

Semester V

Paper No- 12: Medicinal Chemistry

Marks: 150

Preamble: The course highlights the importance of Medicinal Chemistry in all our lives and the fascination of working in a field that overlaps the disciplines of chemistry, biology, biochemistry, pharmacology etc. It gives brief understanding about drug-receptor interactions, lead discovery, drug design and molecular mechanism by which drug act in the body. The course emphasizes on various drug targets in the body and drug development strategies with mechanism of action of antibacterial agents and concept of drug resistance.

THEORY

Total Lectures: 48

Unit I: General Introduction (Chapter 1: Silverman)

(2 Lectures)

Definition and scope of medicinal chemistry

Unit II: Drug target classification (Chapter 7-9: Patrick; Chapter 3-6: Silverman)

(12 Lectures)

Proteins as drug targets

Receptors: The receptor role, ion channels, membrane bound enzyme activation, agonist and antagonists, concept of inverse agonist, desensitization and sensitization of receptors, affinity, efficacy and potency.

Enzymes: Enzyme inhibitors (competitive, non-competitive, suicide inhibitors), medicinal use of enzyme inhibitors.

Nucleic acids as drug targets

Classes of drugs that interact with DNA: DNA intercalators (amsacrine), Groove binders (netropsin), DNA alkylators (amines: mechlorethamine; nitrosoureas: carmustine), concept of antisense therapy.

Unit III: How drug acts: Molecular aspects (Chapter 5: Patrick; Chapter 3: Silverman)

(6 Lectures)

Structure and functions of cell surface receptors, signal transduction mechanism (GPCRs, Tyrosine kinase, guanylate-cyclase linked receptors and intracellular receptors that regulate DNA transcription).

Unit IV: Physicochemical principles of drug action (Chapter 2: Silverman)

(8 Lectures)

Partition coefficient, drug dissolution, acid-base properties, surface activity, bioavailability, stereochemical aspects of drug action, electronic structure

ure(Hammett correlations), determining relationship between chemical and biological data (Hansch approach)

Unit V: Measurement of drug effects (8 Lectures)
(Chapter 2 and 3: Nogrady)

Kinetic analysis of ligand receptor interactions using scatchard plot, double reciprocal plot, Hill plot, forces involved, relationship between dose and effect (graded and quantal response)

Unit VI: Principles of drug design (8 Lectures)
(Chapter 12-14: Patrick)

Introduction to SAR, strategies in the search for new lead compounds, analogue synthesis versus rational drug design, concept of prodrugs.

Unit VII: Antibacterial agents (4 Lectures)
(Chapter 19: Patrick)

Mechanism of action, antimetabolites (sulphonamides), cell wall synthesis inhibitors (penicillins), agents that act on plasma membrane (valinomycin), protein synthesis inhibitors (streptomycin and chloramphenicol), nucleic acids transcription and replication inhibitors (quinolones and fluoroquinolones), drug resistance.

PRACTICALS

1. Preparation of Benzocaine.
2. Preparation of Benzoquinone.
3. Preparation of Aspirin and determination of partition coefficient in octanol-water system.
4. Preparation of Paracetamol.
5. Preparation of Phenacetin.
6. Preparation of Hippuric acid.
7. Preparation of s-benzyl thiuronium salt.
8. Extraction of caffeine from tea leaves and study its absorption properties.
9. Phytochemical screening and qualitative chemical examination of various plant constituents by Solvent extraction. (Detection of alkaloids, carbohydrates, glycosides, phytosterols, oils and fats, tannins, proteins, gums and mucilages).

ESSENTIAL BOOKS

1. Introduction to Medicinal Chemistry, 4th edition (2009), Graham I. Patrick, Oxford University Press.

2. The Organic Chemistry of Drug Design and Drug Action, 2nd edition (2004), Richard B. Silvermann, Elsevier, Academic Press. .
3. Medicinal Chemistry: A Molecular and Biochemical Approach, 3rd edition (2005), Thomas Nogrady and Donal F. Weaver, Oxford University Press.

SUGGESTED READINGS

1. Wilson Gisvold textbook of Organic Medicinal and Pharmaceutical Chemistry, 11th edition (2003), edited by Block and Beale, Baltimore, Lippincot.
2. The Practice of Medicinal Chemistry, 2nd edition (2003), Camille G. Wermuth, Academic Press.
3. Principles and Practice of Medicinal Chemistry, 2nd edition (2003), Frank. D. King. The Royal Society of Chemistry.
4. Introduction to Medicinal Chemistry: How Drugs Act and Why, 1st edition (1996), Alex Gringauz, Wiley VCH.