

M.Sc. I semester Pharmaceutical Chemistry
PCSC-1.6-(L)-INDUSTRIAL CHEMISTRY

UNIT – I

Unit Processes and Operations

Introduction, relevance of various organic unit processes in chemical industries. Le-Charlie's principle, types of process, types of reactors, effect of shape and design of reactors. Factors influencing the optimum yield, I law of thermodynamics, process principles – Thermodynamics kinetics, reagents – their application, back mixing etc., with respect to some selected unit process – nitration, halogenation, esterification, sulphonation, diazotization, oxidation, reduction.

[16 Hours]

UNIT – II

Unit Operations:

Evaporation:

Introduction, principle, types of evaporation – vacuum, film, steam heated, open vessel, closed vessel, under reduced pressure, multiple effect evaporation.

Distillation: Role of pressure on distillation, vapour – liquid equilibrium, flash distillation, batch distillation, rectification of binary mixtures, types of equipments and accessories for distillation.

Crystallization: Role of stability, types of crystallization – atmospheric cooling with stirring, agitated batch crystallization, sensors – Walker crystallization.

Drying: Theory, important variables, different drying equipments used in industries.

Extraction: Liquid–liquid, solid-liquid extraction, counter current extraction, extraction equipments and their applications.

[16 Hours]

UNIT – III

Transportation of Fluids

Transportation of fluids

Pipes, fittings, valves, pumps, fans, blowers, compressors used in industries.

Filtrations: Theory of filtrations, effect of temperature, pressure, viscosity, cake thickness, filter medium & filter aids, types of filters.

Mixing: Mixing operation and selection of mixtures for dry blending of solids, mixing of immiscible liquids and suspended solids in liquids.

[16 Hours]

UNIT – IV

Industrial Management:

Rational Industrialization – Factors favouring and inhibiting industrial action.

Industrial Location – Weber's theory, factors of location and selection of site.

Personal Management – Concept, scope, role and functioning.

Human Resource Development – Contents.

Personnel Problems – Absenteeism, employees turnover, motivation, morale enforcement and discipline.

Industrial Relations – Meaning, nature and significance.

Industrial Disputes – Methods of settling industrial disputes. Collective bargaining, workers participation in management.

[16 Hours]

M.Sc. II semester Pharmaceutical Chemistry
PCSC-2.5-(L)-(Bio-inorganic and Organometallic Chemistry)

64 Hrs

Bio-inorganic Chemistry:

UNIT – I

Metal Ions in Biological Systems:

Essential and types metals, active transport of Na and K, ionophores, metalloproteins as enzymes – carboxy peptidase, (catalases, peroxidases, cytochrome P450, copper oxidases), vitamin B₁₂ coenzyme, enzyme action inhibition and poisoning. Synthetic model compounds. Metals in medicine – Metal deficiency (Fe, Mn, Cu and Zn), chelation therapy and metal complexes as drugs. [16 Hours]

UNIT – II

Heme and Non-heme Systems:

Chlorophyll and its role in photosynthesis, transport and storage of dioxygen – heme proteins, oxygen uptake, functions of haemoglobin, myoglobin, hemerythrin, and hemocyanins, synthetic oxygen carriers, metal storage and transport – ferritin and transferrin, Electron transfer proteins – cytochromes and iron sulphur proteins. Biological nitrogen fixation, in-vivo and in-vitro nitrogen fixation. [16 Hours]

Organometallic Chemistry

UNIT – III

Classification & nomenclature of organometallic compounds – 16 & 18 electron rules – electron counting by neutral atom & oxidation state method.

Organometallic compounds of main group elements:- General methods of synthesis structure & bonding in alkyls of Li, Mg, & Al. TM alkyls (synthesis and stability), metal carbonyls, nitrosyls, carbenes, Fischer and Shock synthesis and bonding.

General methods of synthesis, structure & bonding in metal olefins, metal carbonyls and metallocenes. [16 Hours]

UNIT – IV

Organometallic Reaction mechanisms and catalysis:

Fundamental reactions, substitution in carbonyl complexes, Mechanisms, Insertion reactions, CO, SO₂, olefin insertions, oxidative additions, one electron, addition of oxygen, reductive elimination, CH activation, Use of Organometallic Compounds as catalysts – Catalytic behaviour – Homo catalysis – Anchoring of Catalysts

Hydrogenation. Hydrogenation of olefins (oxo reaction-cobalt and rhodium oxo catalysts), carbonylation of alcohols – Monsanto acetic acid process, Wacker process.

Polymerization of olefins and acetylenes: Ziegler – Natta catalysis systems.

Fischer – Tropsch reaction, Water Gas Shift reactions. [16 Hours]

M.Sc. II semester Pharmaceutical Chemistry
PCSC-2.6-(L)– Polymer Science and Technology

64 Hrs

UNIT- I

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 coordination and co-polymerization. Polymerization conditions and polymer reactions. Polymerization in homogenous and heterogeneous systems, Polymerization Techniques.

Polydispersion-average molecular weight concept.

Number, weight and viscosity average molecular weights. Polydispersity and molecular weight distribution. The practical significance molecular weight. Measurement of molecular weights. End-group, viscosity, light scattering, osmotic and ultracentrifugation methods. 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.

[16 Hours]

UNIT- II

Morphology and order in crystalline polymers - configurations of polymer chains. Crystal structures of polymers. Morphology of crystalline polymers, strain-induced morphology, crystallization and melting. Polymer structure and physical properties-crystalline melting point T_m -melting points of homogenous series, effect of chain flexibility and other steric factors, entropy and heat of fusion. The glass transition temperature, T_g -Relationship between T_m and T_g , effects of molecular weight, diluents, chemical structure, chain topology, branching and cross linking. Property requirements and polymer utilization.

[16 Hours]

UNIT- III

Testing of Polymers: Need for testing-specifications and standards, mechanical-short term (tensile, flexural, impact, tear resistance, abrasion resistance etc.,) long term (creep and fatigue). Electrical-conductivity, volume resistivity, surface, breakdown voltage, dielectric constant, loss factor, thermal coefficient of thermal expansion, heat distortion temperature, vicat softening point, low temperature, properties, thermal conductivity.

Solution properties of polymers:

Polymer dissolution, criteria, thermodynamics, Flory-Huggins theory, nature of polymer molecules in solution, their size and shape, theta solvent, theta temperature, thermodynamics of mixing, solution viscosities.

[16 Hours]

M.Sc. IV semester Pharmaceutical Chemistry
PCSC-4.4-(L)-Bioorganic chemistry

UNIT-I: CARBOHYDRATES:

Introduction, nomenclature, classification, chemical properties of aldoses and ketoses. Mutarotation, formation and hydrolysis of glycosides. Action of alkalies: reverse aldol reaction, Lobry-Brounvan-Emken rearrangement. Action of acids on monosaccharides, methylation, esterification, reduction, oxidation. Reaction of monosaccharides. Kiliani Fischer synthesis (step-up reaction). Wohl and Ruff degradation (step-down reaction), epimerization, conversion of aldose to ketose and vice-versa. Disaccharides, polysaccharides, Hudson's rules, periodic effect.

16 HOURS

UNIT-II: AMINOACIDS AND PEPTIDES:

Amino acids: introduction, classification, isoelectric point. Synthesis of amino acids: Strecker's synthesis, Gabriel phthalimide synthesis, Ehrlich-Mayer's synthesis, Knorr synthesis. Chemical reactions of α -amino acids: reactions involving a) amino group, b) carboxylic acid group, c) carboxylic acid amino group.

Peptides: introduction, peptide linkage, major methods of peptide synthesis: synthesis of following di and tripeptides by using Merrifield resin a) gly-gly b) gly-ala, c) lgy-val, d) gly-gly-gly, e) gly-al-al, f) al-al-gly. Stereochemical features and conformational features. Determination of primary structure of proteins. Blocking agents and deprotecting agents used in amino group protection and deprotection. Reagents and reaction used in activation of carboxylic group of amino protected amino acids. Synthesis in solution: selective protection of the α -amino group, α -carbonyl group, trifunctional amino acids

16 HOURS

UNIT-III: LIPIDS:

Nomenclature, classification purification, structure and synthesis of lipids, phospholipids, sphingolipids. Biological importance of lipids: lecithin, sphingolipids, oils and fats, lipid metabolism: introduction, β -oxidation of saturated (palmitic acid) and unsaturated fatty acids (linoleic acid). Cholesterol, metabolism, formation and fate of keto bodies.

16 HOURS

UNIT-IV: ENZYMES:

Classification, characteristics of enzymes, enzyme substrate complex, Concept of active centre, binding sites, stereo specificity and ES complex formation. Effect of temperature, pH and substrate concentration on reaction rate. Activation energy. Transition state theory. Enzyme kinetics: Michaelis-Menten equation: form and derivation, steady state enzyme kinetics. Significance of V_{max} and K_m , bisubstrate reactions. Graphical approaches to enzyme kinetics and disadvantages of alternate plotting. Enzyme inhibitors: types of inhibition: non-competitive, allosteric, uncompetitive, their mode of action and clinical applications. Enzyme catalysis: factors affecting catalytic efficiency. Enzyme purification: estimation of enzyme activity and specific activity.

M.Sc. III semester Pharmaceutical Chemistry
Paper PCOET-4.7:- Pharmacology and Therapeutic Agents

Unit-I: ANTITUBERCULAR, ANTILEPTOTICS AND ORAL CONTRACEPTIVES

Introduction, classification and mechanism of action. Synthesis of isoniazide, ethambutol, chlofazimine and dapsone.

Classification, mechanism of action of oral contraceptives. Synthesis of any two non steroidal oral contraceptives.

Antineoplastics- introduction, classification and mechanism of action of mustard gas and anti metabolites

16 HOURS

Unit-II: CARDIOVASCULAR AGENTS

A) Antianginal and vasodilator-introduction, mechanism of action. B) Antiarrhythmic agents-introduction, mechanism of action synthesis of Verapamil. C) antihypertensive agents-introduction, mechanism of action synthesis of clonidine and hyropazine derivatives. D) hypo-hyper glycemc agent-introduction, mechanism of action, synthesis of tolbutamoline and tolazamide.

16 HOURS

UNIT-III: GENERAL PHARMACOLOGY:

Introduction, definition/sources and active ingredients of drugs, routs of administration of drugs, absorption of drugs and factors affecting them. Drug distribution, biotransformation and excretion. Mechanism of drugs action, drug receptor interaction. Molecular and biochemical basic of drug action. Additive effects, synergism, potencionation. Factors modifying effects, drug toxicity, drug response relationship, structure activity relationship, drug interaction basic concepts of drug interactions (both invitro and invivo), preclinical and clinical evaluations.

16 HOURS

UNIT-IV: PHARMACOKINETICS:

Absorption, distribution, elimination, dissolution of drugs and factors affecting these properties, passage of drugs across biological membrane, construction of diffusion equation for complex systems. Pharmacokinetics of one component and two component models. Some applications of pharmacokinetics. Principles of multidrugs, dose adjustment and availability, drug interactions illustrate with examples.

16 HOURS