

SYLLABUS: Pharmacist (Dispenser) in MCD & Pharmacist (Allopathic) in NDMC

PHARMACEUTICS

- History of the profession of Pharmacy in India in relation to Pharmacy education, industry, pharmacy practice, and various professional associations.
- Pharmacopoeia: Introduction to IP, BP, USP, NF and Extra Pharmacopoeia. Salient features of Indian Pharmacopoeia
- **Packaging materials:** Types, selection criteria, advantages and disadvantages of glass, plastic, metal, rubber as packaging materials
- **Pharmaceutical aids:** Organoleptic (Colouring, flavouring, and sweetening) agents. **Preservatives:** Definition, types with examples and uses.
- **Unit operations:** Definition, objectives/applications, principles, construction, and workings of:
 - Size reduction: hammer mill and ball mill
 - Size separation: Classification of powders according to IP, Cyclone separator, Sieves and standards of sieves
 - Mixing: Double cone blender, Turbine mixer, Triple roller mill and Silverson mixer homogenizer
 - Filtration: Theory of filtration, membrane filter and sintered glass filter
 - Drying: working of fluidized bed dryer and process of freeze drying
 - Extraction: Definition, Classification, method, and applications
- Tablets – coated and uncoated, various modified tablets (sustained release, extended-release, fast dissolving, multi-layered, etc.)
- Capsules - hard and soft gelatine capsules
- Liquid oral preparations - solution, syrup, elixir, emulsion, suspension, dry powder for reconstitution
- Topical preparations - ointments, creams, pastes, gels, liniments and lotions, suppositories and pessaries
- Nasal preparations, Ear preparations
- Powders and granules - Insufflations, dusting powders, effervescent powders, and effervescent granules
- Sterile formulations – Injectables, eye drops and eye ointments
- Immunological products: Sera, vaccines, toxoids, and their manufacturing methods.
- Basic structure, layout, sections, and activities of pharmaceutical manufacturing plants
- **Quality control and quality assurance:** Definition and concepts of quality control and quality assurance, current good manufacturing practice (cGMP), Introduction to the concept of calibration and validation
- **Novel drug delivery systems:** Introduction, Classification with examples, advantages, and challenges.

PHARMACEUTICAL CHEMISTRY

- **Introduction to Pharmaceutical chemistry:** Scope and objectives
- **Sources and types of errors:** Accuracy, precision, significant figures
- **Impurities in Pharmaceuticals:** Source and effect of impurities in Pharmacopoeial substances, importance of limit test, Principle and procedures of Limit tests for chlorides, sulphates, iron, heavy metals and arsenic.
- **Volumetric analysis:** Fundamentals of volumetric analysis, Acid-base titration, non-aqueous

titration, precipitation titration, complexometric titration, redox titration.

- **Gravimetric analysis:** Principle and method.
- **Inorganic Pharmaceuticals:** Pharmaceutical formulations, market preparations, storage conditions and uses of:
 - Haematinics: Ferrous sulphate, Ferrous fumarate, Ferric ammonium citrate, Ferrous ascorbate, Carbonyl iron.
 - Gastro-intestinal Agents: Antacids :Aluminium hydroxide gel, Magnesium hydroxide, Magaldrate, Sodium bicarbonate, Calcium Carbonate, Acidifying agents, Adsorbents, Protectives, Cathartics.
 - Topical agents: Silver Nitrate, Ionic Silver, Chlorhexidine Gluconate, Hydrogen peroxide, Boric acid, Bleaching powder, Potassium permanganate.
 - Dental products: Calcium carbonate, Sodium fluoride, Denture cleaners, Denture adhesives, Mouth washes.
 - Medicinal gases: Carbon dioxide, nitrous oxide and oxygen.
- **Introduction to nomenclature of organic chemical systems with particular reference to heterocyclic compounds containing up to three rings.**

STUDY OF THE FOLLOWING CATEGORY OF MEDICINAL COMPOUNDS WITH RESPECT TO CLASSIFICATION, CHEMICAL NAME, CHEMICAL STRUCTURE (COMPOUNDS MARKED WITH*) USES, STABILITY AND STORAGE CONDITIONS; DIFFERENT TYPES OF FORMULATIONS AND THEIR POPULAR BRAND NAMES

- **Drugs Acting on Central Nervous System**
 - Anaesthetics: Thiopental Sodium*, Ketamine Hydrochloride*, Propofol
 - Sedatives and Hypnotics: Diazepam*, Alprazolam*, Nitrazepam, Phenobarbital*
 - Antipsychotics: Chlorpromazine Hydrochloride*, Haloperidol*, Risperidone*, Sulpiride*, Olanzapine, Quetiapine, Lurasidone.
 - Anticonvulsants: Phenytoin*, Carbamazepine*, Clonazepam, Valproic Acid*, Gabapentin*, Topiramate, Vigabatrin, Lamotrigine
 - Anti-Depressants: Amitriptyline Hydrochloride*, Imipramine Hydrochloride*, Fluoxetine*, Venlafaxine, Duloxetine, Sertraline, Citalopram, Escitalopram, Fluvoxamine, Paroxetine.
- **Drugs Acting on Autonomic Nervous System**
 - Sympathomimetic Agents: Direct Acting: Nor- Epinephrine*, Epinephrine, Phenylephrine, Dopamine*, Terbutaline, Salbutamol (Albuterol), Naphazoline*, Tetrahydrozoline. Indirect Acting Agents: Hydroxy Amphetamine, Pseudoephedrine. Agents With Mixed Mechanism: Ephedrine, Metaraminol.
 - Adrenergic Antagonists: Alpha Adrenergic Blockers: Tolazoline, Phentolamine, Phenoxybenzamine, Prazosin. Beta Adrenergic Blockers: Propranolol*, Atenolol*, Carvedilol
 - Cholinergic Drugs and Related Agents: Direct Acting Agents: Acetylcholine*, Carbachol, and Pilocarpine. Cholinesterase Inhibitors: Neostigmine*, Edrophonium Chloride, Tacrine Hydrochloride, Pralidoxime Chloride, Echothiopate Iodide.
 - Cholinergic Blocking Agents: Atropine Sulphate*, Ipratropium Bromide.
 - Synthetic Cholinergic Blocking Agents: Tropicamide, Cyclopentolate Hydrochloride, Clidinium Bromide, Dicyclomine Hydrochloride*
- **Drugs Acting on Cardiovascular System**
 - Anti-Arrhythmic Drugs: Quinidine Sulphate, Procainamide Hydrochloride, Verapamil, Phenytoin Sodium*, Lidocaine Hydrochloride, Lorcinide Hydrochloride, Amiodarone and Sotalol.

Anti-Hypertensive Agents: Propranolol*, Captopril*, Ramipril, MethyldopateHydrochloride, Clonidine Hydrochloride, Hydralazine Hydrochloride, Nifedipine,

Antianginal Agents: IsosorbideDinitrate

- **Diuretics:** Acetazolamide, Frusemide*, Bumetanide, Chlorthalidone, Benzthiazide, Metolazone, Xipamide, Spironolactone
- **Hypoglycemic Agents:** Insulin and Its Preparations, Metformin*, Glibenclamide*, Glimepiride, Pioglitazone, Repaglinide, Gliflozins, Gliptins
- **Analgesic And Anti-Inflammatory Agents:** Morphine Analogues, Narcotic Antagonists; Nonsteroidal Anti- Inflammatory Agents (NSAIDs) - Aspirin*, Diclofenac, Ibuprofen*, Piroxicam, Celecoxib, Mefenamic Acid, Paracetamol*, Aceclofenac.
- **Anti-Infective Agents**

Antifungal Agents: Amphotericin-B, Griseofulvin, Miconazole, Ketoconazole*, Itraconazole, Fluconazole*, Naftifine Hydrochloride.

Urinary Tract Anti-Infective Agents: Norfloxacin, Ciprofloxacin, Ofloxacin*, Moxifloxacin.

Anti-Tubercular Agents: INH*, Ethambutol, Para Amino Salicylic Acid, Pyrazinamide, Rifampicin, Bedaquiline, Delamanid, Pretomanid*.

Antiviral Agents: Amantadine Hydrochloride, Idoxuridine, Acyclovir*, Foscarnet, Zidovudine, Ribavirin, Remdesivir, Favipiravir.

Antimalarials: Quinine Sulphate, Chloroquine Phosphate*, Primaquine Phosphate, Mefloquine*, Cycloguanil, Pyrimethamine, Artemisinin.

Sulfonamides: Sulfanilamide, Sulfadiazine, Sulfamethoxazole, Sulfacetamide*, Mafenide Acetate, Cotrimoxazole, Dapsone*.
- **Antibiotics:** Penicillin G, Amoxicillin*, Cloxacillin, Streptomycin, Tetracyclines: Doxycycline, Minocycline, Macrolides: Erythromycin, Azithromycin, Miscellaneous: Chloramphenicol* Clindamycin.
- **Anti-Neoplastic Agents:** Cyclophosphamide*, Busulfan, Mercaptopurine, Fluorouracil*, Methotrexate, Dactinomycin, Doxorubicin Hydrochloride, Vinblastine Sulphate, Cisplatin*, Dromostanolone Propionate.

PHARMACOGNOSY

- **Definition, history, present status and scope of Pharmacognosy**
- **Classification of drugs:**
 - Alphabetical
 - Taxonomical
 - Morphological
 - Pharmacological
 - Chemical
 - Chemo-taxonomical
- **Quality control of crude drugs:**
 - Different methods of adulteration of crude drugs
 - Evaluation of crude drugs
- **Brief outline of occurrence, distribution, isolation, identification tests, therapeutic activity and pharmaceutical applications of alkaloids, terpenoids, glycosides, volatile oils, tannins and resins.**

- **Biological source, chemical constituents and therapeutic efficacy of the following categories of crude drugs:**
 - Laxatives:** Aloe, Castor oil, Ispaghula, Senna
 - Cardiotonic:** Digitalis, Arjuna
 - Carminatives and G.I. regulators :** Coriander, Fennel, Cardamom, Ginger, Clove, Black Pepper, Asafoetida, Nutmeg, Cinnamon
 - Astringents :** Myrobalan, Black Catechu, Pale Catechu
 - Drugs acting on nervous system** Hyoscyamus, Belladonna, Ephedra, Opium, Tea leaves, Coffee seeds, Coca
 - Anti-hypertensive** Rauwolfia
 - Anti-tussive** Vasaka, Tolu Balsam
 - Anti-rheumatics** Colchicum seed
 - Anti-tumour** Vinca, Podophyllum
 - Antidiabetics** Pterocarpus, Gymnema
 - Diuretics** Gokhru, Punarnava
 - Anti-dysenteric** Ipecacuanha
 - Antiseptics and disinfectants** Benzoin, Myrrh, Neem, Turmeric
 - Antimalarials** Cinchona, Artemisia
 - Oxytocic** Ergot
 - Vitamins** Cod liver oil, Shark liver oil
 - Enzymes** Papaya, Diastase, Pancreatin, Yeast
 - Pharmaceutical Aids** Kaolin, Lanolin, Beeswax, Acacia, Tragacanth, Sodium alginate, Agar, Guar gum, Gelatine.
 - Miscellaneous** Squill, Galls, Ashwagandha, Tulsi, Guggul
- **Plant fibres used as surgical dressings:** Cotton, silk, wool and regenerated fibres Sutures – Surgical Catgut and Ligatures.
- **Basic principles involved in the traditional systems of medicine like:** Ayurveda, Siddha, Unani and Homeopathy.
- **Method of preparation of Ayurvedic formulations like:** Arista, Asava, Gutika, Taila, Churna, Lehya and Bhasma.
- **Role of medicinal and aromatic plants in national economy and their export potential**
- **Herbs as health food:**
 - Brief introduction and therapeutic applications of: Nutraceuticals, Antioxidants, Pro-biotics, Pre-biotics, Dietary fibres, Omega-3-fatty acids, Spirulina, Carotenoids, Soya and Garlic.
- **Introduction to herbal formulations:**
 - Herbal cosmetics:** Sources, chemical constituents, commercial preparations, therapeutic and cosmetic uses of: Aloe vera gel, Almond oil, Lavender oil, Olive oil, Rosemary oil, Sandal Wood oil
 - Phytochemical investigation of drugs.**

HUMAN ANATOMY AND PHYSIOLOGY

- **Scope of Anatomy and Physiology** Definition of various terminologies
- **Structure of Cell:** Components and its functions.
- **Tissues of the human body:** Epithelial, Connective, Muscular and Nervous tissues – their sub-types and characteristics.
- **Osseous system:** structure and functions of bones of axial and appendicular skeleton Classification, types and movements of joints, disorders of joints

- **Haemopoietic system**
Composition and functions of blood
Process of Hemopoiesis
Characteristics and functions of RBCs, WBCs, and platelets
Mechanism of Blood Clotting
Importance of Blood groups
- **Lymphatic system**
Lymph and lymphatic system, composition, function and its formation.
Structure and functions of spleen and lymph node.
- **Cardiovascular system**
Anatomy and Physiology of heart
Blood vessels and circulation (Pulmonary, coronary and systemic circulation)
Cardiac cycle and Heart sounds, Basics of ECG
Blood pressure and its regulation
- **Respiratory system**
Anatomy of respiratory organs and their functions.
Regulation, and Mechanism of respiration.
Respiratory volumes and capacities – definitions
- **Digestive system**
Anatomy and Physiology of the GIT
Anatomy and functions of accessory glands
Physiology of digestion and absorption
- **Skeletal muscles**
Histology
Physiology of muscle contraction
Disorder of skeletal muscles
- **Nervous system**
Classification of nervous system
Anatomy and physiology of cerebrum, cerebellum, mid brain
Function of hypothalamus, medulla oblongata and basal ganglia
Spinal cord-structure and reflexes
Names and functions of cranial nerves.
Anatomy and physiology of sympathetic and parasympathetic nervous system (ANS)
- **Sense organs - Anatomy and physiology of**
Eye
Ear
Skin
Tongue
Nose
- **Urinary system**
Anatomy and physiology of urinary system
Physiology of urine formation
Renin - angiotensin system
Clearance tests and micturition
- **Endocrine system (Hormones and their functions)**
Pituitary gland

- Adrenal gland
- Thyroid and parathyroid gland
- Pancreas and gonads
- **Reproductive system**
 - Anatomy of male and female reproductive system
 - Physiology of menstruation
 - Spermatogenesis and Oogenesis
 - Pregnancy and parturition

SOCIAL PHARMACY

- **Introduction to Social Pharmacy: Definition and Scope.** Social Pharmacy as a discipline and its scope in improving the public health. Role of Pharmacists in Public Health. Concept of Health -WHO Definition, various dimensions, determinants, and health indicators. National Health Policy – Indian perspective Public and Private Health System in India, National Health Mission Introduction to Millennium Development Goals, Sustainable Development Goals, FIP Development Goals.
- **Preventive healthcare – Role of Pharmacists in the following:** Demography and Family Planning Mother and child health, importance of breastfeeding, ill effects of infant milk substitutes and bottle feeding Overview of Vaccines, types of immunity and immunization. Effect of Environment on Health – Water pollution, importance of safe drinking water, waterborne diseases, air pollution, noise pollution, sewage and solid waste disposal, occupational illnesses, Environmental pollution due to pharmaceuticals. Psychosocial Pharmacy: Drugs of misuse and abuse – psychotropics, narcotics, alcohol, tobacco products. Social Impact of these habits on social health and productivity and suicidal behaviours.
- **Nutrition and Health:** Basics of nutrition – Macronutrients and Micronutrients. Importance of water and fibres in diet. Balanced diet, Malnutrition, nutrition deficiency diseases, ill effects of junk foods, calorific and nutritive values of various foods, fortification of food. Introduction to food safety, adulteration of foods, effects of artificial ripening, use of pesticides, genetically modified foods. Dietary supplements, nutraceuticals, food supplements – indications, benefits, Drug-Food Interactions.
- **Introduction to Microbiology and common microorganisms**
 - Epidemiology:** Introduction to epidemiology, and its applications. Understanding of terms such as epidemic, pandemic, endemic, mode of transmission, outbreak, quarantine, isolation, incubation period, contact tracing, morbidity, mortality.
 - Causative agents, epidemiology and clinical presentations and Role of Pharmacists in educating the public in prevention of the following communicable diseases:**
 - Respiratory infections** – chickenpox, measles, rubella, mumps, influenza (including Avian-Flu, H1N1, SARS, MERS, COVID-19), diphtheria, whooping cough, meningococcal meningitis, acute respiratory infections, tuberculosis, Ebola
 - Intestinal infections** – poliomyelitis, viral hepatitis, cholera, acute diarrheal diseases, typhoid, amebiasis, worm infestations, food poisoning.
 - Arthropod-borne infections** - dengue, malaria, filariasis and, chikungunya
 - Surface infections** – trachoma, tetanus, leprosy, STD/HIV/AIDS
- **Introduction to health systems and all ongoing National Health programs in India, their objectives, functioning, outcome, and the role of pharmacists.**
- **Pharmacoeconomics** – Introduction, basic terminologies, importance of pharmacoeconomics

PHARMACOLOGY

- **General Pharmacology**

Introduction and scope of Pharmacology

Various routes of drug administration - advantages and disadvantages

Drug absorption - definition, types, factors affecting drug absorption

Bioavailability and the factors affecting bioavailability

Drug distribution - definition, factors affecting drug distribution

Biotransformation of drugs - Definition, types of biotransformation reactions, factors influencing drug metabolisms.

Excretion of drugs - Definition, routes of drug excretion

General mechanisms of drug action and factors modifying drug action

- **Drugs Acting on the Peripheral Nervous System** Steps involved in neurohumoral transmission Definition, classification, pharmacological actions, dose, indications, and contraindications of:

Cholinergic drugs

Anti-Cholinergic drugs

Adrenergic drugs

Anti-adrenergic drugs

Neuromuscular blocking agents

Drugs used in Myasthenia gravis

Local anaesthetic agents

Non-Steroidal Anti-Inflammatory drugs (NSAIDs)

- **Drugs Acting on the Eye** Definition, classification, pharmacological actions, dose, indications and contraindications of:

Miotics

Mydriatics

Drugs used in Glaucoma

- **Drugs Acting on the Central Nervous System** Definition, classification, pharmacological actions, dose, indications, and contraindications of:

General anaesthetics

Hypnotics and sedatives

Anti-Convulsant drugs

Anti-anxiety drugs

Anti-depressant drugs

Anti-psychotics

Nootropic agents

Centrally acting muscle relaxants

Opioid analgesics

- **Drugs Acting on the Cardiovascular System** Definition, classification, pharmacological actions, dose, indications, and contraindications of:

Anti-hypertensive drugs

Anti-anginal drugs

Anti-arrhythmic drugs

Drugs used in atherosclerosis and

Congestive heart failure

Drug therapy for shock

- **Drugs Acting on Blood and Blood Forming Organs** Definition, classification, pharmacological actions, dose, indications, and contraindications of:

Hematinic agents

Anti-coagulants

Anti-platelet agents

Thrombolytic drugs

- **Definition, classification, pharmacological actions, dose, indications, and contraindications of:**

Bronchodilators

Expectorants

Anti-tussive agents

Mucolytic agents

- **Drugs Acting on the Gastro Intestinal Tract** Definition, classification, pharmacological actions, dose, indications, and contraindications of:

Anti-ulcer drugs

Anti-emetics

Laxatives and purgatives

Anti-diarrheal drugs

- **Drugs Acting on the Kidney** Definition, classification, pharmacological actions, dose, indications, and contraindications of:

Diuretics

Anti-Diuretics

- **Hormones and Hormone Antagonists** Physiological and pathological role and clinical uses of:

Thyroid hormones

Anti-thyroid drugs

Parathormone

Calcitonin

Vitamin D

Insulin

Oral hypoglycemic agents

Estrogen

Progesterone

Oxytocin

Corticosteroids

- **Autocoids:**

Physiological role of Histamine, 5 HT and Prostaglandins

Classification, clinical uses, and adverse effects of antihistamines and 5 HT antagonists

- **Chemotherapeutic Agents:**

Introduction, basic principles of chemotherapy of infections, infestations and neoplastic diseases, Classification, dose, indication and contraindications of drugs belonging to following classes:

Penicillins, Cephalosporins, Aminoglycosides, Fluoroquinolones, Macrolides, Tetracyclines

Sulphonamides, Anti-tubercular drugs, Anti-fungal drugs, Anti-viral drugs

Anti-amoebic agents
Anthelmintics
Anti-malarial agents
Anti-neoplastic agents

- **Biologicals** Definition, types, and indications of biological agents with examples

COMMUNITY PHARMACY AND MANAGEMENT

- **Community Pharmacy Practice** – Definition, history and development of community pharmacy - International and Indian scenarios.
- **Professional responsibilities of community pharmacists.** Introduction to the concept of Good Pharmacy Practice and SOPs.
- **Prescription and prescription handling:**
Definition, parts of prescriptions, legality of prescriptions, prescription handling, labelling of dispensed medications (Main label, ancillary label, pictograms), brief instructions on medication usage.
Dispensing process, Good Dispensing Practices, dispensing errors and strategies to minimize them.
- **Communication skills:**
Definition, types of communication skills
Interactions with professionals and patients
Verbal communication skills (one-to-one, over the telephone)
Written communication skills
Body language
Patient interview techniques
- **Patient counseling;**
Definition and benefits of patient counseling
Stages of patient counselling - Introduction, counselling content, counselling process, and closing the counselling session
Barriers to effective counseling - Types and strategies to overcome the barriers
Patient counselling points for chronic diseases/disorders - Hypertension, Diabetes, Asthma, Tuberculosis, Chronic obstructive pulmonary disease, and AIDS
Patient Package Inserts - Definition, importance and benefits, Scenarios of PPI use in India and other countries
Patient Information leaflets - Definition and uses
- **Medication Adherence:** Definition, factors influencing non- adherence, strategies to overcome non-adherence.
- **Health Screening Services in Community Pharmacy** Introduction, scope, and importance of various health screening services - for routine monitoring of patients, early detection, and referral of undiagnosed cases
- **Over The Counter (OTC) Medications:**
Definition, need and role of Pharmacists in OTC medication dispensing
OTC medications in India, counseling for OTC products
Self-medication and role of pharmacists in promoting the safe practices during self-medication
Responding to symptoms, minor ailments, and advice for self-care in conditions such as -

Pain management, Cough, Cold, Diarrhea, Constipation, Vomiting, Fever, Sore throat, Skin disorders, Oral health (mouth ulcers, dental pain, gum swelling).

- **Community Pharmacy Management:**

- Legal requirements to set up a community pharmacy

- Site selection requirements

- Pharmacy designs and interiors

- Vendor selection and ordering

- Procurement, inventory control methods, and inventory management

- Financial planning and management

- Accountancy in community pharmacy – Day book, Cash book

- Introduction to pharmacy operation softwares – usefulness and availability

- Customer Relation Management (CRM)

- Audits in Pharmacies

- SOP of Pharmacy Management

- Introduction to Digital Health, mHealth and Online pharmacies

BIOCHEMISTRY & CLINICAL PATHOLOGY

- **Introduction to biochemistry:** Scope of biochemistry in pharmacy; Cell and its biochemical organization.

- **Carbohydrates:**

- Definition, classification with examples, chemical properties

- Monosaccharides - Structure of glucose, fructose, and galactose

- Disaccharides - structure of maltose, lactose, and sucrose

- Polysaccharides - chemical nature of starch and glycogen

- Qualitative tests and biological role of carbohydrates

- **Proteins:**

- Definition, classification of proteins based on composition and solubility with examples

- Definition, classification of amino acids based on chemical nature and nutritional requirements with examples

- Structure of proteins (four levels of organization of protein structure)

- Qualitative tests and biological role of proteins and amino acids

- Diseases related to malnutrition of proteins.

- **Lipids:**

- Definition, classification with examples

- Structure and properties of triglycerides (oils and fats)

- Fatty acid classification - Based on chemical and nutritional requirements with examples

- Structure and functions of cholesterol in the body

- Lipoproteins - types, composition and functions in the body

- Qualitative tests and functions of lipids

- **Nucleic acids:**

- Definition, purine and pyrimidine bases

- Components of nucleosides and nucleotides with examples

- Structure of DNA (Watson and Crick model), RNA and their functions

- **Enzymes:**

- Definition, properties and IUB and MB classification

Factors affecting enzyme activity

Mechanism of action of enzymes, Enzyme inhibitors

Therapeutic and pharmaceutical importance of enzymes

- **Vitamins:**

Definition and classification with examples

Sources, chemical nature, functions, coenzyme form, recommended dietary requirements, deficiency diseases of fat-and water-soluble vitamins

- **Metabolism (Study of cycle/pathways without chemical structures):**

Metabolism of Carbohydrates: Glycolysis, TCA cycle and glycogen metabolism, regulation of blood glucose level. Diseases related to abnormal metabolism of Carbohydrates.

Metabolism of lipids: Lipolysis, β -oxidation of Fatty acid (Palmitic acid) ketogenesis and ketolysis. Diseases related to abnormal metabolism of lipids such as Ketoacidosis, Fatty liver, Hypercholesterolemia.

Metabolism of Amino acids (Proteins): General reactions of amino acids and its significance– Transamination, deamination, Urea cycle and decarboxylation. Diseases related to abnormal metabolism of amino acids, Disorders of ammonia metabolism, phenylketonuria, alkaptonuria and Jaundice.

Biological oxidation: Electron transport chain and Oxidative phosphorylation.

- **Minerals:** Types, Functions, Deficiency diseases, recommended dietary requirements.

- **Water and Electrolytes:**

Distribution, functions of water in the body

Water turnover and balance

Electrolyte composition of the body fluids, Dietary intake of electrolyte and Electrolyte balance

Dehydration, causes of dehydration and oral rehydration therapy

Introduction to Biotechnology

- **Organ function tests:**

Functions of kidney and routinely performed tests to assess the functions of kidney and their clinical significances.

Functions of liver and routinely performed tests to assess the functions of liver and their clinical significances.

Lipid profile tests and its clinical significances.

- **Introduction to Pathology of Blood and Urine:**

Lymphocytes and Platelets, their role in health and disease

Erythrocytes - Abnormal cells and their significance

Normal and Abnormal constituents of Urine and their significance

PHARMACO THERAPEUTICS

- **Pharmacotherapeutics-** Introduction, scope, and objectives. Rational use of Medicines, Evidence Based Medicine, Essential Medicines List, Standard Treatment Guidelines (STGs). Definition, etiopathogenesis, clinical manifestations, non-pharmacological and pharmacological management of the associated with:-

- **Cardiovascular System**
 - Hypertension
 - Angina and Myocardial infarction
 - Hyperlipidaemia
 - Congestive Heart Failure
- **Respiratory System**
 - Asthma
 - COPD
- **Endocrine System**
 - Diabetes
 - Thyroid disorders - Hypo and Hyperthyroidism
- **Central Nervous System**
 - Epilepsy
 - Parkinson's disease
 - Alzheimer's disease
 - Stroke
 - Migraine
- **Gastro Intestinal Disorders**
 - Gastro oesophageal reflux disease
 - Peptic Ulcer Disease
 - Alcoholic liver disease Inflammatory Bowel Diseases (Crohn's Disease and Ulcerative Colitis)
- **Haematological disorders**
 - Iron deficiency anaemia
 - Megaloblastic anaemia
- **Infectious diseases**
 - Tuberculosis
 - Pneumonia
 - Urinary tract infections
 - Hepatitis
 - Gonorrhoea and Syphilis
 - Malaria
 - HIV and Opportunistic infections
 - Viral Infections (SARS, CoV2)
- **Musculoskeletal disorders**
 - Rheumatoid arthritis
 - Osteoarthritis
- **Dermatology**
 - Psoriasis
 - Scabies
 - Eczema
- **Psychiatric Disorders**
 - Depression
 - Anxiety

Psychosis

- **Ophthalmology**
 - Conjunctivitis (bacterial and viral)
 - Glaucoma
- **Anti-microbial Resistance**
- **Women's Health**
 - Polycystic Ovary Syndrome
 - Dysmenorrhea
 - Premenstrual Syndrome

HOSPITAL AND CLINICAL PHARMACY

- **Hospital Pharmacy:**
 - Definition, scope, national and international scenario
 - Organizational structure
 - Professional responsibilities, Qualification and experience requirements, job specifications, work load requirements and inter professional relationships
 - Good Pharmacy Practice (GPP) in hospital
 - Hospital Pharmacy Standards (FIP-Basel Statements, AHSP)
 - Introduction to NAQS guidelines and NABH Accreditation and Role of Pharmacists
- **Different Committees in the Hospital:**
 - Pharmacy and Therapeutics Committee - Objectives, Composition, and functions
 - Hospital Formulary - Definition, procedure for development and use of hospital formulary
 - Infection Control Committee – Role of Pharmacist in preventing Antimicrobial Resistance
- **Supply Chain and Inventory Control:**
 - Preparation of Drug lists - High Risk drugs, Emergency drugs, Schedule H1 drugs, NDPS drugs, reserved antibiotics
 - Procedures of Drug Purchases – Drug selection, short term, long term, and tender/e-tender process, quotations, etc.
 - Inventory control techniques: Economic Order Quantity, Reorder Quantity Level, Inventory Turnover etc.
 - Inventory Management of Central Drug Store – Storage conditions, Methods of storage, Distribution, Maintaining Cold Chain, Devices used for cold storage (Refrigerator, ILR, Walk-in-Cold rooms.
 - FEFO, FIFO methods.
 - Expiry drug removal and handling, and disposal. Disposal of Narcotics, cytotoxic drugs.
 - Documentation - purchase and inventory
- **Drug distribution:**
 - Drug distribution (in- patients and out - patients) – Definition, advantages and disadvantages of individual prescription order method, Floor Stock Method, Unit Dose Drug Distribution Method, Drug Basket Method.
 - Distribution of drugs to ICCU/ICU/NICU/Emergency wards.
 - Automated drug dispensing systems and devices
 - Distribution of Narcotic and Psychotropic substances and their storage Compounding in Hospitals. Bulk compounding, IV admixture. Services and incompatibilities, Total

parenteral nutrition.

Radio Pharmaceuticals - Storage, dispensing and disposal of radiopharmaceuticals

Application of computers in Hospital Pharmacy Practice, Electronic health records, Softwares used in hospital pharmacy.

- **Clinical Pharmacy**

Definition, scope, and development - in India and other countries. Technical definitions, common terminologies used in clinical settings and their significance such as Paediatrics, Geriatric, Anti-natal Care, Post-natal Care, etc.

- **Daily activities of clinical pharmacists: Definition, goal, and procedure of:**

Ward round participation

Treatment Chart Review

Adverse drug reaction monitoring

Drug information and poisons information

Medication history

Patient counseling

Interprofessional collaboration

- **Pharmaceutical care**

Definition, classification of drug related problems. Principles and procedure to provide pharmaceutical care

- **Medication Therapy Management, Home Medication Review**

- **Clinical laboratory tests used in the evaluation of disease states - significance and interpretation of test results**

Haematological, Liver function, Renal function, thyroid function tests

Tests associated with cardiac disorders

Fluid and electrolyte balance

Pulmonary Function Tests

- **Poisoning**

Types of poisoning: Clinical manifestations and Antidot

- **Drugs and Poison Information Centre and their services**

Definition, Requirements, Information resources with examples, and their advantages and disadvantages

- **Pharmacovigilance:**

Definition, aim and scope

Overview of Pharmacovigilance

- **Medication errors**

Definition, types, consequences, and strategies to minimize medication errors, LASA drugs and Tallman lettering as per ISMP.

- **Drug Interactions**

Definition, types, clinical significance of drug interaction

PHARMACY LAW AND ETHICS

- **General Principles of Law, History and various Acts related to Drugs and Pharmacy profession.**

- **Pharmacy Act-1948 and Rules**

Objectives, Definitions, Pharmacy Council of India; its constitution and functions, Education Regulations, State and Joint state pharmacy councils, Registration of

Pharmacists, Offences and Penalties.

- **Pharmacy Practice Regulations 2015**
- **Drugs and Cosmetics Act 1940 and Rules 1945 and New Amendments**
- **Objectives, Definitions, Legal definitions of schedules to the Act and Rules Import of drugs-** Classes of drugs and cosmetics prohibited from import, Import under license or permit.