

## 2.1 PHARMACEUTICS II (Dispensing Pharmacy)

### THEORY (75 Hours)

**Prescriptions**-Reading and understanding of prescriptions; Latin terms commonly used (Detailed study is not necessary), Modern methods of prescribing, adoption of metric system. Calculations involved in dispensing.

**Incompatibilities in prescriptions**- study of various types of incompatibilities-physical, chemical and therapeutic.

**Posology**- Dose and dosage of drugs, factors influencing dose, calculations of doses on the basis of age, sex, surface area and veterinary doses.

**Dispensed Medications:** (Note: A detailed study of the following dispensed medication is necessary. Methods of preparation with theoretical and practical aspects, use of appropriate containers and closures, special labeling requirements and storage conditions should be high-lighted).

**Powders**-Type of powders-Advantages and disadvantages of powders, Granules, cachets and tablet triturates, preparation of different types of powders encountered in prescriptions. Weighing methods, possible errors in weighing, minimum weighable amounts and weighing of a material below the minimum weighable amount, geometric dilution and proper usage and care of dispensing balance.

#### Liquid oral Dosage forms:

**Monophasic**-Theoretical aspects including commonly used vehicles, essential adjuvant like stabilizers, colorants and flavors, with examples.

Review of the following monophasic liquids with details of formulation and practical methods. Liquids for internal administration Liquids for external administration or used on mucous membranes

Mixtures and concentrates, Gargles

Syrups Mouth washes

Throat-paints

Elixirs

Douches

Ear Drops

Nasal drops

Sprays

Liniments

Lotions.

#### Biphasic Liquid Dosage Forms:

**Suspensions** (elementary study)-Suspensions containing diffusible solids and liquids and their preparations. Study of the adjuvant used like thickening agents, wetting agents, their necessity and quantity to be incorporated ,suspensions of precipitate forming liquids like tinctures, their preparations and stability. suspensions produced by chemical reaction. An introduction to flocculated /non-flocculated suspension system.

**Emulsions**-Types of emulsions, identification of emulsion system, formulation of emulsions, selection of emulsifying agent. Instabilities in emulsions, preservation of emulsions.

#### Semi-Solid Dosage Forms:

**Ointments:** Types of ointments, classification and selection of dermatological vehicles. Preparation and stability of ointments by the following processes:

Trituration

fusion

chemical reaction

Emulsification.

**Pastes:** Differences between ointments and pastes, Bases of pastes, preparation of pastes and their preservation .

**Jellies:** An introduction to the different types of jellies and their preparation.

An elementary study of poultice.

**Suppositories and pessaries**-Their relative merits and demerits, types of suppositories, suppository bases , classification, properties, preparation and packing of suppositories. Use of suppositories of drug absorption.

**Dental and cosmetic preparations:** Introduction to Dentifrices, facial cosmetics, Deodorants, Anti-perspirants, shampoo, Hair dressings and Hair removers.

**Sterile Dosage forms:**

**Parenteral dosage forms** Definition, General requirements for parenteral dosage forms. Types of parenteral formulations, vehicles, adjuvant, processing and personnel, Facilities and quality control. Preparation of Intravenous fluids and admixtures-Total parenteral nutrition, Dialysis fluids.

**Sterility testing:** particulate matter monitoring. Faculty seal packaging.

**Ophthalmic products:** study of essential characteristics of different ophthalmic preparations. Formulation: additives, special precautions in handling and storage of ophthalmic products.

### **PRACTICAL (100 hours)**

Dispensing of at least 100 products covering a wide range of preparations such as mixtures, emulsion, solutions, liniments, E.N.T. preparations. Ointments, suppositories, powders, incompatible prescriptions etc.

#### **Books recommended: (Latest editions)**

1. Indian Pharmacopoeia.
2. British pharmacopoeia.
3. National formularies(N.F.L,B.N.P)
4. Remington's pharmaceutical sciences.
5. Martindale's Extra pharmacopoeia.

## **2.2 PHARMACEUTICAL CHEMISTRY II**

### **THEORY (100 hours)**

1. Introduction to the nomenclature of organic chemical systems with particular reference to hetero-cyclic system containing up to 3 rings.
2. The chemistry of following pharmaceutical organic compounds covering their nomenclature, chemical structure, uses and the important physical and chemical properties(chemical structure of only those compounds marked with asterisk (\*). The stability and storage conditions and the different type of pharmaceutical formulations of these drugs and their popular brand names.

**Antiseptics and Disinfectants**-Proflavine\*, Benzalkonium chloride, Cetrimide, Phenol, chloroxylenol, Formaldehyde solution, Hexachlorophene, Nitrofurantoin.

**Sulphonamides**- Sulphadiazine, Sulphaguanidine, Phthalylsulphathiazole, Succinylsulphathiazole, Sulphadimethoxine, Sulphamethoxyypyridazine, Co-trimoxazole, sulfacetamide\*

**Antileprotic Drugs**- Clofazimine, Thiambutosine, Dapsone\*, solapsone,

**Anti-tubercular Drugs**- Isoniazid\*, PAS\*, Streptomycin, Rifampicin, Ethambutol\*, Thiacetazone, Ethionamide, cycloserine, pyrazinamide\*.

**Antimoebic and Anthelmintic Drugs**- Emctinc, Metronidazole, Halogenated hydroxyquinolines, Diloxanide furoate, Paromomycin, Piperazine\*, Mebendazole, D.F.C.\*

**Antibiotics**- Benzyl penicillin\*, Phenoxymethyl penicillin\*, Benzathine penicillin, Ampicillin\*, Cloxacillin, Carbencicillin, Gentamicin, Neomycin, Erythromycin, Tetracycline, Cephalixin, Cephaloridine, Cephalothin, Griseofulvin, Chloramphenicol.

**Antifungal agents**- Udecylenic acid, Tolnaftate, Nystatin, Amphotericin, Hamycin.

**Antimalarial Drugs**-Chloroquine\*,Amodiaquine, Primaquine, Proguanil, Pyrimethamine\*, Quinine, Trimethoprim.

**Tranquilizers**-Chlorpromazine\*, Prochlorperazine, Trifluoperazine, Thiothixene, Haloperidol\*, Triperidol, Oxypertine, Chlordizepoxide, Diazepam\*, Lorazepam, Meprobamate.

**Hypnotics**- Phenobarbitone\*, Butobarbitone, Cylobarbitone, Nitrazepam, Glutethimide\*, Methypylon, Paraldehyde, Triclofosodium.

**General Anaesthetics**-Halothane\*, Cyclopropane\*, Diethyl ether\*, Methohexital sodium, Thiopental sodium, Trichloroethylene.

**Antidepressant Drugs**- Amitriptyline, Nortriptyline, Imipramine\*, Phepeline, Tranlycypromine.

**Analeptics**- Theophylline, Caffeine\*, Coramine\*, Dextro-amphetamine.

**Adrenergic drugs**- Adrenaline\*, Noradrenaline, Isoprenaline\*, Phenylephrine, Salbutamol, Terbutaline, Ephedrine\*, Pseudoephedrine.

**Adrenergic antagonist**- Tolazoline, Propranolol\*, Practolol.

**Cholinergic Drugs**- Neostigmine†, Pyridostigmine, Pralidoxime, Pilocarpine, Physostigmine†.

**Cholinergic Antagonists**- Atropine\*, Hyoscine, Homatropine, Propantheline\*, Benztropine, Tropicamide, Biperiden\*.

**Diuretic Drugs**- Furosemide\*, Chlorothiazide, Hydrochlorothiazide\*, Benzthiazide, Urea\*, Mannitol\*, Ethacrynic Acid.

**Cardiovascular Drugs**- Ethylnitrite\*, Glyceryl trinitrate, Alpha methyl dopa, Guanethidine, Clofibrate, Quinidine.

**Hypoglycemic Agents**- Insulin, Chlorpropamide\*, Tolbutamide, Glibenclamide, Phenformin\*, Metformin.

**Coagulants and Anti coagulants**- Heparin, Thrombin, Menadione\*, Bisphydroxy-coumarin, Warfarin sodium.

**Local Anaesthetics**- Lignocaine\*, Procaine\*, Benzocaine.

**Histamine and anti Histaminic Agents**- Histamine, Diphenhydramine\*, Promethazine, Cyproheptadine, Mepyramine\*, Pheniramine, Chlorpheniramine\*.

**Analgesics and Anti-pyretics**-Morphine, Pethidine, Codeine, Methadone, Aspirin\*, Paracetamol, Analgin, Dextropropoxyphene, Pentazocine.

**Non-steroidal anti-inflammatory agents**- Indomethacin\*, Phenylbutazone\*, Oxyphenbutazone, Ibuprofen.

**Thyroxine and Antithyroids**- Thyroxine\*, Methimazole, Methyl thiouracil, Propylthiouracil.

**Diagnostic Agents**- Iopanoic Acid, Propyl iodone, Sulfobromophthalcin-sodium, Indigotindisulfonate, Indigo Carmine, Evans blue, Congo Red, Fluorescein sodium.

**Anticonvulsants, cardiac glycosides, Antiarrhythmic, Antihypertensives & Vitamins.**

**Steroidal Drugs**- Betamethasone, Cortisone, Hydrocortisone, Prednisolone, Progesterone, Testosterone, Oestradiol, Nandrolone.

**Anti-Neoplastic Drugs**- Actinomycin, Azathioprine, Busulphan, Chlorambucil, Cisplatin, Cyclophosphamide, Daunorubicin Hydrochloride, Fluorouracil, Mercaptopurine, Methotrexate, Mytomycin.

#### **Books Recommended: (Latest editions)**

1. Pharmacopoeia of India.
2. British Pharmaceutical codex.
3. Martindale's Extra pharmacopoeia.

#### **PRACTICAL (75 hours)**

1. Systematic qualitative testing of organic drugs involving solubility determination, melting point and/or boiling point, detection of elements and functional groups (10 compounds).
2. Official identification tests for certain groups of drugs included in the I.P. like barbiturates, sulfonamides, Phenothiazines, Antibiotics etc.(8 compounds).
3. Preparation of three simple organic preparations.

## **2.3 PHARMACOLOGY & TOXICOLOGY**

### **THEORY (75 hours)**

**Introduction to pharmacology, scope of pharmacology.**

**Routes of administration of drugs**, their advantages and disadvantages. Various processes of absorption of drugs and the factors affecting them. Metabolism, distribution and excretion of drugs.

**General mechanism of drugs action** and their factors which modify drugs action. Pharmacological classification of drugs. The discussion of drugs should emphasize the following aspects:

**Drugs acting on the central Nervous system:**

General anaesthetics- adjunction to anaesthesia, intravenous anaesthetics.  
Analgesic antipyretics and non steroidal  
Anti-inflammatory drugs- Narcotic analgesics.  
Antirheumatic and anti gout remedies.  
Sedatives and Hypnotics, psychopharmacological agents, anticonvulsants, analeptics.  
Centrally acting muscle relaxants and anti parkinsonism agents.  
Local anesthetics.  
Drugs acting on autonomic nervous system.  
Cholinergic drugs, Anticholinergic drugs, anticholinesterase drugs.  
Adrenergic drugs and adrenergic receptor blockers.  
Neurone blockers and ganglion blockers.  
Neuromuscular blockers, used in myasthenia gravis.  
Drugs acting on eye: Mydriatics, drugs used in glaucoma.

#### **Drugs acting on respiratory system**

Respiratory stimulants, Bronchodilators, Nasal decongestants, Expectorants and Antitussive agents.

**Autocoids:** physiological role of histamine and serotonin, Histamine and Antihistamines, prostaglandins.

#### **Cardio vascular drugs**

Cardiotonics, Antiarrhythmic agents, Anti-anginal agents, Antihypertensive agents, peripheral Vasodilators and drugs used in atherosclerosis.

Drugs acting on the blood and blood forming organs, Haematinics, coagulants and anticoagulants, Haemostatic , Blood substitutes and plasma expanders.

**Drugs affecting renal function-** Diuretics and anti-diuretics.

**Hormones and hormone antagonists-** Hypoglycemic agents, Anti--thyroid drugs, sex hormones and oral contraceptives , corticosteroids.

**Drugs acting on digestive system-**carminatives, digest ants, Bitters, Antacids and drugs used in peptic ulcer, purgatives and laxatives, Antidiarrhoeals, Emetics, Anti-emetics, Antispasmodics.

#### **Chemotherapy of microbial diseases:**

Urinary antiseptics, sulphonamides, penicillin, streptomycin, Tetracyclines and other antibiotics. Anti-tubercular agents, Antifungal agents, antiviral drugs, anti-leprotic drugs.

Chemotherapy of protozoal diseases, Anthelmintic drugs.

Chemotherapy of cancer.

#### **Disinfectants and antiseptics.**

## **PHARMACOLOGY**

### **PRACTICAL (50 hours)**

1. The first six of the following experiments will be done by the students while
2. the remaining will be demonstrated by the teacher.
3. Effect of potassium and calcium ions, acetylcholine and adrenaline on frog's heart.
4. Effect of acetyl choline on rectus abdomens muscle of frog and guinea pig ileum.
5. Effect of spasmogens and relaxants on rabbits intestine.
6. Effect of local anaesthetics on rabbit cornea.
7. Effect of mydriatics and miotics on rabbit's eye.
8. To study the action of strychnine on frog.
9. Effect of digitalis on frog's heart.
10. Effect of hypnotics in mice.

11. Effect of convulsants and anticonvulsant in mice or rats.
12. Test for pyrogens.
13. Taming and hypnosis potentiating effect of chlorpromazine in mice/rats.
14. Effect of diphenhydramine in experimentally produced asthma in guinea pigs.

## **2.4 PHARMACEUTICAL JURISPRUDENCE**

### **THEORY (50 hours)**

**Origin and nature of pharmaceutical legislation in India**, its scope and objectives. Evolution of the "Concept of pharmacy" as an integral part of the Health care system.

**Principles and significance of professional Ethics.** Critical study of the code of pharmaceutical Ethics drafted by pharmacy council of India.

**Pharmacy Act,1948** The General study of the pharmacy Act with special reference to Education Regulations ,Working of state and central councils, constitution of these councils and functions, Registration procedures under the Act.

**The Drugs and Cosmetics Act,1940**-General study of the Drugs and cosmetics Act and the Rules there under. Definitions and salient features related to retail and whole sale distribution of drugs. The powers of Inspectors, the sampling procedures and the procedure and formalities in obtaining licenses under the rule. Facilities to be provided for running a pharmacy effectively. General study of the schedules with special reference to schedules C,C1,F,G,J,H,P and X and salient features of labeling and storage conditions of drugs.

**The Drugs and Magic Remedies (objectionable Advertisement)Act, 1954**-General study of the Act, objectives , special reference to be laid on Advertisements, magic remedies and objectionsl and permitted advertisements -diseases which cannot be claimed to be cured.

**Narcotic Drugs and psychotropic substances Act,1985**-A brief study of the act with special reference to its objectives, offences and punishment.

Brief introduction to the study of the following acts:  
**Latest Drugs (price control) order in force.**

**Poisons Act 1919(as amended to date)**

**Medicinal and Toilet preparations (excise Duties) Act, 1955 (as amended to date).**

**Medical Termination of Pregnancy Act, 1971(as amended to date).**

**Books recommended:(Latest editions)**

Bare Acts of the said laws published by Government.

## 2.5 DRUG STORE AND BUSINESS MANAGEMENT

### THEORY (75 hours)

#### Part I Commerce (50 hours)

**Introduction**-Trade, Industry and commerce, Functions and subdivision of commerce, Introduction to Elements for Economics and Management. Forms of Business Organizations. Channels of Distribution.

**Drug House Management**-selection of site, space Lay-out and legal requirements. Importance and objectives of purchasing, selection of suppliers, credit information, tenders, contracts and price determination and legal requirements thereto.Codification, handling of drug stores and other hospital supplies. Inventory Control-objects and importance, modern techniques like ABC,VED analysis, the lead time, inventory carrying cost, safety stock, minimum and maximum stock levels, economic order quantity, scrap and surplus disposal.

Sales promotion, Market Research, Salesmanship, qualities of a salesman, Advertising and Window Display.

**Recruitment, training**, evaluation and compensation of the pharmacist.

**Banking and Finance**-Service and functions of bank, Finance planning and sources of finance.

#### Part II Accountancy (25 hours)

**Introduction to the accounting** concepts and conventions. Double entry Book Keeping, Different kinds of accounts. Cash Book. General Ledger and Trial Balance. Profit and Loss Account and Balance Sheet. Simple techniques of analyzing financial statements. Introduction to Budgeting.

**Books Recommended: (Latest editions)**

## 2.6 HOSPITAL AND CLINICAL PHARMACY

### THEORY (75 hours)

#### Part-I: Hospital Pharmacy:

**Hospital**-Definition, Function, classifications based on various criteria, organization, Management and health delivery system in India.

**Hospital Pharmacy:** Definition Functions and objectives of Hospital pharmaceutical services. Location, Layout, Flow chart of materials and men.

Personnel and facilities requirements including equipments based on individual and basic needs. Requirements and abilities required for Hospital pharmacists.

**Drug Distribution system in Hospitals.** Out-patient service.

In-patient services- types of services detailed discussion of unit Dose system, Floor ward stock system, satellite pharmacy services, central sterile services, Bed side pharmacy.

**Manufacturing:** Economical considerations, estimation of demand.

**Sterile manufacture** Large and small volume parenterals, facilities, requirements, layout production planning , man-power requirements.

**Non-sterile manufacture** Liquid orals, externals, Bulk concentrates. Procurement of stores and testing of raw materials.

Nomenclature and uses of surgical instruments and Hospital Equipments and health accessories.  
**P.T.C.(pharmacy Therapeutic Committee)**

**Hospital Formulary system** and their organization, functioning, composition.

**Drug Information service** and Drug Information Bulletin.

**Surgical dressing** like cotton, gauze, bandages and adhesive tapes including their pharmacopoeial tests for quality. Other hospital supply eg. I.V.sets, B.G. sets, Ryals tubes, Catheters, Syringes etc

**Application of computers** in maintenance of records, inventory control, medication monitoring, drug information and data storage and retrieval in hospital retail pharmacy establishment.

## **Part II: Clinical Pharmacy:**

**Introduction to Clinical pharmacy practice** Definition, scope.

**Modern dispensing aspects** Pharmacists and patient counseling and advice for the use of common drugs, medication history.

**Common daily terminology used in the practice of Medicine.**

**Disease, manifestation and patho-physiology** including salient symptoms to understand the disease like Tuberculosis, Hepatitis, Rheumatoid Arthritis, Cardio-vascular diseases, Epilepsy, Diabetes, Peptic Ulcer, Hypertension.

**Physiological parameters with their significance.**

**Drug Interactions:** Definition and introduction. Mechanism of Drug Interaction. Drug-drug interaction with reference to analgesics, diuretics, cardiovascular drugs, Gastro-intestinal agents. Vitamins and Hypoglycemic agents. Drug-food interaction.

**Adverse Drug Reaction:** Definition and significance. Drug-Induced diseases and Teratogenicity.

**Drugs in Clinical Toxicity-** Introduction, general treatment of poisoning, systemic antidotes, Treatment of insecticide poisoning, heavy metal poison, Narcotic drugs, Barbiturate, Organo-phosphorus poisons.

**Drug dependences,** drug abuse, addictive drugs and their treatment, complications.

**Bio-availability of drugs,** including factors affecting it.

**Books Recommended:(Latest editions)**

1. Remington's pharmaceutical sciences.
2. Testing of raw materials used in (1).
3. Evaluation of surgical dressings.
4. Sterilization of surgical instruments, glassware and other hospital supplies.
5. Handling and use of data processing equipments.