

## Study and Evaluation Scheme of I<sup>st</sup> year

Sr. No.	Subject	No. of hours of theory	No. of hours of practicals
1	Pharmaceutics I	75	100
2	Pharmaceutical Chemistry I	75	75
3	Pharmacognosy	75	75
4	Biochemistry & Clinical Pathology	50	75
5	Human Anatomy & Physiology	75	50
6	Health Education & Community Pharmacy	50	---

### Detailed content

#### 1.1 PHARMACEUTICS-I

##### Theory

1. Introduction of different dosage forms. Their classification with their examples - their relative applications. Familiarization with new drug delivery systems.
2. Introduction to Pharmacopoeias with special reference to Indian Pharmacopoeia.
3. Metrology: Systems of weights and measures. Calculations including conversion from one system to another system, Percentage calculations and adjustments of products. Use of alligation method in calculations. Isotonic solutions.
4. Packaging of Pharmaceuticals : Desirable features of a container-types of containers. Study of glass and plastics as materials for containers and rubber as a material for closures - their merits and demerits. Introduction to aerosol packaging.
5. Size reduction objective, and factors affecting size reduction, methods of size reduction - Study of hammer mill, ball mill, Fluid Energy Mill and disintegrator.
6. Size separation-size separation by shifting. Official standards for powders. Sedimentation methods of size separation. Construction and working of Cyclone separator.
7. Mixing and Homogenization - Liquid mixing and powder mixing, Mixing of semisolids. Study of Silverson Mixer Homo-geniser, Planetary Mixer, Agitated Powder Mixer; Triple Roller Mill; Propellor mixer, Colloid mill and Homogeniser. Double cone mixer.

8. Clarification and Filtration - Theory of filtration, Filter media; Filter aids and selection of filters. Study of the following filtration equipments - Filter press, Sintered Filters Filters candles, Metafilter.
9. Extraction and Galenicals -
  - a. Study of percolation and maceration and their modifications, continuous hot extraction - Application in the preparation of tinctures and extracts.
  - b. Introduction to Ayurvedic dosage forms
10. Heat processes - Evaporation - Definition - factors affecting evaporation - Study of evaporating still and evaporating pan.
11. Distillation - Simple distillation and fractional distillation, steam distillation and vacuum distillation. Study of vacuum still, preparation of Purified water I.P. Construction and working of the still used for the same.
12. Introduction to drying processes - Study of Tray Dryers, Fluidized Bed Dryer, vacuum Dryer and Freeze Dryer.
13. Sterilization - Concept of sterilization and its difference from disinfections - Thermal resistance of microorganisms. Detailed study of the following sterilization processes.
  1. Sterilizations with moist heat
  2. Dry heat sterilization
  3. Sterilization by radiation
  4. Sterilization filters
  5. Gaseous sterilizations

Aseptic techniques - Application of sterilization processes in hospitals particularly with reference to surgical dressings and intravenous fluids. Precaution for safe and effective handling of sterilization equipment.

Processing of Tablets - Definition, Different types of compressed tablets and their properties. Processes involved in the production of tablets, Tablets excipients, Defects in tablets, Evaluation of Tablets, Physical standards including Disintegration and Dissolution. Tablets coating sugar coating; film coating, enteric coating and microencapsulation (Tablet coating may be dealt in an elementary manner).

Processing of capsules - Hard and soft gelatin capsules; different sizes of capsules; filling of capsules; handling and storage of capsules. Special application of capsules.

Study of immunological products like sera, vaccines, toxoids and their preparations.

### **PRACTICAL**

Preparation (minimum number stated against each) of the following categories illustrating different techniques involved.

1. Aromatic waters
2. Solutions
3. Spirits
4. Tinctures
5. Extracts
6. Creams
7. Cosmetics preparations
8. Capsules
9. Tablets
10. Preparation involving sterilisation
11. Ophthalmic preparations
12. Preparations involving aseptic techniques

### **Books recommended (Latest edition)**

1. Remington's Pharmaceutical Sciences
2. The extra Pharmacopoeia martindale

## **1.2 PHARMACEUTICAL CHEMISTRY - I**

### **Theory**

1. General discussion on the following inorganic compounds including important physical and chemical properties, medicinal and Pharmaceutical uses, storage conditions and chemical incompatibility.

A. **Acids, bases and buffers** - Boric acid, Hydrochloric acid, strong ammonium hydroxide, Calcium hydroxide, Sodium hydroxide and official buffers.

**B. Antioxidants** - Hypophosphorous acid, Sulphur dioxide, Sodium bisulfate, Sodium meta-bisulfite, Sodium thiosulfate, Nitrogen and Sodium Nitrite.

**C. Gastrointestinal agents -**

1. Acidifying agents - Dilute hydrochloric acid
2. Antacids - Sodium bicarbonate, Aluminium hydroxide gel, Aluminium Phosphate, Calcium carbonate, Magnesium carbonate, Magnesium trisilicate, Magnesium oxide, combinations of antacid preparations.
3. Protective and Adsorbent - Bismuth subcarbonate and kaolin.
4. Saline cathartic - Sodium Potassium tartrate and magnesium Sulphate

**D. Topical Agents -**

1. Protective - Talc, Zinc oxide, Calamine, Zinc stearate, Titanium dioxide, Silicon polymers.
2. Antimicrobials and Astringents - hydrogen peroxide, potassium permanganate, Chlorinated lime, Iodine, solutions of iodine, Povidone - iodine, Boric acid, Borax silver nitrate, Mild silver protein, Mercury, Yellow mercuric oxide, Ammoniated mercury.
3. Sulphur and its compound - Sublimed sulphur, Precipitated sulphur, Selenium sulphide'
4. Astringents :- Alum and Zinc sulphate

**E. Dental products** - Sodium fluoride, stannous flouride, calcium flouride, calcium carbonate, Sodium meta phosphate, dicalcium phosphate, Strontium chloride, Zinc chloride.

**F. Inhalants** - Oxygen, Carbion dioxide, Nitrous oxide.

**G. Respiratory stimulants** - Ammonium carbonate

**H. Expectorants and Emetics** - Ammonium chloride, Potassium iodide, Antimony Potassium tartrate

**I. Antidotes** - Sodium Nitrate

**2. Major Intra and Extracellular electrolytes**

- A. Electrolytes used for replacement therapy-sodium and its preparations, Potassium chloride and its preparations
- B. Physiological acid-base balance and electrolytes used-Sodium actuate, Potassium acetate, Sodium bicarbonate injection. sodium citrate potassium citrate, Sodium lactate injection, Ammoium chloride and its injection.
- C. Combination of oral electrolyte powders and solutions.

3. **Inorganic Official compounds of Iron, iodine and calcium ferrous sulfate and calcium gluconate.**

4. **Radio pharmaceuticals and contrast media** - Radio activity-Alpha, Beta and Gamma Radiations, Biological effects of radiations, Measurements of radio activity, G.M. Counter Radio isotopes their uses, storage and precautions with special reference to the official preparations.

5. Quality control of Drugs and pharmaceuticals importance of quality control, significant errors, methods used for quality control of impurities in pharmaceuticals, Limit tests for Arsenic, chloride, sulphate, iron and Heavy metals.

6. Identifications tests for cations and anions as per Indian Pharmacopoeia.

### **Practical**

1. Identification tests for inorganic compounds particularly drugs and pharmaceuticals.

2. Limit test for chloride, sulfate. Arsenic, Iron and Heavy metals.

3. Assay of inorganic Pharmaceuticals involving each of the following methods of compound marked with (\*) under theory.

a) Acid-Base titrations (at least 3)

b) Redox titrations (One each of Permanganometry and iodimetry)

c) Precipitation titrations (at least 2)

d) Complexometric titrations (Calcium and Magnesium)

### **Book Recommended (Latest editions)**

1. Indian Pharmacopoeia

## **1.3 PHARMACOGNOSY**

### **Theory**

1. Definition history and scope of pharmacognosy including indigenous system of medicine.

2. Various system of classification of drugs of natural origin.

3. Adulteration and drug evaluation, significance of pharmacopoeial standards.

4. Brief outline of occurrence, distribution outline of isolation, identifications tests, therapeutic effects and pharmaceutical applications of alkaloids, terpenoids, glycosides, volatile oils, tannis and resins.

5. Occurrence, distribution, organoleptic evaluation, chemical constituents including tests wherever applicable and therapeutic efficacy of following categories of drugs.

a. Laxatives : Aloes, Rhubarb, castor oil, Ispaghula, Senna.

- b. cardiotonics - Digitails, Arjuna
  - c. Carminatives 7 G.T. regulators -Umbelliferous fruits. Coriander, fennel, Ajowan, cardamom, Glinger, Black Pepper, Asafoetida, Nutmeg, Cinnamon, Clove.
  - d. Astringents - Catechu.
  - e. Drugs acting on nervous system- Hyoscyamus, Belladonnas Aconite, Ashwagandha, Ephedra, Opium, Cannabis, Nux vomica
  - f. Antihypertensives - rauwolfia
  - g. Antitussive - vasaka, Tolu balsam, tulsi
  - h. Antirheumatic - Guggal, Colchium
  - i. Antitumor - Vinca
  - j. Antileprotics - Chaulmoogra Oil
  - k. Antidiabetics - Pterocarpus, Gymnema, Sylvestro.
  - l. Diuretics - Gokhru, Punarnava.
  - m. Antidysenterics - Ipecacuanha
  - n. Antiseptics and disinfectants Benzoin, Myrrh, Nim, Curcuma
  - o. Antimalarials - Cinchona
  - p. Oxytocics - Ergot
  - q. Vitamins - Shark Liver Oil and Amla
  - r. Enzymes - papaya, Diastase, Yeast
  - s. Perfumes and flavoring agents - peppermint Oil, Lemon Oil, Orange Oil, Lemon grass Oil, Sandalwood.
  - t. Pharmaceutical aids - Honey, Arachis Oil, Starch, Kaolin. Pectin, Olive Oil, Lanolin, Beeswax, acacia, Tragacanth, Sodium Alginate, Agar, Guar gum, Gelatin.
  - u. Miscellaneous - liquorice, garlic, Picrorhiza, Dioscores, Linsee, Shatavari, Shankpushpi, Pyrethrum, Tobacco.
6. Collection and preparation of crude drugs for the market as exemplified by ergot, opium, rauwolfia, Digitails, Senna
7. Study of course, preparation and identification of fibres used in sutures and surgical dressings- cotton, silk, wool and regenerated fibres.
8. Gross anatomical studies of - Senna, datura, Cinnamon, Cinchona, Fennel, Clove, Ginger, Nuxvomica & ipecacuanha.

## **Practical**

1. Identification of drugs by morphological characters
2. Physical and chemical tests for evaluation of drugs wherever applicable
3. Gross anatomical studies (t.s) of the following drugs Senna, datura, Cinchona, Coriander, fennel, Clove, Ginger, Nuxvomica, Ipecacuanha
4. Identification of fibres and surgical dressings.

## **1.4 BIOCHEMISTRY AND CLINICAL PATHOLOGY**

### **Theory**

1. Introduction to biochemistry
2. Brief chemistry and role of proteins, Polypeptides and amino acids, classification, qualitative tests, Biological value, Deficiency diseases.
3. Brief chemistry and role of Carbohydrates, classification, qualitative tests, disease related to Carbohydrates metabolism.
4. Brief chemistry and role of lipids, classification, qualitative tests, disease related to lipids metabolism.
5. Brief chemistry and role of Vitamins and Coenzymes.
6. Role of mineral and water in life processes.
7. Enzymes : brief concept of enzymic action. Factors affecting it. Therapeutic and pharmaceutical importance.
8. Brief concept of normal and abnormal metabolism of proteins, carbohydrates and lipids.
9. Introduction to pathology of blood and urine.
  - (a) Lymphocytes and platelets, their role in health and disease
  - (b) Erythrocytes - Abnormal cells and their significance.
  - (c) Abnormal constituents of urine and their significance in diseases.

### **Practical**

1. Detection and identification of proteins, amino acids, Carbohydrates and Lipids
2. Analysis of normal and abnormal constituents of blood and urine (Glucose, Urea, Creatine, creatinine, Cholesterol alkaline phosphatase, acid phosphatase, Billirubin, SGPT, SGOT, Calcium, Diastase, Lipase)

3. Examination of sputum and faces (microscopic & staining).
4. Practice injecting drugs by intramuscular subcutaneous and intravenous routes. Withdrawal of blood samples.

## 1.5 HUMAN ANATOMY AND PHYSIOLOGY

### Theory

1. Scope of Anatomy and Physiology. Definition of various terms used in Anatomy.
2. Structure of cell, function of its components with special reference to mitochondria and microsomes.
3. Elementary tissues of the body, i.e. epithelial tissue muscular tissue, connective tissue and nervous tissue.
4. Structure of function of Skeleton. Classification of joints and their function, joint disorder.
5. Composition of blood, functions of blood elements. Blood group and coagulation of blood. Brief information regarding disorders of blood.
6. Name and functions of lymph glands.
7. Structure and functions of various parts of the heart. Arterial and venous system with special reference to the name and positions on main arteries and veins. Blood pressure and its recording. Brief information about cardiovascular disorders.
8. Various parts of respiratory system and their functions. Physiology and respiration.
9. Various parts of urinary systems and their functions. Structure and functions of kidney. Physiology of urine formation pathophysiology of renal diseases and oedema.
10. Structure of skeletal muscle. Physiology of muscle contraction. Names, positions, attachments and functions of various skeletal muscles. Physiology of neuromuscular junction.
11. Various parts of central nervous system, brain and its parts, functions and reflex action. Anatomy and physiology of autonomic nervous system.
12. Elementary knowledge of structure and functions of the organs of taste, smell, ear, eye and skin. Physiology of pain.
13. Digestive system names of the various parts of digestive system and their functions. Structure and functions of liver, physiology of digestion and absorption.
14. Endocrine glands and hormones. Location of the glands, their hormones and functions.
15. Reproductive system - Physiology and Anatomy of Reproductive system.



## **Practical**

1. Study of the human skeleton.
2. Study with the help of charts and models of the following systems and organs:
  - (a) Digestive system
  - (b) Respiratory system.
  - (c) Cardiovascular system.
  - (d) Urinary system.
  - (e) Reproductive system.
  - (f) Nervous system.
  - (g) Eye
  - (h) Ear
3. Microscopic examinations of epithelial tissue, cardiac muscle, smooth muscle, skeletal muscle. Connective tissue and nervous tissues.
4. Examination of blood for TLC, DLC and malarial parasite.
5. Determination of clotting time of blood, erythrocyte sedimentation rate and Haemoglobin value.
6. Recording of body temperature, pulse, heart rate, blood pressure and ECG.

## **1.6 HEALTH EDUCATION AND COMMUNITY PHARMACY**

### **Theory**

1. **Concept of health** - Definition of physical health, mental health, social health, spiritual health - determinants of health, indicators of health, concept of disease, natural history of diseases, the disease agents, concept of prevention of diseases.
2. **Nutrition and health** - Classification of foods, requirements, diseases induced due to deficiency of proteins, vitamins and minerals - treatment and prevention.
3. **Demography and family planning** - Demography cycle, fertility, family planning, contraceptive methods, behavioral methods, hormonal contraceptives, population problem of India.
4. **First aid** - Emergency treatment in shock, snakebite, burns, poisoning, heart disease, fractures and resuscitation methods. Elements of minor surgery and dressings.

5. **Environment and health-** Sources of water supply, water pollution, purification of water, health and air, noise, light-solid waste disposal and control-medical entomology, arthropod borne diseases and their control, rodents, animals and diseases.

6. **Fundamental principles of microbiology-** Classification of microbes, isolation, staining techniques of organisms of transmissions and prevention.

7. **Communicable diseases-** Causative agents, mode of transmission and prevention.

(a) Respiratory infections - chicken pox, measles, influenza diphtheria, whooping cough and tuberculosis.

(b) Intestinal infections : poliomyelitis, Hepatitis, cholera, Typhoid, Food poisoning, Hookworm infections.

(c) Arthropod borne infections - Plague, malaria, Filariasis.

(d) Surface infections - Rabies, trachoma, Tetanus, Leprosy.

(e) Sexually transmitted diseases - Syphilis, Gonorhoea, AIDS.

8. **Noncommunicable diseases** - Causative agents, prevention care and control: Cancer, Diabetes, Blindness, cardiovascular diseases.

9. **Epidemiology** - Its scope, methods, uses, dynamics of disease transmission. Immunity and immunization: Immunological product and their dose schedule. Principles of disease control and prevention, hospital acquired infection, prevention and control Disinfection, types of disinfection, disinfection procedures, for faces, urine, sputum, room, linen, dead-bodies, instruments.

### Study and Evaluation Scheme of 2<sup>nd</sup> year

Sr. No.	Subject	No. of hours of theory	No. of hours of practicals
1	Pharmaceutics II	75	100
2	Pharmaceutical Chemistry II	100	75
3	Pharmacology & Toxicology	75	50
4	Pharmaceutical Jurisprudence	50	---
5	Drug Store Business Management	75	---
6	Hospital & Clinical Pharmacy	75	50

### Detailed content

#### 2.1 PHARMACEUTICS II

##### Theory

##### 1. Dispensing Pharmacy :

- (i) Prescriptions- reading and understanding of prescriptions: Latin terms commonly used 9 Detailed study is not necessary), Modern methods of prescribing, adoption of metric system. Calculations involved in dispensing.
- (ii) Incompatibilities in prescriptions - Study of various types of incompatibilities-physical, chemical and therapeutic.
- (iii) Posology-Dose and dosage of drugs, Factors influencing dose, calculations of doses on the basis of age, sex and surface area. Veterinary doses.

##### 2. 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 labelling requirements and storage conditions should be highlighted).

(i) Powders - Types 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.

(ii) Liquid Oral Dosage Forms :

(a) **Monophasic** - Theoretical aspects including commonly used vehicles, essential adjuvant like stabilizers, colourants 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,Douches
Elixirs	Ear Drops, Nasal drops & sprays, Liniments, Lotions

(b) **Biphasic Liquid Dosage Forms :**

(i) Suspensions (elementary study) - Suspensions containing diffusible solids and liquids and their preparations. Study of the adjuvants 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.

(ii) Emulsions-Types of emulsions, identification of emulsion systems, formulation of emulsions, selection of emulsifying agents. Instabilities in emulsions. Preservation of emulsions.

(iii) Semi-Solid Dosage Forms :

a. Ointments-Types of ointments, classification and selection of dermatological vehicles.

Preparation and stability of ointments by the following processes :

- i. i) Trituration
- ii. ii) Fusion
- iii. iii) Chemical reaction

- iv. iv) Emulsification.
- b. Pastes-Difference between ointments and pastes Bases of pastes. Preparation of pastes and their preservation.
- c. Jellies-An introduction to the different types of jellies and ;their preparation.
- d. An elementary study of poultice.
- e. Suppositories and pessaries-Their relatives merits and demerits, types of suppositories, suppository bases, classification, properties, Preparations and packing of suppositories. Use of suppositories for drug absorption.

(iv) Dental and Cosmetic Preparations :

Institution to Denitrifies, Facial cosmetics, Deodorants, Antiperspirants, Shampoos, Hair dressings and Hair removers.

(v) Sterile Dosage Forms

- a. Parenteral ;dosage forms-Definition, General requirements for parenteral dosage forms. Types of parenteral formulations, vehicles, adjuvants, processing, personnel, facilities and Quality control. Preparation of Intravenous fluids and admixtures-Total parenteral nutrition, Dialysis fluids.
- b. Sterility testing, Particulate matter monitoring-Faculty seals-packaging.
- c. Ophthalmic Products-Study of essential characteristics of different ophthalmic preparations. Formulation additives, special lprecautions in handling and storage of ophthalmic products.

**Practical**

Dispensing of at least 100 products covering a wide range of ;preparations such as mixtures, emulsions, lotions, liniments, E.N.T. preparations, ointments suppositories, powders, incompatible prescriptions etc. Books recommended : (Latest editions)

1. Indian Pharmacopeia.
2. British Pharmacopeia.
3. National Formularies (N.F.I., B.N.F.)
4. Remington's Pharmaceutical Sciences.
5. Martindale's Extra Pharmacopeia.

## 2.2 PHARMACEUTICAL CHEMISTRY-II

### Theory

1. Introduction to the nomenclature of organic chemical systems with particular reference to heterocyclic system containing up to 3 rings.

2. The Chemistry of following Pharmaceutical organic compounds, covering chair 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.

- i. Antiseptics and Disinfectants-Proflavine\*, Benzalkonium chloride, cetrimide, chloro cresol 8, chloroxylene, Formaldehyde solution, Hexachlorophene, Liquefied phenol, Nitro funantoin. Sulfathiazole, succinyl sulfathiazole, sulfadimethoxine, sulfamethoxy pyrdazine. Sulfa methoxazole, co-trimoxazole, sulfacetamide\*.
- ii. Antileptotic Drugs-clofazimine, Thiambutosine, Dapson\*, solapsone.
- iii. Anti-tubercular Drugs-Isoniazid\*, PAS\*, Streptomycin, Rifampicin, Ethambutol\*, Thiacetazone, Ethionamide, Cycloserine, Pyrazinamide\*.
- iv. Antiamoebic and /anthelmintic Drugs-Emetine, Metronidazole\*, Halogenated hydroxyquinolines, diloxanide furoate, Paromomycin Piperazine\*, Mebendazole, D.E.C,\*.
- v. Antibiotics-Benzyl Penicillin\*, Phenoxy methyl Penicillin&, Benzathine Penicillin, Ampicillin\*, Cloxacillin, Carbenicillin, Gentamycin, Neomycin, Erythromycin, Tetracycline, Cephalexin, Cephaloridine, Cephalothin, Griseofulvin, Chloramphenicol. Antifungal agents-Undecylenic acid, Tolnaftate, Nystatin, Amphotericin, Hamycin.
- vi. Antimalarial Drugs-Chloroquine\*, Amodiaquine, Primaquine, Proguanil, Pyrimethamine\*, Quinine, Trimethoprim.
- vii. Tranquilizers -Chlorpromazine\*, Prochlor Perazine, Trifluo, Perazine, Phiothixene, Haloperidol\*, Triperidol, Oxypertine, Chlordiazepoxine, Diazepam\*, Lorazepam, Meprobamate.
- viii. Hypnotics:- Phenobarbitone\*, Methypylon, paraldehyde. Triclofos sodium.

- ix. General Anacsthics-Halothane\*, Cyclopropane\*, Diethyl ether\*, Metho-hexital sodium, Thiopental sodium, Trichloro ethylene.
- x. Antidepressant Drugs-Amitriptyline, Nortriptyline, Imipramine\*, Phenezine, Tranyl cypromine.
- xi. Analetptics-Theophylline, Caffeine\*, Coramine\*, Dextro-amphetamine.
- xii. Adrenergic Drugs-Adrenaline\*, Noradrenaline, Isoprenaline\*, Phenylephrine, Salbutamol, Terbutaline, Ephedrine\*, Pseudo ephedrine.
- xiii. Adrenergic Antagonist-Tolazoline, Propranolol \*, Practalol.
- xiv. Cholinergic Drugs-Neostigmine\*, Pyridostigmine, Pralidoxime, Pilocarpine, Physostigmine\*.
- xv. Cholinertgic Antagonists-Atropine\*, Hyoseine, Homatropine, Propantheline\*, Benztropoine, Tropicamide, Biperiden \*.
- xvi. Diuretic Drugs-Furosemide\*, Chlorothiazide, Hydrochlorothiazide Benathiazide, Urea\*, Manitol\*, Ethacrynic Acid.
- xvii. Cardiovascular Drugs-Ethylnitrite\*, Glyceryl trinitrate, Alpha methyldopa, ;Guanethidine, Clofibrate, Quinidine.
- xviii. Hylkpopglycemic Agents-Insulin, Chlorpropamide\*, Tolbutamide Glibenclamide, Phenformine\*, Metformin.
- xix. Coagulants and Anti Coagulants-Heparin, Thrombin, Menadione\*, Blishydrozycoumarin, Warfarin Sodium.
- xx. Local Anaesthetics-Lignocaine\*, Procaine\*, Benzocaine.
- xxi. Histamine and Anti histaminic Agents-Histamine, Diphen hydramine\*. Promethazine, Cyproheptadine, Mepyramine, Pheniramine, Chlorpheniramine\*.
- xxii. Non-steridoal anti-inflammatory Agents-Indomethacin\*, Phenylbutazone\*, Oxyphen butazone, Ibuprofen.
- xxiii. Thurpxome and Antithyroids-Thyroxine\*, Methimazole, Methyl thiouracil, Propylthiouracil.
- xxiv. Diagnostic Agents-Inopanoic Acid, Propyliodone, Sulfobromophthalalein
- xxv. Sodium, Indigotindisulfonate Sodium (Indigo Carmine), Evans blue, Congo Red, Fluoreseein Sodium.

- xxvi. Anticonvulsants, cardiac glycosides, Antiarrhythmic antihypertensives & vitamins.
- xxvii. Steroidal Drugs-Betamethazone, Cortisone, Hydrocortisone, prednisolone, Progesterone, Testosterone, Oestradiol Nandrolone.
- xxviii. Anti-Neoplastic Drugs-Actinomycins, Azathioprine, Busulfan, Chlorambucil, Cisplatin cyclophosphamide, Daunorubicin, Hydrochloride, Fluorouracil, Mercaptopurine, Methotrexate, Mytomye.

**Books Recommended: (latest editions)**

1. Pharmacopeia of India.
2. British pharmaceutical codex.
3. Martindale's Extra pharmacopoeia.

**Practical**

1. System 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**

1. Introduction to Pharmacology, scope of Pharmacology.
2. Routes of administration of drugs, and the factors affecting them. Metabolism, distribution and excretion of drugs.
3. Various processes of absorption of drugs and the factors affecting them. Metabolism, distribution and excretion of drugs.
4. General mechanism of drugs action and the factors which modify drug action.
5. Pharmacological classification of drugs. The discussion of drugs should emphasis the following aspects:



i) Drugs acting on the Central Nervous system:

- a. General anaesthetics, adjuvant to anaesthesia, intravenous anaesthetics.
- b. Analgesic and non-steroidal antiinflammatory drugs, Narcotic analgesics, Antirheumatic and antigout remedies. Sedatives and Hypnotics, Psychopharmacological agents, anti convulsants, analeptics.
- c. Centrality acting muscle relaxants and antiparkinsonism agents.

ii) Local anaesthetics.

iii) Drugs acting on autonomic nervous system.

- a. Cholinergic drugs, Anticholinergic drugs, anticholinesterases drugs.
- b. Adrenergic drugs and adrenergic receptor blockers.
- c. Neurone blockers and ganglion blockers.
- d. Neuromuscular blockers, drugs used in myasthenia gravis.

iv) Drugs acting on eye, mydriatics, drugs used in glaucoma.

v) Drugs acting on respiratory system-Respiratory stimulants Bronchodilator, Nasal decongestants, Expectorants and Antitussive agents.

vi) Antacids, Physiological role of histamine and serotonin, Histamine and Antihistamines, Prostaglandins.

vii) Cardio Vascular drugs, cardiotonics, Antiarrhythmic agents, Antianginal agents, Antihypertensive agents, Peripheral Vasodilators and drugs used in atherosclerosis.

viii) Drugs acting on the blood and blood forming organs. Haematinics, Coagulants and acticoagulants, Hemostatics, Blood substitutes and plasma expanders.

ix) Drugs effecting renal function-Diuretics and antidiuretics.

x) Hormones and hormone antagonists-Hypoglycemic agents, Antithyroid drugs, sex hormones and oral contraceptives corticosteroids.

xi) Drugs acting on digestive system-Carminatives, digestant Bitters, Antacids and drugs used in peptic ulcer, Purgative and laxatives, Antidiarrheal, Emetics, Antiemetic, Antispasmodic.

6. Chemotherapy of microbial disease: Urinary antiseptics, Sulfonamides, Penicillins, Streptomycin, Tetracyclines and other antibiotics. Antitubercular agents, Antifungal agents, antiviral drugs, antileprotic drugs.

7. Chemotherapy of protozoal diseases. Anthelmintic drugs.

8. Chemotherapy of cancer.

9. Disinfectants and antiseptics. A detailed study of the action of drugs on each organ is not necessary.

### **Practical**

The first six of the following experiments will be done by the students while the remaining will be demonstrated by the teacher.

1. Effect of K<sup>+</sup>, Ca<sup>++</sup> acetyl choline and adrenaline on frog's heart.
2. Effect of acetyl choline on rectus abdominis muscle of frog and guinea pigileum.
3. Effect of spasmogens and relazants on rebbits intestine.
4. Effect of local anaesthetics on rabbit cornea.
5. Effect of mydriataics and motics on rabbits eye.
6. To study the action of strychnine of frog.
7. Effect of digitalis on frog's heart.
8. Effect of hypnotics in mice.
9. Effect of convulsants and anticonvulsants in mice or rats.
10. Test for pyrogans.
11. Taming and hypnosis potentiating effect of chlorpromazine in mice/rats.
12. Effect of diphenhydramine in experimentally produced asthma in guinea pigs.

## **2.4 PHARMACEUTICAL JURISPRUDENCE**

### **Theory**

1. 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.
2. Principles and significance of Professional ethives. Critical study of the code of pharmaceutical ethics drafted by pharmacy council of India.
3. 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.
4. The Drugs and Cosmetics Act, 1940- General study of the Drugs and Cosmetics Act the Rules thereunder. 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 licences under the rule. Facilities to be provided for running a pharmacy effectively. General ;study of the schedules with special reference to schedules C,C,F,G,J,H,P, and X and salient features of labelling and storage a conditions of drugs.

5. 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 objectionable and permitted advertisements-diseases which cannot be claimed to be cured

6. Narcotic Drugs and Psychotropic Substances Act, 1985-A \* study of the Act with special reference to its objectives, offences and punishment.

7. Brief introduction to the study ;of the following acts:

1. Latest Drugs (Price Control) order in force.

2. Poisons Act 1919 (as amended to date)

3. Medicinal and Toilet Preparations (Excise Duties) Act, 1955 (as amended to date)

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

### **Books Recommended (Latest edition)**

Bare Acts of the said \* published by the Government.

## **2.5 DRUG STORE AND BUSINESS MANAGEMENT**

### **Theory**

#### **Part I Commerce**

1. Introduction-Trade, Industry and Commerce, Functions and subdivision of Commerce, Introduction to Elements of Economics and Management.

2. Forms of Business organizations.

3. Channels of Distribution.

4. Drug House Management-Selection of Site, Space Layout 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.

5. 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.
6. Sales Promotion, Market Research, Salesmanship, qualities of a salesman, Advertising and Window Display.
7. Banking and Finance-Service and functions of bank, Finance planning and sources of finance.

## **Part II Accountancy**

1. Introduction to the accounting concepts and conventions, double entry, Book keeping, Different kinds of accounts.
2. Cash book.
3. General ledger and trial balance.
4. Profit and loss account and balance sheet.
5. Simple techniques of analyzing financial statements. Introduction to Budgeting.

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

1. Remington pharmaceutical science

## **2.6 HOSPITAL AND CLINICAL PHARMACY**

### **Theory**

#### **Part I Hospital Pharmacy :**

1. Hospitals Definition, Function, Classifications based on various criteria, organization, Management and health delivery system in India.
2. Hospital Pharmacy :
  - (a) Definition
  - (b) Functions and objectives of Hospital Pharmaceuticals services.
  - (c) Location, Layout, Flow chart of materials and men.
  - (d) Personnel and facilities requirements including equipments based on individual and basic needs.
  - (e) Requirements and abilities required for Hospital Pharmacists.
3. Drug Distribution system in Hospitals :
  - (a) Outpatient services

(b) Inpatient services:- (a) types of services (b) detailed satellite pharmacy services, Central sterile services, Bed side Pharmacy.

#### 4. Manufacturing :

(a) Economics considerations, estimation of demand.

(b) Sterile manufacture-large and small volume parenteral, facilities, requirements layout, production planning, manpower requirements

(c) Non-sterile manufacture-Liquid orals, externals, Bulk concentrates

(d) Procurement of stores and testing of raw materials

5. Nomenclature and uses of surgical instruments and \* equipments and health accessories

6. P.T.C. (Pharmacy Therapeutic Committee), Hospital Formulary system and their organizations, functioning, composition

7. Drug Information service and Drug Information Bulletin

8. 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

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

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

1. Introduction to Clinical Pharmacy Practice-Definition, scope.

2. Modern dispensing aspects-Pharmacists and Patient counselling and advice for the use of common drugs, medication history.

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

4. Disease, manifestations and pathophysiology including salient symptoms to understand the disease like Tuberculosis, Hepatitis, Rheumatoid Arthritis, Cardio-Vascular diseases, Epilepsy, Diabetes, Peptic Ulcer, Hypertension.

5. Physiological parameters with their significance.

6. Drug Interactions :

(a) Definition of Drug Interaction

(b) Mechanism of Drug Interaction

(c) Drug-drug interaction with reference to analgesics, diuretics, cardio vascular drugs, Gastrointestinal agent Vitamins and Hypoglycemic agents

(d) Drug-food interaction

7. Adverse Drug Reactions :

(a) Definition and significance

(b) Drug-induced disease and Teratogenicity.

8. Drugs in clinical Toxicity-Introduction, general treatment of poisoning, systematic antidotes. Treatment of insecticide poisoning, heavy metal poison, Narcotic drugs, Barbiturate, Organophosphorus poisons.

9. Drug dependences, Drug abuse, Addictive drugs and their treatment, complications.

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

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

1. Remington's pharmaceutical sciences.

2. Martinadale's Extra Pharmacopoeia.

### **Practical**

1. Preparation of transfusion fluids.

2. Martindale's Extra pharmacopoeia.

3. Evaluation of surgical dressings.

4. Sterilization of surgical instruments, glass ware and other hospital supplies.

5. Handling and use of data processing equipments. (See Regulation 9)