

SYLLABUS FOR THE ENTRANCE EXAMINATION

1. PHARMACEUTICAL CHEMISTRY

- a) **Introduction**
- b) **Gastrointestinal Agents** : Acidifying agents : Antacids : Sodium bicarbonate, Aluminium hydroxide, Aluminium phosphate, Dihydroxy Aluminium amino acetate, Dihydroxy Aluminium, Sodium carbonate, Calcium carbonate, Tribasic Calcium phosphate, Magnesium carbonate, Magnesium hydroxide, Magnesium oxide, Magnesium phosphate, Magnesium trisilicate and Combination antacid preparations.
- c) **Topical Agents** : Antimicrobials and Astringents : antimicrobial terminology, mechanism of action, control of antimicrobial/astringent action.
Antimicrobial Astringent Products : oxidative antimicrobial agents; Hydrogen peroxide, Zinc peroxide, Sodium carbonate, Potassium permanganate, Sodium hypochlorite, Iodine preparation and compounds.
- d) **General Anesthetics Agents** : Introduction, medicinal aspects of anaesthetics, mode of action; gases and volatile liquid anaesthetics, intravenous anaesthetics or fixed anaesthetics, toxicity of general anaesthetics (Divinyl ether, Ethyl chloride, Cyclopropane, Thiopentone Sodium)
- e) **Local Anesthetics Agents** : Introduction : Structure-activity, relationships, benzoic acid derivatives, aminobenzoic acid derivatives, lidocaine derivatives, miscellaneous, toxicity; mode of action (Benzocaine, Procaine Hydrochloride, Lidocaine Hydrochloride)
- f) **Sedatives - Hypnotics** : Introduction ; classification of sedative-hypnotics; structure-activity relationships; barbiturates; amides and imides; alcohols

and their carbamate derivatives; aldehydes and their derivatives; mode of action; pharmacological properties and side effects [Barbitone, Phenobarbitone; Cyclobarbitone; Pentobarbitone Sodium ; Thiopentone Sodium) ; non-barbiturates (official drugs).

- h) **Anticonvulsants** : Introduction, epilepsy and its types; structure activity relationships; barbiturates (official products); hydantoins, Oxazolidinediones, Succinamides; miscellaneous drugs; (Phenytoin Sodium; Troxidone).
- i) **Opioid Analgesics** : Morphine and related drugs, synthetic modifications of morphine, codeine and thebaine.
- j) **Antitussives** : Centrally acting antitussives, opium alkaloids and their modifications; synthetic antitussive. Peripherally acting antitussives. Expectorants
- k) **Central Nervous System Stimulants** : CNS stimulants of natural origin. Synthetic CNS stimulants (Nikethamide) Methylxanthines and modified Methylxanthines (Theophylline).
- l) **Cardiovascular Agents** : Introduction; cardiac glycosides, structure-activity relationship; mechanism of action ; toxic effects. Antihypertensive agents: introduction; etiology, ganglion blocking agents: antiadrenergic agents, drugs acting directly on smooth muscles, drugs acting on CNS. (Propranolol).
- m) **Antibiotics** : Classification, cycloserine, chloramphenicol, penicillins, cephalosporins, aminoglycosides, tetracyclines, polypeptides (Chloramphenicol)
- n) **Antimalarials drugs** : Antimalarials quinoline and analogues, 8-amino quinolins, 9-amino acridines, 4-amino quinolines diamino pyrimidine, and biguanides (Primaquin, Mepacrine, Chloroquin and Pyrimethamine)

- o) **Diuretics** : Osmotic agents, Acidifying salts. Mercurials, Purines and related heterocycles, Sulfonamides, Benzothiadiazene and related compounds, Chlorothalidides and analogs, Sulfamoylbenzoic acid and analogs, Endocrine antagonists, miscellaneous diuretics.

Books Recommended :

1. Wilson and Gisvolds Textbook of Organic Medicinal and Pharmaceuticals Chemistry, 8th Edition, edited by R.F. Doerge, J.B. Lippincott Company, Philadelphia, 1982.
2. Pharmaceutical Chemicals in Perspective, B.G. Reuben and H.A. Wittcoff, John Wiley & Sons, New York, 1989.
3. W.C. Foye, Principles of Medicinal Chemistry, Lea & Febiger, Philadelphia, USA.
4. H.Singh and V.K. Kapoor Medicinal and Pharmaceutical Chemistry, Vallabh Prakashan, Delhi (Latest Edition).
5. J.E.F. Reynolds, Martindale, The Extra Pharmacopoeia, The Pharmaceutical Press, London (Latest Edition).

2. PHARMACEAUTICS

- a) Introduction to different Pharmaceutical Dosage Form
- b) **Pharmaceutical Aerosols** :- Definition advantages of aerosol dosages forms, propellants, containers, valves, mode of operation, formulation of pharmaceutical aerosols, types and systems, section of components, manufacture, labelling, quality control and testing of pharmaceutical aerosols.
- c) **Microencapsulation** : - Fundamental considerations : Core and coating materials, application, methodology coacervation - phase separation, air suspension, multiorifice - centrifugal process, pan coating, spray drying, and spray congealing, polymerization, solvent evaporation and multiple phase emulsion.
- d) **Emulsions** : General consideration, types of emulsion, test for identification of emulsion type, theory of emulsification, formation of emulsion, mechanical equipments for emulsification, stability of emulsions, assessment of emulsion shelf-life.
- e) **Suspensions** : Practical considerations, pharmaceutical application, formulation of suspension - flocculated and deflocculated systems, evaluation of suspension stability, gels, magmas.
- f) **Semisolids** : Percutaneous absorption (structure, function and topical treatment of human skin), basic principles of diffusion, through membranes, skin transport, factors affecting percutaneous absorption, types of vehicles, preservation, evaluation and methods for studying percutaneous absorption, pastes, creams, ointments and contraceptive products.
- g) **Various forms of Tablets** : Coated and compressed layer tablets, effervescent, sublingual buccal and chewable tablets, medicated lozenges, sustained release tablets.

- h) **Tablet formulations** : Properties of compressed tablets, systematic approach to tablet product design, components and additives of tablets, production of tablets, methods of manufacture of tablets. Problems in tablet manufacture.
- i) **Evaluation of Tablets** : Tablet Diameter and thickness, Hardness, Uniformity of weight test, Friability, Disintegration Test, Dissolution Test, Potency and Content uniformity.
- j) **Tablet Coating** : Sugar coating, processing steps, equipments; film coating, film formers, method of evaluating film coating, film coating defects; compression coating and particle coating techniques.
- k) **Sustained release dosage form** : Sustained release drug therapy, advantages, drug properties relevant to sustained release, Introduction to sustained release oral dosage forms; parenteral dosage forms; implants; ocular inserts; transdermal systems. Delivery systems like nanoparticles, microspheres, liposomes, niosomes and maneoemulsions.
- l) **Suppositories** : Introduction, anatomy and physiology of rectum, absorption of drugs from the rectum, factors affecting drug absorption from rectum, types of suppository bases, formulation/manufacturing processes, specific formulation problems, packaging / storage of suppositories, testing and Quality Control of suppositories.
- m) **Ophthalmic Preparations** : Introduction, ocular bioavailability, and classification of ophthalmic products -eye drops, semisolid dosage forms, ophthalmic ointments and gels, intraocular dosage forms, formulation and manufacturing considerations, contact lenses and lens care products.
- n) **Blood and glandular products and enzymes** : Whole human blood, concentrated RBC, dried human plasma, dried human serum, liquid plasma

and serum, fabrication of plasma protein fraction, human fibrinogen, human thrombin, human fibrin foam, human normal immunoglobulin : control for blood products, plasma substitutes : properties of an ideal plasma substitute, dextran, absorbable haemostat, absorbable gelatin, sponge, oxidized cellulose, calcium alginate, pituitary, thyroxin, pancreatin, pepsin.

- o) **Capsules formulations** : Advantages and disadvantages of Capsules formulations, material for production for hard gelatine capsules, size of capsules, method of filling of capsules, soft gelatine capsules, shell capsules contents, importance of base absorption and minimum per gram factor in soft capsules.

Books Recommended :

1. C.W. Copper and G. Cunn, Dispensing Pharmacy, CBS Publishers & Distributors, Delhi.
2. L. Lachman et. al., Theory and Practice of Industrial Pharmacy, Varghese Publishing House, Dadar, Bombay, 1987.
3. S. J. Carter. Dispensing for Pharmaceutical Students, 11th and 12th Edition, 1967 and 1975, Pitman Books Ltd., London, U.K.
4. Herbert, A., Lieberman and Leon Lachman, Pharmaceutical Dosage Forms, Tablets, Vol. I, II, III, Marcel Dekker Inc., NY (Latest Edition).
5. L.Lachman, H.A> Liebermann and J.L. Kanig, The Theory and Practice of Industrial Pharmacy, Lea and Febiger, Philadelphia (Latest edition).
6. Remington : The Science and Practice of Pharmacy, Mack Publishing Company, Easton, Pennsylvania (Latest Edition).
7. H.S. Ansel and N.G. Popovich, Pharmaceutical Dosage Forms and Drug Delivery Systems (Latest Edition).

3. PHARMACOLOGY

- a) Introduction of Human Physiology in relation of drug action, Sources and nature of drugs, routes of administration, factors influencing doses and drug actions.
- b) **Pharmacokinetics** : Absorption, distribution, metabolism and excretion of drugs.
- c) **Pharmacodynamics** : Mechanism of drug action and sites of drug action including membrane and receptor concepts.
- d) **Pharmacology of Autonomic Nervous System** : Cholinergic drugs, adrenergic drugs, Drugs used in myasthenia gravis.
- e) **Pharmacology of Central Nervous System** : General anaesthetics, methods of giving anaesthesia, stages of anaesthesia, narcotic analgesics, sedatives & hypnotics, barbiturate poisoning and treatment.
- f) **Local Anesthesia**
- g) **Histamines & Antihistamines**
- h) **Toxicology** : Concept, development and scope of toxicology, behavioural and neurotoxicity, teratology, endotoxin, pesticides cardiac, hepatic, renal and pulmonary toxicity. Industrial, environmental and forensic toxicology.

Books Recommended :

1. Pharmacology by P.C. Dandya and S.K. Kulkarni, Vallabh Prakashan, New Delhi, Edition 2001.
2. Textbook of Pharmacology by K.D. Tripathi. Edition 2002.
3. Experimental Pharmacology by S.K.Kulkarni, Vallabh Prakashan, New Delhi edition 1997.
4. C.R. Craig and R.E. Stitzel, Modern Pharmacology, Little Brown and

Company, 6th Ed. (2003).

5. Goodman & Gilman's "The Pharmacological Basis of Therapeutics", Ninth Edition, Eds. A.G. Gilman, J.G. Hardman, L.E. Limbird, P.B. Molinoff, R.W. Ruddon, Macmillan Publishing Co. Inc. (2001).
6. B.G. Katzung, Basic and Clinical Pharmacology, Lange Medical Publications, 8th Ed. (2000).
7. P.K.Gupta, Modern Toxicity, Vol. 1-3, Metropolis, New Delhi, 1985.
8. j.Doull, C.D. Klaassen and M.A. Amdur Casarett and Doull's Toxicology, 2nd Edition, McMillan Publishing Co., Inc, 1980.
9. B.Ballantyne, T.Marrs. P.Turner, General and Applied Toxicology, Macmillan Press Ltd., 1995.

4. CHEMISTRY

- a) **Kinetics** : Reaction rate : Rate and rate constant, order and molecularity, zero, first and rate constant, order and molecularity, zero, first and second order reactions, half life time, integration of rate expressions, methods of determining order of a reaction, effect of temperature on reaction rates, Arrhenius equation. Concept of steady state approximation, activation energy barrier. Collision and activated complex theory of bimolecular reactions. Catalysis : Characteristics of catalyzed reactions; definition of the terms, autocatalysis, negative catalysis, inhibitors, promoters, homogeneous and heterogeneous catalysis, acid base catalysis and its mechanism, enzyme catalysis, Michaelis Menten equation, turn over number, the Line Weaver-Burk method.
- b) **Photochemistry** : Frank-Condon principle, Jablonski diagram, singlet and triplet states, photosensitization, quantum efficiency. Photochemistry of alkenes and dienes. Photochemistry of carbonyl compounds, Norrish type I and Type II cleavages, Paterno-Buchi reactions, photoreduction of Ketones.
- c) **Alkanes** : Alkanes : nomenclature of straight and branched chain alkanes and alkyl groups, classification of carbon atoms of alkanes, isomerism in alkanes, sources, methods of preparation, physical properties and chemical reactions. Mechanism of free radical halogenation of alkanes, orientation, reactivity and selectivity, chlorofluorocarbons and ozone layer.
- Cycloalkanes** : nomenclature, methods of preparation, chemical reactions, Bayer's strain theory, ring strain, isomerism in cyclopentane and cyclohexane, reactions of carbenes, cyclic ethers, crown ethers, epoxides.
- d) **Alkyl Halides** : Nomenclature and classes of alkyl halides, methods of preparation, chemical reactions, mechanism of nucleophilic substitution reactions, SN_1 and SN_2 reactions, carbonium ions, and carbocations.

structure, relative stability, ease of formation, rearrangements and other characteristics of carbocations.

e) **Alcohols & Ethers** : Nomenclature, methods of preparation, physical properties and chemical reactions. Role of Solvent : Secondary bonding, solubility of non-ionic and ionic solutes, protic and aprotic solvents, ion pairs, role of solvent in substitution reactions, phase-transfer catalysis.

f) **Alkenes & Dienes** : Alkenes: nomenclature, methods of preparation, mechanism of dehydration of alcohols and dehydrohalogenation of alkyl halides, E1 and E2 reaction mechanisms, physical properties and relative stabilities of alkenes, chemical reactions, mechanisms of hydrogenation, electrophilic and free radical additions Markovnikov's rule, hydroboration-oxidation, oxymercuration-reduction, epoxidation, ozonolysis, hydration, hydroxylation and oxidation with KMnO_4 .

Dienes : nomenclature, structures of isolated, conjugated and cumulated dienes, 1, 2 and 1-4 - addition reactions, free radical polymerization of dienes.

Alkynes : nomenclature, structure and bonding in alkynes, method of preparation, chemical reactions, acidity and electrophilic addition reactions.

g) **Aldehydes & Ketones** : Nomenclature of aldehydes and ketones (carbonyl compounds), preparation of aldehydes and ketones, Friedel-Crafts acylation reaction, oxidation of primary alcohols, oxidation of methyl benzenes and reduction of acid chlorides and using organometallic compounds.

Reactions of aldehyde and ketones : oxidation, reduction, addition of Grignard reagents, Cannizzaro reaction, synthesis of organic compounds using Grignard synthesis.

- h) **Carboxylic Acids & their functional Derivatives** : Carboxylic acids : nomenclature, preparation, physical properties and chemical reactions, ionization of carboxylic acids, structure of carboxylate ions, conversion to acid chlorides, esters and amides, reduction to alcohols, halogenation of aliphatic carboxylic acids (Hell-Vohlard-Zenisky reaction), dicarboxylic acids.
- i) **Surface Chemistry & Catalysis** : Pressure difference across a curved phase boundary. Enhanced vapour pressure of small droplets (Kelvin Equation). Gibbs adsorption equation. Homogenous catalysis, Acid-base catalysis as well as general acid-base catalysis, Surface catalysis, Salient features of Langmuir, Freundlich. Mechanism of surface reactions.
- j) **Chemical Kinetics** : Recapitulation of first, second and third order rate laws opposing reactions, parallel reactions, consecutive reactions. Photochemical reactions, and oscillator reactions. Theories of reaction rates : Molecular collision theory, Unimolecular Theory, Transition state Theory. Reactions in solutions : Kinetics in solutions, salt effects, influence of the solvent. Fast reactions - flash photolysis.
- k) **Theory of Chemical Bonding** : Valance bond theory, Molecular Orbital Theory, Crystal Field Theory, Transition Metal Chemistry
- l) **Valance Bond Theory** : Concepts of VB theory. Hybridization (sq, sp^2 , dsp^2 , sp^3 , sp^3d , dsp^3 , sp^3d^2 , d^2sp^3). Application of V.B theory of simple inorganic molecules and transition metal complexes. Inner and outer orbital complexes.
- m) **Molecular Orbital Theory** : A brief introduction to ICAD method. Resonance integral, energy level diagrams for O_2 , F_2 , CO, CO_2 , PH_3 , BF_3 , NO, NO_2 , NO_3 and H_2O , Molecular orbital description of tetrahedral and octahedral complexes of transition metals.

- n) **Crystal Field Theory** : Splitting of energies of orbitals under octahedral, tetrahedral and square planar environment, magnetic properties of complexes in terms of CFT. Crystal field stabilization energy and heats of ligation, lattice energy, Terms and Symbols, Selection rules, Hole formulation, electronic spectra of co-ordination complexes. (Orgel diagrams of d^1 - d^9 tetrahedral and Octahedral complexes. Limitation of CFT. Stability of co-ordination complexes and factors effecting the stability nephelauxetic effect, ligand field theory. Calculation of B and $10 Dq$ from spectral data.
- o) **Transition Metal Chemistry** : Magnetic moments, Magnetic properties of transition metal complexes. Interior magnetic coupling. Spin State crossovers. Comparison of first transition series with 2nd and 3rd transition series.

Books Recommended :

1. Organic Chemistry by Solmons, John Wiley, 9th Ed. (2008).
2. Advanced Organic Chemistry by Jerry-March, Wiley Eastern, VIth edition (2007).
3. Reaction Mechanism in Organic Chemistry by S.M. Mukherji & S.P. Singh, New Age Internationals, IIIrd edition (2004).
4. Organic Chemistry by Carey, Tata Mc-Graw Hill (2008).
5. R.T. Morrison and R. N. Boyd, Organic Chemistry, 6th Edition, Prentice-Hall of India Pvt. Ltd., Delhi
6. G.Solomons, C. Fryhle and R.Johnson, Organic Chemistry, 7th ed. John Wiley and Sons (Singapore)
7. Text Book of Physical Chemistry by S. Glasstone, Macmillan India Press (1977).

8. Chemical Kinetics by K. J. Laidler (Chapters 1 and 2), Tata McGraw Hill (1995).
9. Basic Physical Chemistry W.J. Moore (Chapter 14 & 18), Prentice-Hall of India Pvt. Ltd. New Delhi (1986).
10. Physical Chemistry by P.W. Atkin & Julio de Paula, Oxford University Press, 7th Edition (2002).
11. J. R. Barrante, Physical Chemistry of the Life Science, Printell (Lastest Edition).
12. B. R. Puri, L.R. Sharma and M.S. Pathania, Principal of Physical Chemistry, Shoban Lal Nagin Chand & Co. 1998.
13. F.A. Cotton and G.W. Wilkinson, Advanced Inorganic Chemistry, John Wiley and Sons 6th edition, John Wiley New York (1999).
14. J.E. Huheay, Inorganic Chemistry, Principles of Structure and Reactivity, harper International, SI edition, 3rd edition, Harper London (1978).
15. G. Wilkinson (ed.) Comprehensive coordination chemistry vol. 3 chapter 23, Pergamon, Pergamon Oxford (1982).