

4A. Determination of partition coefficient of a substance between two immiscible liquids

5A. Synthesis of Thiokol rubber.

6A. Thin Layer Chromatography

PART-B

1B. Potentiometric estimation of FAS using standard $K_2Cr_2O_7$ solution.

2B. Conductometric estimation of an acid (HCl) using standard NaOH solution.

3B. Determination of Viscosity co-efficient of a given liquid Using Ostwald's Viscometer

4B. Determination of Surface Tension of Lubricants Using Stalagmometer..

5B. Determination of the rate constant of a reaction

6B. Preparation of Metal oxide nanoparticles.

Reference

1. Vogel's Qualitative Inorganic Analysis (7th Edition) 7th Edition
2. Text Book of engineering chemistry by R. N. Goyal and Harrmendra Goel, Ane Books Private Ltd.,
3. A textbook on experiments and calculation Engg. S.S. Dara.
4. Instrumental methods of chemical analysis, Chatwal, Anand, Himalaya Publications (5th Edition)