# Department of Pharmaceutical Sciences
# University of Kashmir

## *Entrance Examination Syllabus for M. Pharm in Pharmaceutical Sciences*

***Note***

The objective of this syllabus is to evaluate the foundational and applied knowledge of candidates seeking admission to the M. Pharm degree program. It covers key disciplines such as Pharmaceutical Chemistry, Pharmaceutics, Pharmacology, Pharmacognosy and photochemistry, and Pharmaceutical Biotechnology etc., ensuring a comprehensive assessment of candidates' understanding. The entrance test will consist of 60 multiple-choice questions (MCQs), each carrying one mark, with proportional weightage assigned to each unit (as indicated) to ensure balanced coverage of the syllabus. Paper setters must design questions that provide uniform representation of topics and maintain an appropriate level of difficulty to effectively assess candidates' aptitude in pharmaceutical sciences.

### Unit 1

Atomic and molecular orbitals, dipole moment, resonance, inductive and electrometric effects, intermolecular and intermolecular hydrogen bonding

**Stereochemistry:** Optical activity, stereoisomerism, specification of configuration, reactions involving stereoisomerism, Bayer Strain theory and conformational analysis.

Structure, nomenclature, preparation and reactions/ properties of following groups of Compounds (including mechanism of reactions wherever necessary)

Aliphatic & Alicyclic Hydrocarbons; Alkanes, alkenes, alkynes, cycloalkanes.

**Aliphatic Halohydrocarbons:** SN1 and SN2 reactions, chloroform, carbon tetrachloride, trichloroethylene and halothane.

**Aliphatic Alcohols**: Primary, secondary and tertiary alcohols, methanol, ethanol, proof spirit, denatured alcohol, methylated spirit, determination of alcohol in Pharmaceutical preparations, di and trihydric alcohols: glycols, glycerol, ethylene glycol, propylene glycols, glyceryl trinitrate, allylalcohol, polyethylene glycols.

**Ethers:** Thioethers, divinyl ether, solvent ether, anaesthetic ether

**Aldehydes and Ketones:** Formaldehyde, paraformaldehyde, acetaldehyde and its polymers, chloral hydrate.

**Saturated Monocarboxylic acids and Esters:** Preparation and properties of formic acid, acetic acid and derivatives, propionic acid, butyric acid, valeric acid, palmitic acid and stearic acid, ethyl acetate, ethyl acetoacetate, dioctyl sodium sulphosuccinate, ethyl oleate, sodium lauryl sulphate, lactic acid, lactones, glucuronic acid and gluconic acid.

**Di & Tricarboxylic acids:** Oxalic acid, malonic acid, succinic acid and their amide and imide derivatives, maleic acid fumaric acid, glutaric acid, tartaric acid and citric acid.

**Aliphatic Amines and Related compounds**: Alkylamines, b-hydroxy and b-haloalkyl diamines, urea and ureides, dextropropoxyphene hydrochloride, dicyclamine hydrochloride, mustine hydrochloride, ethylene diamine hydrate, sodium calcium edetate, cyclamic acid, calcium cyclamate, thiambutosine.

**Carbanions:** Reactions involving carbonions: Malonic ester, synthesis of carboxylic acid, acetoacetic ester, synthesis of ketones, direct and indirect alkylation of esters and ketones, alkylation of carbonyl compounds via enamines, a, b- unsaturated carbonyl compounds (conjugate addition) including Michael and Diels-Alder reaction.

## Unit 2

**Aromatic Compounds:** Structure and resonance of benzene, aromatic character, mechanism of electrophilic aromatic substitution, Orientation effects in electrophilic substitution, nucleophilic aromatic substitution.

Preparation, properties and actions of: Phenols, Sulphonic acid and derivatives, Carboxylic acids, Carboxamides, Nitro compounds, amines, diazonium salts, aryl halides and ketones.

Poly nuclear aromatic hydrocarbons: Naphthalene, Phenanthrene and Anthracene.

Heterocyclic compounds: Study of fundamentals of heterocyclics, Nomenclature, methods of synthesis and important chemical reactions of the following:

a. Five membered heterocycles: Furan, Thiophene, Pyrrole, Thiazole, Oxazole, Imidazole, Pyrazole and tetrazole.

b. Six- membered heterocycles: Pyridine, Pyridazine, Pyrimidine, Pyrazine and Pyrones.

c. Benz-fused heterocycles: Quinoline, Isoquinoline, Indole, Acridines and Xanthone

Synthetic procedures, uses and structure activity relationship of following drugs:

a. Sedatives and Hypnotics: Phenabarbitone, Allobarbitone, Meprobromate, Glutethimide, Chloral hydrate, Paraldehyde.

b. General Anesthetics: Cyclopropane, Hatothane , thiopental sodium, Fentanyl citrate, Ketanine Hcl.

c. Local anesthetics: Cocaine, Benzocaine, Dibucaine Hcl, Procaine, Lidnocaine.

d. Opioid Analgesics: Morphine sulphate, Codeine, Dextromethorphan, Metazocin, Pethidine Methadone Hcl.

e. CNS Stimulants: Caffiene, Aminophylline, Nikethamide, Pentetrazol, Bemigride.

f. Antiseptics and Disinfectants: Ethyl Alcohal, Ethylene oxide, Cetyl pyridinium chloride, Glutarol, Halozone.

g. Sulphonamides: Sulphanilamide, Sulphadiazine, Sulphacetamide, Sulphafurazole, Pthalyl sulphathiazole, Mafenide.

h. Thyroid harmones & Antithyroid drugs: Thyroxine,Triiodothyronkine, Propyl thiouracil, Methimazole, Carbimazole.

i. Anticoagulants: Warfarin, Phenidion, Dicumarol, Ethyl biscoumacetate, Coumadin.

**Steroids:** Nomenclature, Stereochemistry, Classification, Isolation methods, Chemistry of Cholesterol (Excluding Synthesis), Diosgenin, Stigmastrol and Erogsterol.

**Steroids and related drugs:** Androgens & Anabolic agents, Oestrogens and Progestational agents (Oral contraceptives) & Adrenocorticoids.

**Cardiac Glycosides**: Digoxin, Digitoxin

**Coronary Dilaters:** Glyceryl trinitrate, lsosorbide dinitrate, Dipyridamole, Strophanthin, Bufotoxin

**Antilipidimic Agents:** Theofibrate, Clifbrate, Probucol, Gemfibrozil, Lovastatin.

**Anti Fibrillatory Agents:** Quinidine $SO_4$

**Antiarrythmic Agents:** Procainamide, Mexiletine, Flecainide, amiodarone, Verapamil.

**Hypotensive Agents:** Methyl dopa, Clomidine, Guanidine, Propranelol, Minoxidil, Nitroprusside, Reserpine, Captopril, Nifidipine.

***Synthesis, procedures, classification, uses, structure, activity relationship of:***

**Antibiotics:** Penicillin

*Aminoglycosides:* Streptomycin, Gentamycin, Neomycin, Kanamycin, Chloramphenicol, Tetracyclines, Cephalosporines

**Antimalarials:** Chloroquine phosphate Hcl; Pamaquine, Primaquine, Pentaquine phosphate, Mepacrine Hcl, Proguanil Hcl, Pyrimethamine, Trimethoprim, Quinine sulphate.

**Antiaemobic:** Metronidazole, Diloxanide furcate, Paramomy cin, Phanquone.

**Anthelminthes:** Albendazole, Mebendazole, Praziquintal, Piperazine citrate.

**Antifungal agents:** Propionic acid, Ketoconazole, Griseofulvin, Natamycin.

**Anti-Tubercular Drugs:** P-Amino salicylic acid, Isomiazide, Pyrazinamide, Ethanbutol, Ethinoamide.
**Medicinal Dyes:** Crystal Violet, Brilliant green, Acriflavin, Methylene blue, Malachite green.
**Anti-Viral agents:** Amantidine Hcl, Idoxuolidine, Acycloviv, Vidabarin, Ribavarin, Methisazone.
**Antineoplastic:** Mechlorethamine Hcl, Mephalan, Cholrambucil, Buslfan, Triethylene, Melanine, Carmustine, Methotrextrate, Mercaptoparin, Flururacil, Cytrabin Azaserine, Daunorcrbicin, Cisplatin Mitotane.

**VITAMINS**

**Aniticonvulsants:** Phenobarbitone, Phenytoin, Trimethadion, Paramethadion, Phensuxlmide, Valproic acid, Primadone, Crbama epine.
**Antihistaminics:** Diphenyhydramine, lamotrigene, Dime4nhydrenate, Pyrilamine malaete, Triaplenenamine rrialeate, Pheniramine maleate, Promethazine, Cyclazine, Buclizine, Chlorophenniramine.
**Antiparkinsonism Drugs:** Bipridine, Trihexyphenidyl, Procyclidine, Thopropazine, Orphenadrine citrate, Levodopa, Amantidine.
**Diuretics:** Chloroeneowrin, Mercaptomerine, Chlorothiozaide, Bendroflumethiazide, Polythiazide, Acetazolamide, Disulfamide, Chlorothalidone, Furosemide, Ethacrynic acid, Spirmolactone, Triamterene.
**Non-Steroidal Anti-Inflammatory Agents:** Indomethacin, Tolmetin, Ibuprofen, Diclifenac, Ketoprofen, Naproxen, Auranofin, aspirin, Phenylbutazone
**Expectorants & Antitussives:** Acetylcycsteine, Bromohexine, Ammonium chloride, Guaniphesine, Eucalyptol, Benzonatate, Nocapine, Genopropoxyphene, Pholcodine.
**Hypoglycaemic Agents:** Insulin, Tolbutamide, Chlopropamide, Glibenclamide, Glipizide, Phentornine, Piglitazone
**Antipyretic Analgesics**: Paracetamol, Acetanalide, salicylamide, Benorylate phenozone Dipyrone, Mefananine acid
**Uricosurics** (Anti-gout Agents): Probenecid, Sulfinpyrazone, allopurinol, Colchicine, Prednisolone
**Muscle Relaxants**: Chlorzoxazone, Paclofen, Crisoproder, Mephencsin, Dantrollene
**Adregenic Drugs:** Adrenaline, Noradrenaline, Terdutaline, Amphetamine, Ephedrine, Isoprenaline
**Cholinergics:** Acetylcholine, Pilocarpine, Carbachol, Edrophonium, Physostigmine, anticholinepsterases
**Antispasmodics:** Homatropine, Diperidine Hcl, Dicyclolomine, Orphemnadrine citrate,
**Psychoactive Drugs:** Triflupromazine, Haloperidul, Diazepam, Oxazepam, Alprozolam, Amitryptiline, Imipramine, Fluoxetive, Venlafaxine, Phenelzine, Tranylcypromine

## Unit 3

**Chromatography-** Fundamental principles of Chromatography, adsorption, partition, column, paper, thin layer Chromatography, gas Chromatography, electrophoresis, high performance liquid Chromatography, instrumentation with particular reference to quantitative estimation of drugs and biopharmaceutical agents. Theory of Ion exchange, types of exchangers, Ion-exchange equilibrium, Ion-exchange separation, applications in Pharmaceutical analysis
Spectroscopy- Basic principle, instrumentation, spectra and qualitative and quantitative applications of UV, Visible, IR, NMR, mass spectrometry, Flame photometry, Atomic absorption, Emission spectroscopy, Polarography

**Acid base titration:** Theories of acidimetry and alkalimetry, classification, direct titration of strong acids, strong bases, preparation and standardization of acids and bases, official assay procedures e.g. boric acid, hydrochloric acid, sodium hydroxide,

Zinc oxide, Sodium carbonate, tartaric acid, aspirin

**Redox reaction:** Redox indicators, Potassium permanganate titrations, Iodometry and Iodimetry, Cerric ammounium sulphate titrations, Potassium iodate titrations Preparation and standardization of titrants like Silver nitrate, Ammonium thiocynate titrations according to Mohr's and Volhard's methods

**Diazotization**: Different conditions involved in diazotisation of different amines, end point determination, Pharmaceutical analytical applications

**Gravimetric analysis:** Introduction, precipitation, techniques, supersaturation, coprecipitation, digestion, washing of precipitates, filtration, filter paper and crucibles, ignition

**Non-aqueous titrations:** Acid-base equilibria; in non aqueous media, titration of weak bases, titration of weak acids

**Complexometric titrations:** Types, metal ion indicators, factors influencing the stability of complexes and applications e.g. Calcium gluconate, Bismuth carbonate, Potassium alum

**Potentiometric analysis:** Potentials of Galvanic cells, Potentiometric acid-base titrations, Potentiometric pH determination, precipitation and complex formation, Oxidation-reduction titrations, applications in Pharmacy.

**Conductometric analysis:** units in conductometric titrations, determination of water analysis of salt solutions, measurement of conductance, high frequency (Oscillometric method), applications.

**Aquametry:** Physical methods for water determination, thermal methods, azeotropic distillation, refractive index, spectrophotometric method, gas chromatography, electrochemical methods, chemical methods of water determination, Karl Fischer method of moisture determination.

**Polarimetry:** Its principles and applications; polarization types of molecule analysed; optical rotation; effects of concentration, wave length, solvent, temperature on optical rotation; polarimeter, light source, sample cells.

## Unit 4

Introduction, Occurrence, Isolation, classification, general methods of determining structure with reference to Citral, Citronallol, Carvone Limonene, Thymol, Menthol and structural features of terpenoids (isoperene rule).

**Alkaloids:** Introduction, Occurrence, functions of Alkaloids. Classification, isolation, properties. General methods of determining structure of alkalods with reference to Ephedrine, Atropine, Quinine, Papaverine and Morphine.

**Glycosides:** Introduction, Natural glycosides, Classification and methods of isolation and determination of structure, Arbutin, Salicin, Amygdalin, Sinigrin and Indican.

**Carbohydrates:** Introduction, Nomenclature and Classification. General reactions of Monosaccharides, Configuration of Monosaccharides, Structure and properties of disaccharides, Maltose, Lactose and Sucrose. Structure and properties of **Polysaccharides:** Starch, Glycogen and Cellulose. Structure and conformation of Sugars. Isomerism in sugars. Mucopolysaccharides.

**Lipids:** Introduction, Classification of lipids. Fatty acids- Nomenclature and Physio-chemical properties. Phospholipids- Their properties and functions. Glyco lipids and Sphingo lipids. Lipo proteins.

**Amino acids and proteins:** Introduction, Classification of amino acids. General physical and chemical properties of amino acids. Polypeptides- Synthesis of polypeptides. Proteins and uses of proteins. Classification and structure of proteins

**Purines**: Introduction, Synthesis and Classification of Purines. Methods of determining structure with reference to Caffeine, Theobromine and Theophylline.

**Flavones and Iso-flavones**: A preliminary study

## Unit 5

**Classification of dosage forms:** Solids, Semisolids & Liquid dosage form.
Principle involved in the preparation of following Pharmaceutical products official in I.P and their uses, Purified water, Deionized water, Distilled water and water for injection, Aromatic water, Solutions, Spirits, Glycerines, Syrups, Elixirs, Lotions, Mucilages and Liniments
**Size Reduction and Size Separation** Definitions, factors affecting size reduction; Principles, Laws and factors affecting energy requirements, different methods of size reduction, study of Hammer mill, Fluid energy mill and disintegrator. Various methods & equipments employed for size separation e.g. sieving, sedimentation, centrifugal, elutriation, microscopic methods
**Prescriptions:** Modern Methods of prescribing Common Latin abbreviations.
**Metrology**: Reducing and Enlarging recipes; percentage calculations %, w/v, v/v & w/w.
**Alcohol dilutions**, use of Alligation methods; proof spirit. Isotonic solutions,
**Suppositories:** Displacement value of suppositories
**Posology:** Dose and dosage of drugs, Factors influencing dose. Calculations of doses on the basis of age, sex and surface area
**Powders**: Types; merits and demerits; Compounding, storage and packaging of: Effervescent powders, Granules, Cachets and tablet triturates, Dusting powders.
**Liquids Dosage Forms:** Preparation, merits, demerits, storage and packaging of solutions and mixtures of Pharmaceuticals
**Emulsions:** Preparation, identification uses, Classification of emulsifying agents and stability of Emulsions.
**Suspensions:** Preparation of suspensions, suspending agents; Flocculated and Deflocculated suspensions; stability of suspensions.
**Semi-Solid Dosage Forms:** Ointment bases: dispensing, demerits and packaging aspects of ointments, pastes, jellies, Poultice, Suppositories and Pessaries.
**Sterile Dosage Forms:** Definition, types, their merits and demerits, Elementary study of the formulation characteristics of the following types: Injectable preparations, Ophthalmic and ENT products, Total Parenteral nutrition, Dialysis fluid

## Unit 6

**Preformulation studies:** Solid state properties (Crystallinity, Polymorphism), Solubility studies (Dissociation, Partition coefficient, pH solubility profile, common ion effect) Stability study and Drug Excipient interaction

**Tablets:** Production of tablets, additives and components for compression, forms of compressed tablets, evaluation. Tablet coating: Sugar coating, film coating, air suspension coating, film defects.
**Capsules:** Hard gelatin capsules: formulation of shell & contents, capsule production, filling operation and equipment employed. Soft gelatin capsules: Manufacture, processing and quality control.
**Microencapsulation:** Importance and Application, techniques, equipment employed.
**Pharmaceutical Aerosols:** Components, formulation, types of systems, manufacturing, operation of an aerosol package , quality control and testing, oral, inhalation, nasal and topical aerosols, future developments.
**Controlled Drug Delivery systems:** Introduction, terminology, Drug targeting, Design and fabrication of oral controlled release drug delivery system. Introduction to implantable and transdermal therapeutic system.
**Sustained action dosage form:** Drug replacement rate, unit drug dose, mechanisms, formulation and manufacture of sustained action dosage form.
**Packaging technology:** Types of containers; materials used, closures, unit dose packaging, strip packaging materials, packaging of solid, parenterals and Ophthalmic dosage forms.

## Unit 7

**Biopharmaceutics**: Fundamental principles and concepts, Bioavailability, Bioequivalence and inequivalence, Chemical equivalence, therapeutic equivalence etc.
**Drug Absorption:** Mechanisms, physio-chemical, biological and dosage form considerations in in gastrointestinal drug absorption.
**Drug disposition:** Distribution in blood, plasma-protein binding, cellular distribution, drug penetration to cell, drug excretion -renal, biliary, salivary and biotransformation.
**Bioavailability:** Introduction, comparative bioavailability, Methods of estimation of bioavailability
**Pharmacokinetics:** Introduction, importance in bioavailability and clinical practice and concepts,Terminologies used.
Absorption, distribution, metabolism and excretion of drugs. Biological halflife, apparent volume of distribution, Fluid compartments and circulatory system.
**Compartment models:** Concepts and their importance in the study of Pharmacokinetics. One compartment open model. Determination of drug/metabolic levels on administration of single and multiple dose in plasma and urine after i.v injection. Oral administration and first order absorption. Percent absorbed time plot and absorption rates based on one compartment model.
Two compartments open model, Pharmacokinetics of single and multiple dose administration as applied to intravenous(rapid) and oral administration, intravenous transformation

## Unit 8

**Surface and Interfacial Phenomenon**: Determination of surface and interfacial tension, surface free energy, spreading co-efficient, adsorption isotherms, factors affecting adsorption and applications of adsorption, General characters and classification of surfactants, HLB, solubilization: Mechanism, factors and application of solubilization, Micelle formation, CMC, Detergency, Wetting agents, Contact angle, Foaming and Antifoaming agents..
**Complexation:** Protein binding Metal complexes, molecular organic complexes, inclusion complexes, method of analysis, protein binding, factors and its applications
**Drug stability:** Mechanisms of drug degradation, Influence of light and temperature on drug decomposition, Chemical stability testing in dosage forms and storage
**Reaction kinetics:** Molecularity of reactions, order of reaction, determination of order, factors affecting rate of reaction, accelerated stability analysis.
**Viscosity and Rheology:** Viscosity, factors affecting viscosity, Determination of flow properties, Viscoelasticity, Newtonian and Non-newtonian systems, thixotropy, Thixotropy measurement and applications, Rheopexy, negative thixotropy

## Unit 9

**Physiology** of Muscle contraction, Neuromuescular transmission, Physiology of-Nervous, cardiovascular, respiratory, Digestive, Urinary and endocrine systems

**General aspect of Pathophysiology**: Atrophy, necrosis, pain, irritation, inflammation, shock, allergy.
**Pathophysiology and clinical assessment of Disorders of:**
**Cells and tissues**: Hypoplasia, hyperplasia, hypertrophy, metaplasia, neoplasia and general considerations
**Blood cells**: Leukopenia, leukemia, erythrocyte disorders (anemia polycythemia etc.), diseases (thrombocytopenia, fibrinogen deficiency, purpura, etc.)
**Blood vessels and heart**: Atheroma, arterioslerosis, aneurysrns, thrombophlebitis, embolism, varicose veins, congestive cardiac failure, ischaemic heart disease, rheumatic heart diseases, arrhythmia, hypertension, Burger's diseas
**Respiratory tract**: Tonsillitis, bronchitis, bronchial asthma, emphysema, cough
**Digestive tract**: Gastritis, peptic ulcers, pancreatitis, cirrhosis of the liver, jaundice
**Urinary system:** Glomerulonephritis, renal calculi.

**Nervous system and special senses:** Multiple sclerosis, hypoxia, dementia, parkinson's disease, chorea, Alzheimer's disease, migraine, depression, schizophrenia
**Reproductive system**: Impotency, infertility, cryptorchism
**Bones, joint and cartilages**: Osteoporosis, gout, arthritis, rickets
**Disorders of eye:** Glaucoma

## Unit 10

Definition, scope and branches of Pharmacology, Routes of drug administration and drug delivery systems, bioavailability and biotransformations, metabolizing enzymes as targets of drug action (induction and inhibition), Mechanisms of drug action, drug receptors and cellular signaling systems, Drug antagonism and synergism, Drug dependence and related conditions, Pharmacovigilance, Adverse Drug Effects and their monitoring, Iatrogenic Diseases, Pharmacogenetics and Pharmacoeconomics

**ANS:** Cholinergic receptors, cholinergic drugs (Parasympathomimetics, anticholinesterases), anticholinergic drugs. Adrenoceptors, sympathomimetics, adrenoceptor blockers and adrenergic neurone antagonists
Drug action on autonomic ganglia (ganglionic stimulants, ganglion blocking agents).
Neuromuscular blocking agents and centrally acting muscle relaxants
**Autocoids**: Histamine, Antihistaminics
Serotonin, agonists and antagonists
Arachidonic acid metabolites
Angiotensin, Plasmakinins, VIP, neurotensin, Substance P, PAF

**CNS:** Synaptic transmission in CNS, General Anesthesia, Hypnotic and Sedatives, Alcohol, Anti-convulsants, Psychopharmacological agents, Antipsychotics, Anxiolytics, Antidepressants, Antiparkinsonian drugs, Non-steroidal Analgesics, anti-inflammatory and anti-pyretic agents, drugs used in gout, DMARDs.

**Drugs acting on cardiovascular system**
Cardiac glycosides and inotropic agents used in CHF, Anti-arrhythmic agents, Anti-hypertensive agents, Coronary vasodilators and drugs used in angina, Hypolipedimic drugs., Fibrinolytic agents.

## Unit 11

**Chemotherapy:** General principles of Chemotherapy, Sulfonamides, Quinolones, aminoglycosides, tetracyclines, penicillines, cephalosporins and macrolide antibiotics, Antiprotozoal drugs, Antimalarials, Antiamoebics, Antifungal and antiviral drugs, Anti-helmintics, Chemotherapy of Tuberculosis and leprosy.
Chemotherapy of cancer, Immunomodulators
Pharmacology of endocrine system: Pituitary hormones, Thyroid, antithyroid drugs, Insulin, Oral hypoglycemics and glucagons, Adrenocortical steroids and their antagonists Sex hormones, contraceptives and drugs used in fertility, Drugs regulating calcium homeostasis.
**Drugs acting on the blood and blood forming agents**: Coagulants, Anticoagulants, Hametinics (Iron, vitamin B2 and Follic acid), Plasma Expanders.
Diuretics
**Drugs acting on gastrointestinal system:** Purgatives, Antidiarrhoeal drugs, Antiacids and antiemetics, Digestants
**Drugs acting on respiratory system:** Expectorants, Antitussives. Drugs used for cough and bronchial asthma
**Bioassays:** General principles and methods of Bioassays, Official methods of bioassay: Insulin, Heparin, Oxytocin, d-Tubocurarine, Vasopressin, Digitalis, ACTH, Glucagon, Gonadotrophin. Evaluation of new drugs: Acute, subacute and chronic toxicity tests, Teratogenicity & Carcinogenicity, Clinical trials.
Vitamins

## Unit 12

- ✓ **Hospital Pharmacy:** Functions and objectives, Location, Layout & flow chart of material and men, personnel and facilities required, including equipments.

  **Drug distribution system in Hospitals:** a) Out patients b) In patients: Detailed discussion of; i) Unit dose dispensing ii) Floor ward stock system & satellite pharmacy services iii) Central sterile services; bed side pharmacy. iv) Prepackaging

  Maintenance of records of issue and use of Nacrotics and Dangerous drugs, Ward stock medicines and emergency drugs.

  **Medical stores:** Medical store management, Organization of Drug store, Location and layout, Inventory and stock control, Procedures for procurement of drugs and supplies from different sources. Inspection and issue of material. Storage of materialsf Non-parenterals, Parenterals), Pricing policy, Utilization of computers in drug store management. Maintenance of records of retail and wholesale.,

  **Pharmacy Therapeutics Committee:** Constitution and functions of Pharmacy therapeutics committee, Hospital formulary system and their organization, Functions and composition,

  Nomenclature and uses of surgical instruments, hospital equipments and health accessories

- ✓ **Rational Drug Use & Essential Medicines:** drug interactions, adverse reactions

  **Toxicology:** Poisoning management, antidotes, heavy metal toxicity, Mutagenicity, Teratogenicity and Carcinogenicity

  **Spread and prevention of communicable diseases**: AIDS, sexually transmitted diseases, small pox, measles, influenza, diphtheria, ` whooping cough, meningitis, tuberculosis, polio-myelites, viral hepatitis, cholera, typhoid, diarrhoea, amoebiasis, malaria, filariasis, rabies, tetanus, leprosy.

  **Contraception**: (mechanical, chemical, surgical, immunological, physical and physiological)

  **Immunization**: vaccines, toxoids and their uses

  **Therapeutic Drug Monitoring:** importance, high-risk drugs

- ✓ **Genetic Material:** Structure, function and properties, Basic principles of genetic engineering, Blood products, Synthesis of monoclonal antibodies, biopolymers, derivative of biopolymers and their application in medicine

  **Enzyme & Cell immobilization:** Methods and applications, Plant cell culture for the production of useful chemicals, plant tissue culture, protoplast fusion, totipotency, and direct gene transfer

## Unit 13

Introduction to different group of plant constituents and their tests, Principles of classification of plants with special reference to:

**Algae:** Rhodophyceae (Agar, Aliginic acid)

**Fungi:** Eumycetes (Ergot, Yeast, Mushrooms)

**Gymnosperm:** Pinaceae, Gnetaceae

**Angiosperm:** Apocynacae, Compositae, Convulvulaceae, Labiateae, Rubiaceae, Rutaceae, Solanaceae, Scrophulariaceae, Umbellifereae, Leguminoseae.

Study of plant tissue and ergastic cell inclusions with a view to identify and authenticate powder crude drugs with emphasis on anatomical structures of bark, stem (Monocot, Dicot), Different systems of classification of crude drugs

Different systems of medicine practiced in India with specific reference to Unani, Ayurvedic and Homoeopathic medicines

Factors involved in the production of drugs from Wild and cultivated sources including cultivation, collection, drying, storage, commerce and quality control

Biological source, chemical tests for identity and salient microscopic features of commercial fibres used as surgical dressings and filtering aids. Cotton, Silk, wool and

rayon
Natural pesticides and insecticides.
Classification and chemistry of carbohydrates.
Study of drugs dealing with biological sources, geographical distribution, collection, commercial production, chemical constituents, chemical tests for identity, substitutes, adulterants and uses of following drugs; Starches, Acacia, Tragacanth, Sterculia, Guargum, Plantago and Honey
Study of Lipids, their chemistry, classification and biogenesis of lipid containing drugs dealing with general methods of extraction and purification of fixed oils, biological source, chemical constituents, tests for identity and use of the following; Arachis oil, Castor oil, Sesame oil, Cotton seed oil, Olive oil, Chaul moogra oil, Bees wax
Drugs of animal origin: Shellac, Cochineal, Cantharides, Spermaceti, Wool fat.
Tannin counting drugs: Catechu (Black and pale), Tannic acid, Myrobalon, Katha industry in India
Protein containing drugs: General chemistry and study of amino acids, Gelatin
Plant allergens and allergenic substances
Hallucinogens, narcotics and common poisonous plants of India
General study of formation of secondary metabolites. Biogenesis of primary metabolites and importance of photosynthesis in formation of primary metabolites and their relationship to the formation of secondary metabolites (Calvine cycle , TCA cycle, Shikimic acid pathway, Embden Merrhoffs pathway, Acetate hypothesis, Isoprenoid compounds biosynthesis
Study of drugs containing alkaloids: Nature, occurrence, Chemistry and Biosynthesis.
Pyridine-Piperidine alkaloids: Nicotine, Areca nut.
Tropane alkaloids: Belladona, Hyoscymus, Stramonium, Duboisia.
Quinoline alkaloids: Cinchona
Isoquinoline alkaloids: Opium, Ipecae.
Indole alkaloids: Nuxvomica, Ergot, Rauwolfia, Catharanthus
Steroidal alkaloids: Kurchi, Solanum.
Alkaloidal Amines: Ephedra, Colchicum
Processes of plant extraction and chromatographic techniques as applicable to Phtopharmaceuticals.

## Unit 14

Study of volatile oil containing following drugs with regard to the nature, occurrence, chemistry, biogenesis and Pharmacognostic study
Hydrocarbons: Pepper, turpentine
Alcohol: Mentha, Coriander, Cardamom
Aldehyde: Cinnamon, Lemon peel, Lemon grass, Citronella, Cumin
Ketone: Caraway, Dill, spearmint
Phenol: Clove
Phenolic ethers: Anise, Star anise, Fennel, Nutmeg
Oxides: Eucalyptus, Chenopodium.
Nature, occurrence, chemistry, collection and preparation of drugs containing :
**Bolsams:** (Tolu balsam, Peru balsam, Benzoin),
**Acid Resins:** Colopltony
**Gum Resins:** Myrth, Asaofetida
**Resins:** Colocynth, Ginger, Turmeric, Capsicum, Cannabis, Podophyllum
Biological source, preparation and uses of the following enzymes: Diastase, Papain, Maltase, Bromalein, Ficin
Quantitative Microscopy, Factors affecting plant drug constituents
Drug adulteration and authentication
**Glycosides:** Nature, Occurrence, Chemistry and Biogenesis.
*Anthraquinone glycosides*: Cascara, Aloe, Rhubarb, Senna.
*Cardiac glycosides:* Digitalis, Stropanthus, Squill, Thevetia

*Bitter glycosides:* Quassia
*Saponin glycosides:* Dioscorea, Quillia
*Flavonoid glycosides:* Ruta graveolens.
**Plant tissue culture** techniques and their contribution to phytopharmaceuticals.
**Plant growth regulators**
**Evaluation of crude drugs**

## Unit 15

**Drug regulatory affairs:** Drug Legislation in India, Code of Ethics for Pharmacists, Drug Laws:
a) Prevention of Cruelty against Animals Act,
b) Pharmacy Act-1948,
c) Drugs and Cosmetic Act-1940, Rules 1945,
d) Narcotic Drugs and Psychotropic Substance Act, and Rules there under,
e) Drugs and Magic Remedies (Objectionable Advertisements) Act 1954,
f) Medicinal and Toilet preparations (Excise duties) Act-1955, Rules-1976,
g) Poisons Act,
i) Indian Patents Act, 1970 with recent amendments,
j) The Drug (prices control) order, 1995,
j) The Insecticides Act,
k) Prevention of Food Adulteration, Act and Rules there under

**Good Manufacturing Practice:** Status and applicability of regulation, current good manufacturing practices in manufacturing, processing, packaging & holding of drugs