

MEDICINAL CHEMISTRY

CHE301

UNIT-I

Structure and activity : Relationship between chemical structure and biological activity (SAR). Receptor Site Theory. Approaches to drug design. Introduction to combinatorial synthesis in drug discovery. Factors affecting bioactivity. QSAR-Free-Wilson analysis, Hansch analysis, relationship between Free- Wilson analysis and Hansch analysis.

UNIT-II

Pharmacodynamics: Introduction, elementary treatment of enzymes stimulation, enzyme inhibition, sulfonamides, membrane active drugs, drug metabolism, xenobiotics, biotransformation, significance of drug metabolism in medicinal chemistry.

UNIT-III

Antibiotics and antibacterial: Introduction, Antibiotic β -Lactam type - Penicillin's, Cephalosporin's, Ant tubercular – Streptomycin, Broad spectrum antibiotics – Tetracycline's, Anticancer - Dactinomycin (Actinomycin D)

UNIT-IV

Antifungal –polyenes: Antibacterial – Ciprofloxacin, Norfloxacin, Antiviral – Acyclovir Antimalarials: Chemotherapy of malaria. SAR. Chloroquine, Chloroguanide and Mefloquine

UNIT-V

Non-steroidal Anti-inflammatory Drugs : Diclofenac Sodium, Ibuprofen and Netopam Antihistaminic and antiasthmatic agents. Terfenadine, Cinnarizine, Salbutamol and Beclomethasonedipropionate.

References Book:

Introduction to medicinal chemistry, A. Gringuage, Wiley-VCH.

Wilson and Gisvold's Text Book of Organic Medicinal and Pharmaceutical Chemistry, Ed Robert F Dorge.

An Introduction to Drug Design, S.S. Pandeya and J.R. Dimmock, New Age Internaitonal.

Burger's Medicianl Chemistry and Drug Discovery, Vol-I (Chapter 9 and Chapter 14), Ed. M.E.Wolff, John Wiley.

Goodman and Gilman's Pharmacoloical Basis of Therapeutics, Mc GRaw-Hill.

PHOTOCHEMISTRY

CHE302

UNIT-I

Photochemical Reactions:

Interaction of electromagnetic radiation with matter, types of excitations, fate of excited molecule, quantum yield, transfer of excitation energy, actinometrical.

UNIT-II

Determination of Reaction Mechanism :

Classification, rate constants and life times of reactive energy state, determination of rate constants of reactions. Effect of light intensity on the rate of photochemical reactions. Types of photochemical reactions-photo dissociation, gas-phase photolysis. A'.1.

UNIT-III

Photochemistry of Alkenes:

Intermolecular reactions of the olefin bond-geometrical isomerism, cyclisation reactions, rearrangement of 1,4- and 1,5-dienes.

Photochemistry of Aromatic Compounds

Isomerization's, additions and substitutions.

UNIT-IV

Photochemistry of Carbonyl Compounds:

Intermolecular reactions of carbonyl compounds-saturated, cyclic and acyclic, b,g unsaturated and a, b unsaturated compounds, cyclohexadienones. Intermolecular cycloaddition reactions-dimerization's and oxetane formation.

UNIT-V

Miscellaneous Photochemical Reactions :

Photo-Fries reactions of annelid's, Photo-Fries rearrangement. Barton reaction. Singlet molecular oxygen reactions. Photochemical formation of smog. Photo degradation of polymers. Photochemistry of vision.

Suggested Readings :

Physical Methods for Chemistry, R.S. Drago, Saunders Compnay.

Structural Methods in Inorganic Chemistry, E.A.V. Ebsworth, D.W.H. Rankin and S. Cradock, ELBS.

Infrared and Raman Spectral : Inorganic and Coordination Compounds K. Nakamoto, Wiley.

Progress in Inorganic Chemistry vol., 8, ed., F.A. Cotton, vol., 15 ed. S.J. Lippard, Wiley.

ENVIRONMENTAL

CHE303

UNIT-I

Atmosphere :

Atmospheric layers, Vertical temperature profile, heat/radiation budget of the earth atmosphere systems. Properties of troposphere, thermodynamic derivation of lapse rate. Temperature inversion. Calculation of Global mean temperature of the atmosphere. Pressure variation in atmosphere and scale height. Biogeochemical cycles of carbon, nitrogen, sulphur, phosphorus, oxygen. Residence times.

Atmospheric Chemistry :

Sources of trace atmospheric constituents : nitrogen oxides, sulphurdioxide and other sulphur compounds, carbon oxides, chlorofluorocarbons and other halogen compounds, methane and other hydrocarbons.

Tropospheric Photochemistry :

Mechanism of Photochemical decomposition of NO_2 and formation of ozone. Formation of oxygen atoms, hydroxyl, hydroperoxy and organic radicals and hydrogen peroxide. Reactions of hydroxyl radicals with methane and other organic compounds. Reaction of OH radicals with SO_2 and NO_2 . Formation of Nitrate radical and its reactions. Photochemical smog meteorological conditions and chemistry of its formation.

UNIT-II

Air Pollution :

Air pollutants and their classifications. Aerosols-sources, size distribution and effect on visibility, climate and health.

Acid Rain

Definition, Acid rain precursors and their aqueous and gas phase atmospheric oxidation reactions. Damaging effects on aquatic life, plants, buildings and health. Monitoring of SO_2 and NO_2 . Acid rain control strategies.

Stratospheric Ozone Depletion

Mechanism of Ozone formation, Mechanism of catalytic ozone depletion, Discovery of Antarctic Ozone hole and Role of chemistry and meteorology. Control Strategies.

Green House Effect

Terrestrial and solar radiation Spectra, Major green house gases and their sources and Global warming potentials. Climate change and consequences.

Urban Air Pollution Exhaust emissions, damaging effects of carbon monoxide. Monitoring of CO. Control strategies.

UNIT-III

Aquatic Chemistry and Water Pollution :

Redox chemistry in natural waters. Dissolved oxygen, biological oxygen demand, chemical oxygen demand, determination of DO, BOD and COD. Aerobic and anaerobic reactions of organic sulphur and nitrogen compounds in water acid-base chemistry of fresh water and sea water. Aluminum, nitrate and fluoride in water. Petrification. Sources of water pollution. Treatment of waste and sewage. Purification of drinking water, techniques of purification and disinfection.

UNIT-IV

Environmental Toxicology :

Toxic heavy metals : Mercury, lead, arsenic and cadmium. Causes of toxicity. I Bioaccumulation, sources of heavy metals. Chemical speciation of Hg, Pb, As, and Cd. Biochemical and damaging effects.

Toxic Organic Compound : Pesticides, classification, properties and uses of organ chlorine and ionospheres pesticides detection and damaging effects. Polychlorinated biphenyls : Properties, use and environmental continuation and effects.

Polynuclear Aromatic Hydrocarbons : Source, structures and as pollutants.

UNIT-V

Soil and Environmental Disasters :

Soil composition, micro and macronutrients, soil pollution by fertilizers, plastic an metals. Methods of re-mediation of soil. Bhopal gas tragedy, Chernobyl, three mile island, Minimtata Disease, Sevoso (Italy), London smog.

Suggested Readings :

Environmental Chemistry, Colin Baird, W.H. Freeman Co. New York, 1998.

Chemistry of Atmospheres, R.P. Wayne, Oxford.

Environment Chemistry, A.K. De, Wiley Eastern, 2004.

Environmental Chemistry, S.E. Manahan, Lewis Publishers.

Introduction to atmospheric Chemistry, P.V. Hobbs, Cambridge..

POLYMERS

CHE304

UNIT-I

Basics :Importance of polymers. Basic concepts: Monomers, repeat units, degree of polymerization Linear, branched and network polymers. Classification of polymers. Polymerization: condensation, addition/radical chain-ionic and co-ordination and copolymerization. Polymerization conditions and polymer reactions. Polymerization in homogeneous and heterogeneous systems.

UNIT-II

Polymer Characterization :Poly dispersion -average molecular weight concept. Number, weight and viscosity average molecular weights. Polydispersity an molecular weight distribution. The practical significance of molecular weight. Measurement of molecular-weights. End-group, viscosity, light scattering, osmotic and ultracentrifugation methods.

UNIT-III

Analysis and testing of polymers :Chemical analysis of polymers, spectroscopic methods, X-ray diffraction study. Microscopy. Thermal analysis and physical testing-tensile strength. fatigue, impact, Tear resistance, Hardness and abrasion resistance.

UNIT-IV

Inorganic Polymers :A general survey and scope of Inorganic Polymers special characteristics, classification, homo and hetero atomic polymers.

Structure, Properties and Applications of

- a. Polymers based on boron-borazines, boranes and carboranes.
- b. Polymers based on Silicon, silicone's polymetalloxanes and polymetallosiloxanes, silazanes.

UNIT-V

Structure, Properties and Application of Polymers :

- a. Polymers based on Phosphorous-Phosphazenes, Polyphosphates
- b. Polymers based on Sulphur-Tetrasulphur tetranitride and related compounds.
- c. Co-ordination and metal chelate polymers.

Suggested Readings :

Inorganic Chemistry, J.E. Huheey, Harper Row.

Developments in Inorganic polymer Chemistry, M.F. Lappert and G.J. Leigh.

Inorganic polymers- N.H. Ray.

Inorganic polymers, Graham and Stone.

INDUSTRIAL CHEMISTRY- (HEAVY CHEMICALS & PETROLEUM)

CHE305

UNIT-I

Water, Gases and Heavy Chemicals Water: Water Pollutants, their classes with examples, Biochemical oxygen demand, thermal pollution, pollution by fertilizers, detergents, pesticides and industrial wastes. .

Water Purification : Classical and modern Methods - Ion exchange, electro dialysis, Reverse osmosis. Softening of Hard water. Chlorination and fluoridation.

UNIT-II

Gases : Chemistly Large-scale production storage, hazards and uses of the following industrial gases: Hydrogen, oxygen, nitrogen, carbon dioxide, chlorine, fluorine, sulphur dioxide, phosgene, acetylene, argon, neon and helium.

Heavy Chemicals : Manufacture, Physical properties, Analysis, Hazards and applications of the following chemicals : HCL, H₂SO₄, HNO₃, H₃F0₄, poly phosphoric acid, NaHCO₃, NA₂CO₃, NaOH, NaCL, Na₂S₂O₃, Bleaching Powder, Bromine.

UNIT-III

Coal & Petroleum Coal : Origin and economic importance of coal. Coal composition, Coal carbonization, Coal gasification, Coal Gas, Water Gas, Producer gas, coal tar industry and manufacture of coal tar based chemicals and their importance. Role as carcinogens, Non-fuel uses of coal, and Cl Chemistry based on MeCOOH, CH₄ and CHO

UNIT-IV

Petroleum : Origin and composition, Refining, Reforming Fractionation; Cracking; knocking and Octane number, Kerosene and Napthene; Liquified petroleum gas (I.P.G.) Synthetic Gas, Synthetic Petrol, Petrochemicals, manufacture of ethylene propylene. Butedmne, xylenes, etc. Economic importance with particular reference to India.

UNIT-V

Fats & Oils Fats & Oil Natural Fats, Edible and Industrial Oils of vegetable origin, common fatty acids and glyceride. Hydrogenation of Unsaturated oils, manufacture of Vanaspati and margarine.

Suggested Readings :

Industrial Chemistry J.S Jangwan, A. S Mathuria

Inorganic Chemistry, J.E. Huheey, Harper Row.

Structural Methods in Inorganic Chemistry, E.A.V. Ebsworth, D.W.H. Rankin and S. Cradock, ELBS.

. Progress in Inorganic Chemistry vol., 8, ed., F.A. Cotton, vol., 15 ed. S.J. Lippard, Wiley.

