

P.G. Diploma - Pharmaceutical Chemistry

Paper 1 Organic Chemistry

UNIT 1: Reaction Mechanism

Reactive intermediates - Carbocations, Carbanions, Free radicals, Carbenes and nitrenes – Guidelines for proposing reasonable mechanism - Intermediates - Kinetic and Thermodynamic control – methods of determining reaction mechanism.

UNIT 2 : Stereochemistry

Elements of symmetry, Chirality, Molecules with more than one chiral centre - Resolution - Methods of resolution – Sterospecific and Stereoselective synthesis -Racemisation.

UNIT 3 : Reagents in organic synthesis

Oxidation: Oxidations using MnO_2 , SeO_2 , $\text{Pb}(\text{OAc})_4$, OsO_4 , Peracids, PCC and PDC

Reduction: Reduction using LiAlH_4 , NaBH_4 , Wilkinson's catalyst, Lindlar catalyst, BH_3/THF and 9-BBN.

UNIT 4: Retro synthesis

Synthones - Synthetic Equivalent - Target Molecule - Functional Group Inter conversion. Guidelines to a Good Disconnection – 1,2 - 1,3 - 1,4 -1,5 and 1,6 Di functional Disconnections.

UNIT 5: Natural products chemistry

Carbohydrates : Classification – Structural elucidation of glucose and fructose – Disaccharides. Structural elucidation of sucrose, maltose and lactose– Chemistry of starch and cellulose.

Steroids : Classification – Study of Vitamin D, Estrone, Progesterone, Testosterone and Androsterone.

Alkaloids : Classification – General Study of Papaverine, Morphine, and Quinine.

References :

1. Advanced Organic Chemistry, Reaction Mechanism and Structure, Jerry March, John Wiley & sons 4th Edn. 1992.
2. A Guide book to Mechanism in Organic Chemistry, Peter Skyes , Longman.
3. Stereo Chemistry of Organic Compounds, Ernest L Eliel, Samuel H.wilen, John Wiley & Sons, Inc. 2003.
4. Stereo Chemistry of Organic Compounds, D.Nasipuri, Wiley Eastern Ltd., 1991.
5. Principles of Organic Synthesis, Norman and J.M.Coxan, ELBS 3rd Edn. 1993.
6. Guide book to Organic Synthesis, R.M.Mackie and D.M.Smith, ELBS, 1982.
7. Organic Synthesis, Michael B.Smith, M.C.Graw Hill, International Edn. 1994.
8. Modern Synthetic Reactions, H.O.House, Cambridge University Press, 3rd Edn. 1972
9. Some Modern Method of Organic Synthesis, W.Caruthers, Cambridge University 1972.
10. Organic Synthesis Concepts, Methods and Starting Materials, Furthrhop Penzlin Verlag Chemie, 1983.
11. Organic Synthesis, the disconnection approach, Stuart Warren, John Wiley & Sons. 1992.
12. Organic Chemistry, I.L.Finar, Vol.II, ELBS, 5th Edn.1975.

Paper 2 Analytical Techniques

Unit 1: Chromatographic Techniques

Principle - Classification of Chromatography - Paper Chromatography TLC-Column chromatography - Ion Exchange Chromatography - Gas Chromatography and HPLC.

Unit 2: Spectrophotometric methods of analysis

Laws of absorption - Lambert's and Beer's law - Principle and applications of Photometry, Fluorimetry and Flame spectrophotometry.

Unit 3: Volumetric methods of analysis

Acid - Base titrations - Complexometric titrations - EDTA titrations and metal ion indicator.

Unit 4: UV, IR, and NMR Techniques

UV-Visible Spectroscopy : Principle - Instrumentation - Electronic Excitation -Applications.

IR Spectroscopy : Principle -Mode of vibrations of a molecule - Instrumentation - Identification of the sample - Characteristic group frequencies.

NMR Spectroscopy : Principle - Chemical shift - Peak area - Instrumentation -Spin-spin splitting - Spin relaxation - Shift reagents - Deutrium Substitution-Applications.

Unit 5: Industrial effluent treatment

Classification of effluents - Treatment of mineral effluents by Ion-exchange, Reverse osmosis and Reagents methods - Treatment of organic effluents by biological oxidation, chlorination and adsorption.

References :

1. Instrumental Methods of Analysis H.H. Willard, L.L.Merritt,J.A.Dean,F.A.Settle, CBS Publishers & Distributors, 1986.
2. Instrumental methods of chemical analysis, Gurdeep R.Chatwal,Sham K.Anand,5th Edn., 2003.
3. Principles and practice of analytical chemistry, F. W. Fifield and D.kealey,5th Edn., 2000.
4. Fundamental of analytical chemistry, D.A.Skoog and D.M.,West,Saunders college publishing Cp., Philadelphia, 1982.
5. William Kemp,Organic Spectrocopy, ELBS, 3rd Edn.,1991.
6. R.M.Silverstine, G.C.Bassler, J.C.morril, Spectroscoppc identification of organic compounds,john wiley & sons INC 5th Edn.,1991
7. Industrial Chemistry, B.K.Sharma, Goel publishing House, Edn.XIV,2004

Paper 3 Fundamentals of Pharmaceutical Chemistry

Unit 1: Basic concepts

Definition of drug – Classification of drug based upon mode of action and chemical nature - Definition of Pharmacokinetics and Pharmacodynamics – Route of administration – Absorption – Metabolism – Elimination – Non linear and time dependent pharmacokinetics.

Unit 2: Principles of Therapeutics

Definition and explanation of MEC, MSC, MPC, AVC (graph), LD50, ED50 and Therapeutic Index.

Unit 3: Principles of drug discovery

Drug discovery without Lead – Lead discovery – Random screening – Non random screening – Clinical observation- Phase I, Phase II, Phase III and Phase IV trails.

Principles of drug design : Definition – Agonist – Antagonist drugs – development of cimetidine from Lead molecules.

Molecular modeling – Energy minimization – energy calculation.

Unit 4: SAR and QSAR Relationship

SAR : Definition – Binding of hydroxyl group, amino group, aromatic ring of ketones.

Variation substituents : Alkyl substituents, Aromatic substituents, Isosteres.

QSAR: Definition – Parameters – electronic parameters – Steric parameters.

Unit 5: Pharmacological screening methodology of drug

Analgesic activity – CNS stimulant – CNS depressant – Anti inflammatory – Anticonvulsant – Muscle relaxant properties.

References :

1. Goodman and Gilman's "The Pharmacological Basis of Therapeutics", Gilman, Joel G. Hardman, Lee E. Limbird, 5th Edn., 2001.
2. Biopharmaceutics and Pharmacokinetics, D.M. Brahmanikar and Sunil B. Jaiswal, Edn. XIX 2004.
3. Pharmacology, Mary J. Mycek and Richard A. Harvey 2nd Edn. 2000.
4. Foye's principles of medicinal chemistry, chemistry, David A. Williams and Thomas L. Lemke, Edn. V, 2002.
5. Pharmacology and Pharmacotherapeutics, R.S. Staskar, S.D. Bhandakar and S. Ainapure, Edn. XVIII, 2003.
6. Hand book of Experimental Pharmacology, S.K. Kulkarni, 3rd Edn., 1999.

Paper 4 Synthesis and Therapeutic action of drugs

Unit 1 : Anti inflammatory, Analgesic and Anti pyretic drugs

Synthesis and therapeutic action of Aspirin, Paracetamol, Analgin, Ibuprofen, Indomethacin, and Diclofenac sodium.

Unit 2 : Chemotherapeutic agents

Classification – Synthesis and therapeutic action of chlonambucil, Busulfan, 6 – mercaptopurine, 5 – fluorouracil and cisplatin.

Antimalarial, Antitubercular drugs : Synthesis and therapeutic action of Ethambutol, Ethionamide, chloroquine, and primaquine.

Unit 3: Antihypertensive and Diuretics drugs

Antihypertensive drugs : Synthesis and therapeutic action of captopril, methyldopa, and nifedipine.

Diuretics; Synthesis and therapeutic action of Furosemide, Chlorothiazide and bumetanide.

Unit 4 : Antihistamines, CNS stimulant and CNS depressant drugs

Antihistamines: Synthesis and therapeutic action of chlorpheniramine, promethazine, cimetidine and ranitidine.

CNS stimulant : Synthesis and therapeutic action of caffeine, theobromine and piracetam.

CNS depressant: Synthesis and therapeutic action of Isocarboxazid, Desipramine and trazodone.

Unit 5: Chemical assay

Chemical assay of Aspirin, 6-mercaptopurine, chloroquine, methyldopa, ranitidine, furosemide and theobromine.

References:

1. Bently's text of Pharmaceutics, E.A.Rawlins, 8th Edn.2002.
2. Principles of medicinal chemistry, S.S.Kadam, K.R. Mahadik, K.G.Bothara, Vol.I 10th Edn., 2002.
3. Principles of medicinal chemistry, S.S.Kadam, K.R. Mahadik, K.G.Bothara, Vol.II, 10th Edn.,2002.
4. Science and practise of pharmacy, Remington, Vol. I and Vol.II, 20th Edn.,2000
5. Medicinal Chemistry, G.R.Chatwal, Himalaya Publishing House, 2nd Edn. 2002.
6. Pharmacology and pharmacotherapeutics, R.S. Sataskar, S.D.Bhandankar and S.S.Ainapure , 2003
7. Introduction to medicinal chemistry, Graham L.Patrick 2nd Edn., 2003.

Paper 5 Industrial Processes in Drug Manufacture

Unit 1: Industrial drug manufacture I

introduction – Raw materials – Manufacturing Procedure – therapeutic function – common name
– Structure of naproxen, acyclovir, propranolol, and levodopa.

Unit 2: Industrial drug manufacture II

Introduction – Raw materials – Manufacturing Procedure – therapeutic function – common name
– Structure of mephensin, 5-fluorouracil, levothyroxin sodium, amoxicillin, and norfloxacin.

Unit 3: Industrial manufacturing of tablets, ointments and suspension

Tablet: Raw material – Flow chart diagram – Manufacturing processes.

Ointments : Raw material – Flow chart diagram – Manufacturing processes.

Suspension : Raw material – Flow chart diagram – Manufacturing processes.

Unit 4: Industrial unit processes

Introduction – alkylation – amination – Nitration – Oxidation – Halogenation.

Unit 5 : Industrial hazards and safety measures

Hazards – Definition – Chemical hazard – Dust hazard – Electrical hazard-Preventive measures –
Use of PPE.

References:

1. industrial Chemistry, B.K.Sharma.Goel publishing house,Edn.XIV,2004.
2. Unit processes in organic synthesis, Groggins,5th Edn.,2000.
3. Pharmaceutical manufacturing encyclopedia ,Vol.I and II,2nd Edn.,2001.
4. Biopharmaceutics and. Pharmacokinetics, D.M.Brahmanikar and Sunil B.Jaiswal, Edn.XIX 2004.
5. Pharmaceutical analysis , Takeru Higuchi, Einar Brochmann and Hanffen Hanseen, 3rd Edn.2004.