

# Syllabus - M.Pharmacy

## Section A: PHARMACEUTICS

1. Physical Pharmacy: States of matter, Physical properties of drug molecules, pH, buffers and isotonic solution, solubility phenomena, surface tension, interfacial phenomenon, Kinetics, Rheology, Micromeritics & powder flow, Diffusion and dissolution, Colloids, Complexation and protein binding.
2. Pharmaceutical Engineering: Stoichiometry, Fluid Flow, Heat Transfer, Evaporation, Distillation, Drying, Size Reduction, Size Separation, Mixing, Material Handling System, Filtration & Centrifugation, Crystallization, humidification, air conditioning and refrigeration, Material of Plant Construction, Corrosion and Plant lay out.
3. Pharmacy Practice: Professional Pharmacy, Pharmaceutical jurisprudence including Drugs and Cosmetics Act 1940 and rules 1945. Pharmacy Act 1948, Code of Pharmaceutical ethics. Prescription: definition, various parts of prescription and their functions, handling of prescription, sources of errors, care required in dispensing procedures including labeling of dispensed products, preliminary knowledge of important Latin terms used in the prescriptions and their translation in to English. Posology: Definition, Factors affecting dose selection. Calculation of children and infant doses.
4. Pharmaceutical Technology: Principles, Formulation, Ingredients, method of manufacture, evaluation, quality control tests, labeling and packaging of following class of product:  
Solid dosage forms- Tablets, coating, capsules, microcapsules, powders, granules etc.  
Liquid dosage forms- solutions, suspensions, emulsions,  
Semisolid dosage forms- ointment, creams, gels, suppositories,  
Parenterals- injections small volume, large volume, ophthalmic preparations and  
Pre-formulation studies, Stability studies and Pharmacopoeal specifications for various formulations.  
Formulation of cosmetics preparation like lipstick, shampoo, creams, nail preparations and dentifrices, powers etc.
5. Biological Pharmacy and Pharmaceutical Biotechnology: Principles and methods of microbiological assays of the Pharmacopoeia. Methods of preparation of official sera and vaccines. Serological and diagnostics tests. Applications of microorganisms in bio conversions and in pharmaceutical industry.
6. Biopharmaceutics and Pharmacokinetics and their importance in formulation. Introduction to biopharmaceutics: Drug absorption, distribution, metabolism and elimination. Compartment model- Definition and Scope. Pharmacokinetics of drug absorption - Zero order and first order absorption rate constant. Determination of pharmacokinetic parameters.  
Bioavailability and bioequivalence: Measures of bioavailability,  $C_{max}$ ,  $t_{max}$ ,  $K_{el}$  and Area Under the Curve (AUC); Review of regulatory requirements for conducting bioequivalent studies. Biopharmaceutical Classification System (BCS) of drugs.

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## Section B: PHARMACEUTICAL ANALYSIS AND QUALITY ASSURANCE

1. Fundamental of pharmaceutical analysis, Theoretical consideration and application in drug analysis and quality control.  
Acid base titrations: Acid base concepts, ionization, law of mass action, common ion effect, ionic product of water, pH, hydrolysis of salts, Henderson- Hasselbach equation, buffer solutions, neutralization curves, acid-base indicators, theory of indicators, choice of indicators, mixed indicators, polyprotic systems, polyamine and amino acid systems, amino acid titrations.  
Oxidation- Reduction titrations: Concepts of oxidation and reduction, theory, redox indicators, oxidation-reduction curves, iodometry, Precipitation titrations: Principles, procedures of Precipitation reactions.  
Complexometric titrations: Complexing agents used as titrants, indicators, types of complexometric titrations, masking and demasking;  
Non-aqueous titrations: Acidic and basic drugs, solvents used, indicators  
Gravimetry: Precipitation techniques, colloidal state, supersaturation, co-precipitation, post- precipitation, digestion, washing of the precipitate, thermogravimetric curves.  
Miscellaneous Methods of Analysis: Diazotization titrations, Kjeldahl method of nitrogen estimation, Karl-Fischer aquametry, oxygen flask combustion method, gasometry.  
Potentiometry: Electric potential, electrochemical cell, reference electrodes, indicator electrodes, measurement of potential and pH, construction and working of electrodes, potentiometric titrations, method of deduction of end-point.  
Conductometry: Conductance, conductivity cell, conductometric titrations, applications.  
Polarography: Instrumentation, DME, residual current, diffusion current and limiting current, polarographic wave, Ilkovic's equation, effect of oxygen on polarographic wave, polarographic maxima and suppressors, applications.  
Amperometry: Introduction, types of electrodes used, reference and indicator electrode, instrumentation, titration procedure, advantages and disadvantages of amperometry over potentiometry, pharma applications.
2. Chromatographic methods of pharmaceutical analysis:  
Principles of separation, theory, instrumentation and applications of Column chromatography, Paper chromatography, Ion Exchange chromatography, TLC & HPTLC, HPLC and Gas chromatography.
3. Instrumental methods of pharmaceutical analysis:  
Theoretical aspects, basic instrumentation, elements of interpretation of spectra, and applications (quantitative and qualitative) of Ultraviolet and Visible spectrophotometry, Fluorimetry, Infrared spectrophotometry, Nuclear Magnetic Resonance spectroscopy [proton technique only], Mass Spectrometry (EI & CI only), Flame Photometry, Atomic Absorption Spectroscopy, X-ray Diffraction Analysis, Thermal methods(TGA,DSC,DTA), Radioimmunoassay.
4. Quality assurance:  
GLP, ISO 9000, TQM, Validation, quality audit, quality of equipment, validation of equipment and validation of analytical procedures.

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## Section C: PHARMACOLOGY

1. Pathophysiology of common diseases; Basic Principles of Cell Injury and Adaptations: Causes of Cellular injury, pathogenesis, morphology of cell injury, adaptations and cell death.  
Basic Mechanisms involved in the process of inflammation and repair: Vascular and cellular events of acute inflammation, chemical mediators of inflammation, pathogenesis of chronic inflammation, brief outline of the process of repair. Immunopathophysiology: T and B cells, MHC proteins, antigen presenting cells, immune tolerance, pathogenesis of hypersensitivity reactions, autoimmune diseases, AIDS, Amyloidosis.
2. Fundamentals of general pharmacology:  
Dosage forms and routes of administration, mechanism of action, combined effect of drugs, factors modifying drug action, tolerance and dependence; Pharmacogenetics; Principles of Basic and Clinical pharmacokinetics, absorption, Distribution, Metabolism and Excretion of drugs, Adverse Drug Reactions; Bioassay of Drugs and Biological Standardization; Discovery and development of new drugs, Bioavailability and bioequivalence studies;
3. Pharmacology of Peripheral Nervous System:  
Neurohumoral transmission (autonomic and somatic), Parasympathomimetics, Parasympatholytics, Sympathomimetics, Adrenergic receptor and neuron blocking agents, Ganglion stimulants and blocking agents, Neuromuscular blocking Agents, Local anesthetic Agents.
4. Pharmacology of Central Nervous System:  
Neurohumoral transmission in the C.N.S., General Anesthetics, Alcohols and disulfiram, Sedatives, Hypnotics, Anti-anxiety agents and Centrally acting muscle relaxants, Psychopharmacological agents (anti-psychotics), anti-manics, and hallucinogens, Antidepressants, Anti-epileptics drugs, Anti-Parkinsonian drugs, Analgesics, Antipyretics, Narcotic analgesics and antagonists, C.N.S. stimulants, Drug Addiction and Drug Abuse.
5. Pharmacology of Cardiovascular System:  
Drugs used in the management of congestive cardiac failure, Antihypertensive drugs, Anti-anginal and Vasodilator drugs, including calcium channel blockers and beta adrenergic antagonists, Antiarrhythmic drugs, Anti-hyperlipidemic drugs, Drugs used in the therapy of shock.
6. Drugs Acting on the Hemopoietic System:  
Hematinics, Anticoagulants, Vitamin K and hemostatic agents, Fibrinolytic and anti-platelet drugs, Blood and plasma volume expanders.
7. Drugs acting on urinary system:  
Fluid and electrolyte balance, Diuretics. Anti diuretics.
8. Autacoids:  
Histamine, Antihistaminic drugs, 5-HT- its agonists and antagonists, Prostaglandins, thromboxanes and leukotrienes, Angiotensin, Bradykinin and Substance P and other vasoactive peptides.
9. Drugs Acting on the Respiratory System:

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- Anti-asthmatic drugs including bronchodilators, Anti-tussives and expectorants, Respiratory stimulants.
10. Drugs acting on the Gastrointestinal Tract:  
Antacids, Anti-secretory and Anti-ulcer drugs, Laxatives and anti-diarrhoeal drugs, Appetite Stimulants and Suppressants, Emetics and anti-emetics, Miscellaneous: Carminatives, demulcents, protectives, adsorbents, astringents, digestants, enzymes and mucolytics.
  11. Pharmacology of Endocrine System:  
Hypothalamic and pituitary hormones, Thyroid hormones and anti-thyroid drugs, parathormone, calcitonin and Vitamin D, Insulin, glucagons, incretins, oral hypoglycemic agents and insulin analogs, ACTH and corticosteroids, Androgens and anabolic steroids, Estrogens, progesterone and oral contraceptives, Drugs acting on the uterus.
  12. Chemotherapy: General Principles of Chemotherapy, Bacterial resistance; Sulfonamides and cotrimoxazole, Antibiotics- Penicillins, Cephalosporins, Aminoglycosides, Chloramphenicol, Macrolides, Tetracyclines, Quinolones, fluoroquinolones and Miscellaneous antibiotics; Chemotherapy of tuberculosis, leprosy, fungal diseases, viral diseases, HIV and AIDS, urinary tract infections and sexually transmitted diseases, malaria, amoebiasis and other protozoal infections and Anthelmintics. Chemotherapy of malignancy and immunosuppressive agents.
  13. Principles of Toxicology: Definition of poison, general principles of treatment of poisoning with particular reference to barbiturates, opioids, organophosphorous and atropine poisoning, Heavy metals and heavy metal antagonists.

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## Section D: PHARMACEUTICAL CHEMISTRY

1. Pharmaceutical inorganic chemistry: An outline of methods of preparation, uses, sources of impurities, tests for purity and identity, including limit tests for iron, arsenic, lead, heavy metals, chloride, sulphate  
Gastrointestinal Agents: Acidifying agents, Antacids, Protectives and Adsorbents, Cathartics; Topical Agents: Protectives, Astringents and Anti-infectives. Gases and Vapors: Oxygen, Anesthetics (inorganic) and Respiratory stimulants; Dental Products: Dentifrices, Anti-caries agents; Complexing and chelating agents used in therapy; Miscellaneous Agents: Sclerosing agents, Expectorants, Emetics, Inorganic poisons and antidotes. Pharmaceutical Aids Used in Pharmaceutical Industry: Anti-oxidants, Preservatives, Filter aids, Adsorbents, Diluents, Excipients, Suspending agents, Colorants; Acids, Bases and Buffers: Buffer equations and buffer capacity in general, buffers in pharmaceutical systems, preparation, stability, buffered isotonic solutions.
2. Pharmaceutical Organic Chemistry: Structure, nomenclature and Stereochemistry of drug molecules.
3. Medicinal Chemistry: Structure, nomenclature, classification, synthesis, SAR and metabolism of the following category of drugs, which are official in Indian Pharmacopoeia and British Pharmacopoeia. Hypnotics and sedatives, analgesics, NSAIDs, neuroleptics, antidepressants, anxiolytics, anticonvulsants, antihistaminics, local anaesthetics, cardio vascular drugs? Antianginal agents vasodilators, adrenergic & cholinergic drugs, cardiotoxic agents, diuretics, antihypertensive drugs, hypoglycemic agents, antileptic agents, coagulants, anticoagulants, antiplatelet agents. Chemotherapeutic agents? Antibiotics, antibacterials, sulphadiazine. Antiprotozoal drugs, antiviral, antitubercular, antimalarial, anticancer, antiamoebic drugs. Diagnostic agents. Preparation and storage and uses of official radiopharmaceuticals, vitamins and hormones. Eicosanoids and their application. Introduction to drug design.
4. Biochemistry: Biochemical role of hormones, vitamins, enzymes, nucleic acids, bioenergetics. General principles of immunology. Immunological. Metabolism of carbohydrate, lipids, proteins. Methods to determine, kidney & liver function. Lipid profiles.
5. Pharmacognosy:
  - a. Systematic pharmacognostic study of the followings:

Carbohydrates and derived products: Agar, guar gum, acacia, Honey, Isabgol, pectin and Tragacanth.

Lipids: Bees wax, Castor oil, Codliver oil, Shark liver oil and Wool fat.

Resins: Colophony, podophyllum, jalap, cannabis, capsicum, myrrh, asafoetida, balsam of Tolu, balsam of Peru, benzoin, turmeric, ginger.

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Volatile oils: Mentha, Coriander, Cinnamon, Cassia, Lemon peel, Orange peel, Lemon grass, Citronella, Caraway, Dill, Clove, Fennel, Nutmeg, Eucalyptus, Chenopodium, Cardamom, Sandal wood.

Fibers: Cotton, silk, wool, nylon, glass-wool.

b. Study of the biological sources, cultivation, collection, commercial varieties, chemical constituents, substitutes, adulterants, uses, diagnostic macroscopic and microscopic features and specific chemical tests of following groups of drugs.

Cardioactive glycosides: Digitalis, squill, strophanthus and thevetia,

Anthraquinones: Aloe, senna, rhubarb and cascara,

Alkaloid containing drugs: Pyridine-piperidine: Tobacco, areca and lobelia. Tropane: Belladonna, hyoscyamus, datura, duboisia, coca and withania. Quinoline and Isoquinoline: Cinchona, ipecac, opium. Indole: Vinca alkaloids, Ergot, rauwolfia, catharanthus, nux-vomica and physostigma. Steroidal: kurchi. Purines: Coffee, tea and cola.

c. Enzymes: Diastase, papain, pepsin, trypsin, pancreatin.

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