

VEER NARMAD SOUTH GUJARAT UNIVERSITY
M.Sc. – PHARMACEUTICAL CHEMISTRY
SEMESTER-1

TO COME IN FORCE FROM JUNE-2008

PAPER- (I) ADVANCED PHYSICAL AND INORGANIC DRUG CHEMISTRY

COURSE NO. - CPC- 101

Max. Marks: 70

Total Periods: 60

SECTION -1

UNIT-I : STATES, SOLUBILITY & THERMAL ANALYSIS (10 Periods)

- (A) Solid and crystalline states: crystalline solids, X-ray diffraction methods for crystal structure determination.
- (B) Thermal Analysis: TG, DTA and DSC-basic principle and instrumentation, Drug decomposition by heating, degradation mechanism, estimation of energy of activation and frequency factors, identification and purity of pharmaceuticals,
- (C) Solubility and dissolution: solute-solvent interactions, polar and non-polar solvents, Dissolution of drugs-drug absorption, tablets and capsule dissolution, factors affecting dissolution, mathematical of dissolution, powder dissolution.

UNIT-II : VISCOSITY, ISOTONIC SOLUTION & INTERFACIAL PHENOMENA (10 Periods)

- (A) Viscosity and Rheology properties:
 - a. Introduction- concept of viscosity, factors influencing viscosity.
 - b. Newtonian systems:- Newtonian law of flow, kinematic viscosity, temperature dependence and theory of viscosity.
 - c. Non-Newtonian systems:- Plastic flow, pseudo plastic flow and dilatant flow.
 - d. Thixotropy: measurement of thixotropy, bulges and spurs, negative thixotropy, thixotropy in formulation.
 - h. Application to pharmacy (Numericals)
- (B) Buffered and isotonic solutions
 - Buffers in pharmaceutical and biological systems: In vivo biological buffer systems, pharmaceutical buffers, preparation of pharmaceutical buffer solution, influence of buffer capacity and pH on irritation, stability Vs optimum therapeutic response, pH and solubility.
- (C) Surface and interfacial phenomena
 - a. Liquid interfaces: surface and interfacial tensions, surface free energy, pressure differences across curved interfaces measurement of surface and interfacial tensions-methods spreading, energetic of liquid surface.
 - b. Adsorption of liquid interfaces: Surface active agents, systems of hydrophilic-lipophile classification, types of monolayer at liquid surfaces, soluble monolayers and Gibb's adsorption equation, insoluble monolayers and film balance.
 - c. Applications of surface active agents. Foams and antifoaming agents.

UNIT-III : DISPERSION & MICROMERITICS

(10 Periods)

(A) Coarse dispersion (Dispersion systems)

- a. Suspensions
- b. Classification of suspensions
- c. particle-particle interaction and behaviour
- d. Interfacial properties of suspended particles
- e. Settling in suspensions: Theory of sedimentation, effect of Brownian movement, sedimentation of flocculated particles, sedimentation parameters.
- f. Emulsions; Emulsion types, pharmaceutical applications.
- g. Theories of emulsification. Mono molecular adsorption, multimolecular adsorption & film formation, solid particle adsorption.
- h. Physical stability of emulsions: Creaming and stoke's law, coalescence and breaking, evaluation of stability, phase inversion.
- i. Preservation of emulsions.

(B) Micromeritics:

- a. Introduction and importance
- b. Particle size and size distribution:- various diameters; average particle size, particle size distribution, number and weight distribution, particle number.
- c. Methods of determining particle size: optical microscopy, sieving, sedimentation, particle volume measurement.

SECTION -2

UNIT-IV : ANTIOXIDANTS, GASTROINTESTINAL AGENTS (10 Periods)

Antioxidants: Introduction, Criteria for A substance To Act As Antioxidant, Mechanism of Action, Hypophosphorous Acid, Sulphar Dioxide, Sodium Metabisulphite, Sodium Sulphite, Sodium Bisulphate, Nitrogen, Carbon Dioxide, Sodium Nitrite, Sodium Thiosulphate.

Gastrointestinal Agents: Introduction, Acidifiers, Antacids, Aluminum, Calcium, magnesium and Sodium Compounds As Antacids, Preparations Containuing Combinations of Antacids, Protectives, Bismuth compounds, laxatives, Catharatics and Purgatives

UNIT-V : BIOINORGANIC CHEMISTRY

(10 Periods)

Introduction, Classification and role of metal ions according to their action in biological system.

(A) COMPOUNDS OF IRON: Introduction, Ferric Ammonium Citrate, Ferrous Fumarate, Ferrous Gluconate, Ferrous Sulphate, Iron Sorbitol Injection.

(B) METALS AND ITS COMPLEXES AS THERAPEUTIC AGENTS

Generals remarks, Anticancer drugs (Platinum Complexes), Antimalarials Drugs (Gold, Copper and its complexes)

UNIT-VI : RADIO PHARMACEUTICALS: (10 Periods)

Introduction, isotopes, Types of Radionuclides, units of Radioactivity, Half Life of Radio Elements, Production of Radio Isotopes, Measurement of Radio Activity, Handling And Storage of Radioactive materials.

REFERENCE BOOKS:

1. Introduction to colloid and surface sciences By Duncan J. Shaw Second Edition, Butterworths, London.
2. Surfactants and Interfacial phenomena by Milton J. Rosen, John Wiley and Sons, New York, 1989.
3. Text book of physical pharmaceutical by C.V.S. Subrahmanyam Second Edition 2000 Vallabh Prakashan.
4. Physical pharmacy Alfred Martin, James Swarbrick, Arthur Cammarata Lea & Febiger, Philadelphia 1983.
5. Inorganic Pharmaceutical Chemistry by Chatwal.
6. Inorganic medicinal and Pharmaceutical Chemistry by Block, Roche and Sonie.
7. Inorganic Pharmaceutical Chemistry by Gundu Rao.
8. India Pharmacopeias.

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PAPER- (I) BASIC PHYSIOLOGY PHARMACOLOGY PHARMACOGNOSY
COURSE NO. - CPC- 102

Max. Marks: 70

Total Periods: 60

SECTION -1

UNIT-I : Drug Design (10 Periods)

Development of new drugs, Procedures followed in drug design, Concept of lead compound and lead modification, Concept of Prodrugs and Soft drugs, Structure Activity Relationship(SAR), Factors affecting Bioactivity, Resonance, Inductive effects, Isosterism, Bio-isosterism, Spatial considerations. Theory of drug activity, Occupancy theory, Rate theory, Induced fit theory, Quantitative structure activity relationship (QSAR), LD-50, ED-50(Mathematical derivation of equation excluded)

UNIT-II : Pharmacodynamics (10 Periods)

- Introduction
- Elementary treatment of enzyme stimulation
- Enzyme inhibition
- Sulphonamides
- Membrane active drugs
- Drug metabolism
- Xenobiotics
- Biotransformation

Significance of drug metabolism in medicinal chemistry

UNIT-III : Physiology (10 Periods)

- Scope of Physiology.
- Human Cell and Tissues with functions
- Blood
- Cardiovascular system: Heart, Cardiac output, Blood Pressure and Cardiac cycle
- Nervous system: Eye, Ear and Skin
- Endocrine glands and Hormones: Pituitary, Thyroid, Adrenal and Pancreas
- Urinary system
- Digestive System

SECTION -2

UNIT-IV : Pharmacology (10 Periods)

- Scope of Pharmacology and important definitions
- Routes of Drug administration
- Pharmacokinetics: Absorption, Distribution, Metabolism and excretion of Drugs

UNIT-V : Pharmacognosy-1**(10 Periods)**

- Definition and scope of Pharmacognosy
- Various system of classification of drugs of nature origin
- Occurance, Distribution, organoleptic evaluation, Chemical constitutions including tests wherever applicable and therapeutic efficiency of following category of drugs:
 - Laxatives: Aloes, Rhubarb, Caster oil, Isapaghula, Senna
 - Cardiotonics: Digitalis, Arjuna
 - Carminatives and G.I. regulators: Umbelliferous fruits, Coriander, Fennel, Ajowan, Cardamom, Ginger, Black pepper, Asafoetida, Nutmeg, Cinnamon, Clove
 - Astringents: Catechu
 - Drug active on nervous system: Hyoscymus, Belladonna, Aconite, Aswagandha, Ephedra, Opium, Cannabis, Nuxvomica
 - Antihypertensive: Rauwolfia
 - Antitussives: Vasaka, Tolu balsam, Tulsi

UNIT-VI: Pharmacognosy-2**(10 Periods)**

Occurance, Distribution, organoleptic evaluation, Chemical constitutions including tests wherever applicable and therapeutic efficiency of following category of drugs:

- Antirheumatics: Guggul, Colchicum
- Antitumor: Vinca
- Antileprotic: Chaulmoogra oil
- Antidiabetics: Pterocarpus, Gymnema sylvestris
- Diuretics: Gokhru, Punarnava
- Antidysenterics: Ipecacuanha

Reference Books:

1. Principles of Anatomy and Physiology by Tortora.
2. Pharmacology and Pharmacotherapeutics by R.S. Satoskar.
3. Essentials of Pharmacotherapeutics by F.S.K. Barar.
4. Elements of Pharmacology by Derasavi and Goyal.
5. Essentials of Medical Pharmacology by K.D. Tripathi.
6. Text book of Pharmacognosy by Trease and Evans.
7. Text book of Pharmacognosy by T.E. Wallis.
8. Elements of Human Anatomy, Physiology and Health Education by Derasavi and Goyal.
9. Human Physiology by C.C. Chatterjee.
10. Introduction of Medicinal Chemistry, A Gringuage, Wiley –VCH.
11. Wilson and Gisvold's Text book of Medicinal and Pharmaceutical Chemistry, Ed Robert F. Dorge.
12. An Introduction to Drug Design, S.S. Pandeya and JR Dimmock, New edge International.
13. The Organic Chemistry of Drug Design and Drug Action, R.B. Silverman, Academic Press.
14. Strategies of Organic Drugs Synthesis and Design, D. Lednicer, John Wiley.

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PAPER- (III) ADVANCED ORGANIC CHEMISTRY
COURSE NO. - CPC- 103

Max. Marks: 70

Total Periods: 60

SECTION-1

UNIT-I: REACTIVE INTERMEDIATES (10 Periods)

Formation, Structures and Reactions of Carbonium ion, Carbanion, Free radical, Carbene, Nitrene, Arynes, Enamines.

UNIT-II: HETEROCYCLIC CHEMISTRY-1 (10 Periods)

Nomenclature of Heterocyclic compounds

(A) Five-membered and Benzo fused Five-membered Heterocycles:

Oxazole, Isoxazole, Thiazole, Isothiazole, Pyrazole, Imidazole, Benzoxazole, Benzothiazole, Benzopyrazole, Benzoimidazole.

(B) Six-membered and Benzo fused six-membered heterocycles with two heteroatoms:

Preparation and Properties of Pyridazine, Pyrimidine, Pyrazine, Oxazine, Thiazine, Dioxane, Quinazoline, Quinoxaline, Cinnoline.

UNIT-III: HETEROCYCLIC CHEMISTRY-2 (10 Periods)

(A) Compounds containing more than Two Heteroatoms:

Preparation of Pteridine, Triazines, Sydnone

(B) Heteroatoms in Seven and Eight membered ring:

Synthesis of Azepine, Thiepine, Diazepine.

SECTION-2

UNIT-IV: (10 Periods)

(A) Stereochemistry

Introduction, CIP, Nomenclature of more than one Chiral centre, Convention used in Stereochemistry, Specification of absolute configuration, Elements of Symmetry, Molecular Symmetry, Prochirality, Limitations of D & L notation, Erythro & Threo and E & Z nomenclature, R-S system, Resolution of Racemic modifications.

(B) Conformational Analysis:

Chirality, mono-, di- and poly substituted cyclohexane, decaline derivatives and cholesterol.

UNIT-V: ORGANIC NAME REACTIONS (10 Periods)

- Barbier-Wieland,
- Barton
- ChiChi Babin
- Ene
- Friedel-Crafts
- Hofmann Loffler Freytag
- Hydroboration
- Mannich
- Sharpless asymmetric epoxidation
- Storke Enamine.

UNIT-VI: MOLECULAR REARRANGEMENTS (10 Periods)

- Wagner-Meerwein
- Benzil-Benzilic acid
- Arndt-eistert synthesis
- Favorskii
- Neber
- Beckmann
- Hoffman
- Curtius
- Schmidt
- Shapiro.

Reference books:

1. Advanced Organic Chemistry-Reactions, Mechanism and Structure, Jerry March, John Wiley.
2. Advanced Organic Chemistry, (Vol. A & B), F. A. Carey and R. J. Sundberg, Plenum.
3. Chemistry of Heterocyclic Compounds by Badger (Academic Press, 1963).
4. Heterocyclic Compounds by R. C. Elderfield (Ed.), Vol. 1-9 (Wiley, New York, 1960-65).
5. An Introduction to the Chemistry of Heterocyclic Compounds by R. M. Acheson (John Wiley & Sons Ltd., New York, 1967).
6. A Guide Book to Mechanism in Organic Chemistry, Peter Sykes, Longman.
7. Structure and Mechanism in Organic Chemistry, C. K. Ingold, Cornell University Press.
8. Organic Chemistry, R. T. Morrison and R. N. Boyd, Prentice-Hall.
9. Reaction Mechanism in Organic Chemistry, S. M. Mukherji and S. P. Singh, Macmillan.
10. Stereochemistry of Organic Compounds, D. Nasipuri, New Age International.
11. Stereochemistry of Organic Compounds, P. S. Kalsi, New Age International.