

3rd SEMESTER

PHARMACEUTICS-II (Physical Pharmacy - I)

PH. 3.1 THEORY

3 hours/week

UNIT -I

- 1. Matter, Properties of Matter :** State of matter, change in the state of matter, latent heats and vapour pressure, sublimation, critical point, eutectic mixtures, gases, aerosols,

inhalers, relative humidity, liquid complexes, liquid crystals, glassy state, solids-crystalline, amorphous and polymorphism.

UNIT –II

2. **Thermodynamics:** First, second and third laws, Zeroth law, absolute temperature scale, thermochemical equations, phase equilibria and phase rule.

UNIT -III

3. **Solutions :** Ideal and real solutions, solution of gases in liquids, colligative properties, partition coefficient, conductance and its measurement. Debye Huckel theory.
4. **Buffers:** Buffer equations and buffer capacity, buffers in pharmaceutical systems, preparation, buffered isotonic solutions, measurements of tonicity, calculations and methods of adjusting isotonicity.

UNIT -IV

5. **Surface and Interfacial Phenomenon :** Liquid interface, surface and interfacial tensions, surface free energy, measurement of surface and interfacial tensions, spreading coefficient, adsorption at liquid interfaces, surface active agents, HLB classification, solubilization, detergency, adsorption at solid interfaces, solid-gas and solid-liquid interfaces, complex films, electrical properties.
6. **Adsorption :** Freundlich and Gibbs adsorption isotherms, Langmuir theory of adsorption, BET equation.

PHARMACEUTICS-II (Physical Pharmacy - I)

PH. 3.2 PRACTICAL 3 hours/ week
(A minimum of 15 experiments shall be conducted)

1. To determine molar mass by Rast method and cryoscopic method.
2. To determine refractive index of given liquids and find out the contribution of carbon, hydrogen and oxygen in molar refraction of a compound.
3. To determine molar mass of volatile liquids by Victor-Meyer method.
4. To determine the specific rotation of sucrose at various concentrations and determine the intrinsic rotation
5. To determine the heat of solution, heat of hydration and heat of neutralization.
6. To determine the cell constant, verify Ostwald dilution law and perform conductometric titration.
7. To determine rate constant of simple reaction
8. Determination of surface interfacial tension, HLB value and critical micellar concentration of surfactants.

RECOMMENDED BOOKS:

1. Martin's Physical Pharmaceutical Sciences by P.J.Sinko (Lippincott William and Wilkins, Baltimore)
- 2 Cooper and Gunn's Tutorial Pharmacy edited by S.J. Carter
- 3 Bently's Textbook of Pharmaceutics edited by E.A. Rawlins

BASIC ENGINEERING - I (Unit Operations – I)

PH.3.3 THEORY

3 hours/ week

UNIT -I

1. **Heat Transfer:** Heat transfer, overall heat transfer coefficient, sources of heat, steam and electricity as heating media, determination of requirement of amount of steam/ electrical energy, steam pressure, heat exchangers.
2. **Drying:** Moisture content and mechanism of drying, rate of drying and time of drying calculations. Classification and types of dryers, dryers used in pharmaceutical industries and special drying methods.

UNIT -II

3. **Size Reduction and Size Separation:** Definition, objectives of size reduction and size separation, factors affecting size reduction, laws governing energy and power requirements of mills including ball mill, hammer mill, fluid energy mill , sieve analysis, standards of sieves, size separation equipment shaking and vibrating screens, gyratory screens, cyclone separator, air separator, bag filters, cottrell precipitator, scrubbers, size separators basing on sedimentation theory.

UNIT -III

4. **Mixing and Homogenization:** Theory of mixing, mixing efficiency, solid-solid, solid-liquid and liquid-liquid mixing equipments, homogenizers.
5. **Evaporation:** Basic concept of phase equilibria, factors affecting evaporation, evaporators, film evaporator, single effect and multiple effect evaporator.

UNIT -IV

6. **Distillation:** Raoult's law, phase diagrams, volatility, simple, steam and flash distillations, principles of rectification, McCabe Thiel method for calculation of number of theoretical plates, Azeotropic and extractive distillation.
7. **Filtration:** Theory of filtration, filter aids, filter media, industrial filters including filter press, rotary filter, edge filter. Factors affecting filtration, optimum cleaning cycle on batch filters.

BASIC ENGINEERING-I (Unit Operations – I)

PH.3.4 PRACTICAL

3 hours/ week

(A minimum of 15 experiments shall be conducted)

1. Determination of rate of evaporation.
2. Determination of overall heat transfer coefficient.
3. Experiments based on steam, extractive and azeotropic distillations.
4. Experiments based on determination of radiation constant.
5. Experiments based on sieve analysis.
6. Determination of rate of drying, free moisture content and bound moisture content.
7. Experiments to illustrate the influence of various parameters on the rate of drying.
8. Experiments to illustrate solid – solid mixing, determination of mixing efficiency using different types of mixers.

RECOMMENDED BOOKS:

1. Cooper and Gunn's Tutorial Pharmacy Edited by S.J.Carter (CBS Publishers, Delhi)
2. Pharmaceutical Engineering by K.Sanbamurty (New Age International, New Delhi)
3. Chemical Engineering by Badger and Banchero (Mc Graw Hill, New Delhi)
4. Pharmaceutical Dosage forms by Aulton.(Churchill Livingstone, Edinburg)

PHARMACEUTICAL CHEMISTRY-III (Organic Chemistry-II)

PH.3.5 THEORY

3 hours/ week

UNIT –I

Stereochemistry:

Isomerism: Different types of isomerism, their nomenclature and associated physicochemical properties, Structural Isomerism: Chain isomerism, Positional isomerism, Functional isomerism and Metamerism, Keto-Enol tautomerism.

Conformational Isomerism: Conformations of Ethane and Butane.

Geometrical Isomerism: Cis-Trans Isomers and E-Z Isomers, Physical and Chemical properties, Stability of Cis and Trans Isomers.

Optical Isomerism:

Optical activity, Specific rotation, Asymmetric carbon, Chirality, Fischer projection, Enantiomerism, Diastereoisomerism.

Specification of configuration:

Absolute and Relative configuration (D, L system and R, S system).

External and Internal compensation, Racemic mixture and Resolution of racemic mixture, Racemization, Walden inversion.

UNIT – II

Aldehydes and Ketones: General methods of preparation, acidity of α -hydrogen Nucleophilic addition reactions, Aldol condensation reaction, Cannizzaro reaction, Clemmensen reduction.

Carboxylic acids: Acid halides and anhydrides: Nomenclature, general methods of preparation, physical and chemical properties, Effect of substituent on acidity.

Esters: Nomenclature, preparations with special emphasis on synthesis of Malonic and acetoacetic esters and their synthetic applications.

UNIT – III

Benzene and its homologues:Structure of benzene, Resonance, Aromatic character, Huckel Rule.

General methods of preparation, Physical properties, Chemical properties: Electrophilic substitution reactions, Friedel crafts reaction, Catalytic hydrogenation.

Orientation of aromatic substitution in mono-substituted benzene

Phenols:General methods of preparation, Acidity, Characteristic reactions

UNIT – IV

Nucleophilic aromatic substitution reactions, α,β -unsaturated carbonyl compounds, stereoselective and stereospecific reactions, organic reagents used in drug synthesis (e.g,(Aluminium tert-butoxide, Lithium Aluminium Hydride, Grignard reagent, N-Bromo-succinimide (NBS), Diazomethane)

PHARMACEUTICAL CHEMISTRY-III (Organic Chemistry-II)

**PH.3.6. PRACTICAL 3 hours/ week
(A minimum of 15 experiments shall be conducted)**

1. Preparation of organic compounds and their derivatives, crystallization and determination of their melting points(minimum three).
2. Estimation of organic compounds using functional groups (minimum three).
3. At least four experiments. on analysis of organic compounds containing two functional groups

RECOMMENDED BOOKS:

1. Organic Chemistry by R.T. Morrison and R.N.Boyd.(Prentice Hall of India, New Delhi)
2. Advanced Organic Chemistry by B.S.Bahl and Arun Bahl.(S.Chand, New Delhi)
3. Bentley and Driver's Text Book of Pharmaceutical Chemistry.(Oxford University Press, New Delhi)
4. Organic Chemistry – Reactions and Reagents by O.P.Agarwal.(Krishna Prakashan, Meerut)
5. Organic Chemistry by I.L. Finar Vol. I & Vol. II.(Longman, Singapore)

PHARMACOGNOSY-III

PH.3.7 THEORY 3 hours/ week

UNIT -I

1. General methods of isolation and preliminary phytochemical screening of glycosides.
2. Study of the biological source, cultivation, collection, chemical constituents, adulterants, uses, macroscopic, microscopic features and chemical tests of following group of drugs containing –
 - i) Saponins : Liquorice, ginseng, dioscorea, sarasparilla and senega.
 - ii) Cardioactive sterols : Digitalis, squill and strophanthus
 - iii) Anthraquinone cathartics : Aloes, senna, rhubarb and cascara.
 - iv) Others : Psoralea, gentian, saffron, chirata and quassia

UNIT -II

3. Biological sources, preparation, identification tests and uses of the following enzymes: Diastase, papain, pepsin, trypsin, pancreatin.
4. General techniques of biosynthetic studies and basic metabolic pathways. Biogenesis of aromatic aminoacids, steroidal glycosides , tropane alkaloids and indole alkaloids.

UNIT -III

5. Historical development of plant tissue culture, types of cultures, nutritional requirements, growth and their maintenance. Application of plant tissue cultures with special reference to production of secondary metabolites.

UNIT -IV

6. An introduction to poisonous plants in India.
7. Marine pharmacognosy, novel medicinal agents from marine sources.

PHARMACOGNOSY-III

PH. 3.8

PRACTICAL

3 hours/ week

(A minimum of 15 experiments shall be conducted)

1. Identification of crude drugs listed in theory (Any five)
2. Microscopic study of at least four drugs including the powder study listed in theory.
3. Specific identification tests for some crude drugs listed in theory

RECOMMENDED BOOKS:

1. Textbook of Pharmacognosy by C.K.Kokate and D.P.Purohit (Nirali Prakashan, Pune)
2. Trease G.E. and Evans w.e., Pharmacognosy (Baillere Tindall, Eastbourne)
3. Tyler V.E., Brady L.R. and Robbers J.E., Pharmacognosy (Len & Febiger, Philadelphia)
4. Pharmacognosy by T.E. Wallis(CBS Publisher, New Delhi)
5. Staba E.J., Plant Tissue Culture as a source of Bio-medicinals

PATHOPHYSIOLOGY OF COMMON DISEASES

PH. 3.9 THEORY

3 hours/ week

UNIT -I

1. **Basic Principles of Cell Injury and Adaptation** : Causes of Cellular injury, Pathogenesis, morphology of cell injury, intercellular alterations in lipids, proteins and carbohydrates, Cellular adaptations, atrophy, hypertrophy, hyperplasia, metastasis & dysplasia.

2. **Basic Mechanisms involved in the process of inflammation and repair** :

Alteration in vascular permeability and blood flow, migration of WBCs, acute and chronic inflammation, mediators of inflammation, brief outline of the process of repair.

UNIT -II

3 **Pathophysiology of Common Diseases** : Rheumatoid arthritis, gout, epilepsy, psychosis, depression, mania,

UNIT -III

4. Hypertension, angina, congestive heart failure, atherosclerosis, myocardial infarction, diabetes, peptic ulcer asthma, ulcerative colitis, hepatic disorders like jaundice, viral hepatitis, hepatocellular carcinoma, cirrhosis & portal hypertension, acute and chronic renal failure,

UNIT -IV

5. Tuberculosis, urinary tract infections, sexually transmitted diseases, anemias and common types of neoplasms like carcinoma of lung, skin cervix, colon & brief outline on different types of leukemias. Wherever applicable the molecular basis should be discussed.

RECOMMENDED BOOKS:

1. Pathologic basis of diseases by Robbins S.L. (Harcourt India, New Delhi).
2. Pathology Quick Review and MCQs based on Harsh Mohan's Text Book of Pathology (Jaypee brothers medical publishers, New Delhi)

ENVIRONMENTAL SCIENCE

PH. 3.10 THEORY

3 hours/week

UNIT – I

Ecological Concepts and Natural Resources: Ecological perspective and value of environment. Environmental auditing, biotic components, Ecosystem Process: Energy, Food Chain, Water cycle, Air cycle etc.

Chemistry and Microbiology in Environmental Engineering: Physical and chemical properties of water, Atmospheric chemistry, Soil chemistry, Microbiology, Chemical and biochemical reactions.

Concept in Hydrology : Hydrological cycle, Water balance, Energy budget, Precipitation, Infiltration, evaporation and evapotranspiration, Rainfall-runoff relationships, Urban hydrology, Ground water, Ground water chemistry.

UNIT – II

Water Pollution: water quality standards and parameters, Assessment of water quality, Transformation process in water bodies, Oxygen transfer by water bodies, Turbulent mixing, Water quality in lakes and preservers, Ground water quality.

Water Treatment: Water quality standards, Water sources and their quality, Water treatment processes, Pre-treatment of water, Conventional process, Advanced water treatment process.

Waste Water Treatment: Water flow rate and characteristics, Design of waste water network, Waste water treatment process, pretreatment, primary and secondary treatment of waste water, Activated sludge treatment: Anaerobic digestion and its application.

UNIT – III

Solid Waste Management

Sources classification and composition of MSW ; properties and separation, storage and transportation, MSW Management, Waste minimization, Reuse and recycling, Biological treatment, Thermal treatment, Landfill, Integrated waste management.

Hazardous Waste Management, Hazardous waste and their generation, Medical hazardous waste. Household waste, Transportation and treatment of hazardous waste: incinerators, Inorganic waste treatment, Treatment systems for hazardous waste, handling of treatment plant residue.

Industrial Air Emission Control:

Air Pollution: Air pollution and pollutants, criteria pollutants, Acid deposition, Global climate change - green house gases, non-criteria pollutants, emission standard from industrial sources, air pollution metereology, Atmospheric dispersion.

Noise Pollution : Physical Properties of sound, Noise criteria, Noise Standards, Noise measurement, Noise control.

UNIT – IV

Waste Minimization: Concept, Life Cycle Assessment, Elements of waste minimization strategy, benefits of waste minimization, Elements of waste minimization programme, Waste reduction techniques.

Environment Impact Assessment, Origin and procedure of EIA, Project Screening of EIA, Scope studies, Preparation and review of EIS.

RECOMMENDED BOOKS:

1. Environmental Engineering Irwin/McGraw Hill International Edition, 1997 , G. Kiely,
2. Principles of Environmental Engineering and Sciences, K.L. Davis and S.J. Masen, McGraw Hill International Edition, 2004.
3. Principles of Environmental Science inquiring & applications, Cunningham & Cunningham (TMH, New Delhi)
4. Introduction to Environmental Science, Y. Anjaneyalu, B.S. Publication. Hyderabad