

# SYLLABUS

## DIPLOMA IN PHARMACY (PART-I)

### 1.1 PHARMACEUTICS I

#### Theory (75 Hours)

**Introduction of different dosage forms.** Their classification with examples-their relative applications. Familiarization with new drug delivery systems. Introduction to Pharmacopoeias with special reference to the Indian Pharmacopoeia.

**Metrology**-System of weights and measures. Calculations including conversion from one to another system. Percentage calculations and adjustment of products. Use of alligation method in calculations. Isotonic solutions.

**Packaging of pharmaceuticals**-Desirable features of a container and types of containers. Study of glass & plastics as materials for containers and rubber as a material for closure-their merits and demerits. Introduction to aerosol packaging.

Size reduction, objectives, and factors affecting size reduction, methods of size reduction- study of Hammer mill, ball mill, Fluid energy mill and Disintegrator.

**Size separation**-size separation by sifting. Official standards for powders. Sedimentation methods of size separation. Construction and working of Cyclone separator.

**Mixing and Homogenization**-Liquid mixing and powder mixing, Mixing of semisolids. Study of silverson Mixer-Homogenizer, planetary Mixer; Agitated powder mixer; Triple Roller Mill; Propeller Mixer, colloid Mill and Hand Homogeniser. Double cone mixer.

**Clarification and Filtration**-Theory of filtration, Filter media; Filter aids and selection of filters. Study of the following filtration equipments-Filter Press, sintered filters, Filter candles, Metafilter.

#### **Extraction and Galenicals-**

(a) Study of percolation and maceration and their modification, continuous hot extraction-Application in the preparation of tinctures and extracts.

(b) Introduction to Ayurvedic dosage forms.

Heat process-Evaporation-Definition-Factors affecting evaporation-study of evaporating still and Evaporating pan.

**Distillation**-Simple distillation and Fractional distillation, steam distillation and vacuum distillation. Study of vacuum still, preparation of purified water I.P. and water for Injection I.P. construction and working of the still used for the same.

**Introduction to drying process**-Study of Tray Dryers; Fluidized Bed Dryer, Vacuum Dryer and Freeze Dryer.

**Sterilization**-Concept of sterilization and its differences from disinfection-Thermal resistance of microorganisms. Detailed study of the following sterilization process.

Sterilization with moist heat, Dry heat sterilization, Sterilization by radiation, Sterilization by filtration and Gaseous sterilization.

**Aseptic techniques**-Applications of sterilization process in hospitals particularly with reference to surgical dressings and intravenous fluids. Precautions for safe and effective handling of sterilization equipment.

**Processing of Tablets**-Definition; different type of compressed tables and their properties. Processes involved in the production of tablets; Tablets excipients ; Defects in tablets; Evaluation of Tablets; Physical standards including Disintegration and Dissolution. Tablet coating-sugar coating; films coating, enteric coating and micro-encapsulation (Tablet coating may be de.. 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 applications of capsules.

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

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

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

1. Aromatic waters<sup>3</sup>
2. Solutions<sup>4</sup>
3. Spirits<sup>2</sup>
4. Tinctures<sup>4</sup>
5. Extracts<sup>2</sup>
6. Creams<sup>2</sup>
7. Cosmetic preparations<sup>3</sup>
8. Capsules<sup>2</sup>
9. Tables<sup>2</sup>
10. Preparations involving<sup>2</sup>
11. Ophthalmic preparations<sup>2</sup>
12. Preparations involving aseptic techniques<sup>2</sup>

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

- 1.) Remington's Pharmaceutical Sciences.
- 2.) The Extra Pharmacopoeia-Martindale.

## **1.2 PHARMACEUTICAL CHEMISTRY-I**

### **THEORY (75 Hours)**

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

**Acids, bases and buffers**-Boric acid, Hydrochloric acid, Strong Ammonium hydroxide, Sodium hydroxide and official buffers.

**Antioxidants**- Hypophosphorous acid, Sulphur dioxide, Sodium bisulphite, Sodium meta-bisulphite, Sodium thiosulphate, Nitrogen and Sodium nitrite.

#### **Gastrointestinal agents-**

Acidifying agents- Dilute Hydrochloric acid.

Antacids- Sodium bicarbonate, Aluminum hydroxide gel, Aluminum phosphate, Calcium carbonate, Magnesium carbonate, Magnesium trisilicate, Magnesium oxide, Combinations of antacid preparations.

Protective and Adsorbents- Bismuth sub carbonate and Kaolin.

Saline cathartics- Sodium potassium tartrate and Magnesium sulphate.

#### **Topical Agents-**

Protective- Talc, Zinc Oxide, Calamine, Zinc stearate, Titanium dioxide, silicone polymers.

**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.

Sulphur and its compounds- Sublimed sulphur, Percipitated sulphur, Selenium sulphide.

Astringents- Alum and Zinc Sulphate.

**Dental Products-** Sodium fluoride, Stannous fluoride, Calcium carbonate, Sodium meta phosphate, Dicalcium phosphate, Strontium chloride, Zinc chloride.

Inhalants- Oxygen, Carbon dioxide, Nitrous oxide.

**Respiratory stimulants-** Ammonium carbonate.

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

**Antidotes-** Sodium nitrite.

**Major Intra and Extra cellular electrolytes-**

Electrolytes used for replacement therapy- Sodium chloride and its preparations, Potassium chloride and its preparations.

Physiological acid-base balance and electrolytes used- Sodium acetate, Potassium Acetate, Sodium bicarbonate Inj., Sodium citrate, Potassium citrate, Sodium lactate injection, Ammonium chloride and its injection.

Combination of oral electrolyte powders and solutions.

**Inorganic official compounds** of Iron, Iodine and Calcium, Ferrous Sulphate and Calcium Gluconate.

**Radio pharmaceuticals and contrast media-** Radio activity-Alpha; Beta and Gamma Radiations, Biological effects of radiations, Measurement of radio activity, G.M. Counter, Radio isotopes-their uses, Storage and precautions with special reference to the official preparations. Radio opaque contrast media- Barium sulfate.

**Quality control of Drugs and pharmaceuticals-**Importance of quality control, significant errors, methods used for quality control, sources of impurities in pharmaceuticals. Limit tests for Arsenic, Chloride, Sulfate, Iron and Heavy metals.

**Identification tests** for cations and anions as per Indian Pharmacopoeia.

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

- 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 compounds marked with (\*) under theory.
  - i. Acid-Base titrations(at least 3)
  - ii. Redox titrations (one each of permanganometry and iodimetry).
  - iii. Precipitation titrations (at least 2)
  - iv. Complexometric titration (Calcium and Magnesium).

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

1. Indian pharmacopoeia.

## 1.3 PHARMACOGNOSY

### THEORY (75 Hours)

1. Definition, history and scope of Pharmacognosy including indigenous system of medicine.
2. Various systems of classification of drugs and natural origin.
3. Adulteration and drug evaluation; significance of pharmacopoeial standards.
4. Brief outline of occurrence, distribution, outline of isolation, identification tests, therapeutic effects and pharmaceutical application of alkaloids, terpenoids, glycosides, volatile oils, tannins and resins.
5. Occurrence, distribution, organoleptic evaluation, chemical constituents including tests wherever applicable and therapeutic efficacy of following categories of drugs.

- (a) **Laxatives**- Aloe, Rhubarb, Castor oil, Ispaghula, Senna.
- (b) **Cardiotonics**- Digitalis, Arjuna.
- (c) **Carminatives & G.I. regulators**- Umbelliferous fruits, Coriander, Fennel, Ajowan, Cardamom, Ginger, Black pepper, Asafoetida, Nutmeg, Cinnamon, Clove.
- (d) **Astringents**- Catechu.
- (e) **Drugs acting on nervous system**- Hyoscyamus, Belladonna, Aconite, Ashwagandha, Ephedra, Opium, Cannabis, Nux-vomica.
- (f) **Antihypertensive**- Rauwolfia.
- (g) **Antitussives**- Vasaka, Tolu balsam, Tulsi.
- (h) **Antirheumatics**- Guggal, Colchicum.
- (i) **Antitumour**- Vinca.
- (j) **Antileptotics**- Chaulmoogra oil.
- (k) **Antidiabetics**- Pterocarpus, Gymnema sylvestre.
- (l) **Diuretics**- Gokhru, Punarnava.
- (m) **Antidysenterics**- Ipecacuanha.
- (n) **Antiseptics and disinfectants**- Benzoin, Myrrh, Neem, 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, sandal wood.

**Pharmaceutical aids**-Honey, Arachis oil, starch, kaolin, pectin, olive oil. Lanolin, Beeswax, Acacia, Tragacanth, sodium Alginate, Agar, Guar gum, Gelatin.

**Miscellaneous**- Liquorice, Garlic, picrorhiza, Dirscorea, Linseed, shatavari, shankhpushpi, pyrethrum, Tobacco.

Collection and preparation of crude drugs for the market as exemplified by Ergot, opium, Rauwalfia, Digitalis, senna.

Study of source, preparation and identification of fibers used in sutures and surgical dressings-cotton, silk, wool and regenerated fibers.

Gross anatomical studies of-senna, Datura, cinnamon, cinchona, fennel, clove, Ginger, Nuxvomica & ipecacuanha.

### PRACTICAL (75 hours)

1. Identification of drugs by morphological characters. Physical and chemical tests for evaluation of drugs wherever applicable.
2. Gross anatomical studies(t.s.)of the following drugs :Senna, Datura, cinnamon, cinchona, coriander, fennel, clove, Ginger, Nux-vomica, Ipecacuanha.
3. Identification of fibers and surgical dressing.

## 1.4 BIOCHEMISTRY AND CLINICAL PATHOLOGY

### THEORY (50 Hours)

**Introduction to biochemistry.** Brief chemistry and role of proteins, polypeptides and amino acids, classification, Qualitative tests, Biological value, Deficiency diseases.

**Carbohydrates:** Brief chemistry and role of carbohydrates, classification, qualitative tests, Diseases related to carbohydrate metabolism.

**Lipids:** Brief chemistry and role of lipids, classification and qualitative tests. Diseases related to lipids metabolism.

**Vitamins:** Brief chemistry and role of vitamins and coenzymes. Role of minerals and water in life processes.

**Enzymes:** Brief concept of enzymatic action. factors affecting it.

**Therapeutics:** Introduction to pathology of blood and urine. Lymphocytes and platelets, their role in health and disease. Erythrocytes-Abnormal cells and their significance. Abnormal constituents of urine and their significance in diseases.

### **PRACTICAL (75 Hours)**

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, Bilirubin, SGPT, SGOT, calcium, Diastase, Lipase).
3. Examination of sputum and faeces (microscopic & staining).
4. Practice in injecting drugs by intramuscular, subcutaneous and intravenous routes, withdrawal of blood samples.

## **1.5 HUMAN ANATOMY AND PHYSIOLOGY**

### **THEORY(75 Hours)**

**Scope of Anatomy and physiology.** Definition of various terms used in Anatomy. Structure of cell, function of its components with special reference to mitochondria and microsomes.

**Elementary tissues:** Elementary tissues of the body, i.e. epithelial tissue, muscular tissue, connective tissue and nervous tissue.

**Skeletal System:** Structure and function of Skelton .Classification of joints and their function. Joint disorders.

**Cardiovascular System:** Composition of blood, functions of blood elements. Blood group and coagulation of blood. Brief information regarding disorders of blood. Name and functions of lymph glands. Structure and functions of various parts of the heart .Arterial and venous system with special reference to the names and positions of main arteries and veins. Blood pressure and its recording. Brief information about cardiovascular disorders.

**Respiratory system:** Various parts of respiratory system and their functions, physiology of respiration.

**Urinary System:** Various parts of urinary system and their functions, structure and functions of kidney. Physiology of urine formation. Patho-physiology of renal diseases and edema.

**Muscular System:** Structure of skeletal muscle, physiology of muscle contraction. Names, positions, attachments and functions of various skeletal muscles. physiology of neuromuscular junction.

**Central Nervous System:** Various parts of central nervous system, brain and its parts, functions and reflex action. Anatomy and physiology of automatic nervous system.

**Sensory Organs:** Elementary knowledge of structure and functions of the organs of taste, smell, ear, eye and skin. Physiology of pain.

**Digestive System:** names of various parts of digestive system and their functions. structure and functions of liver, physiology of digestion and absorption.

**Endocrine System:** Endocrine glands and Hormones. Location of glands, their hormones and functions. pituitary, thyroid. Adrenal and pancreas

**Reproductive system:** Physiology and Anatomy of Reproductive system.

### **PRACTICALS (50 hours)**

1. Study of the human Skelton.
2. Study with the help of charts and models of the following system and organs:  
Digestive system                      Respiratory system                      Ear  
Cardiovascular system                      Urinary system  
Reproductive system                      Eye
3. Microscopic examination of epithelial tissue, cardiac muscle, smooth muscle, skeletal muscle. Connective tissue and nervous tissues.
4. Examination of blood films for TLC.DLC and malarial parasite.
5. Determination of RBCs, clotting time of blood, erythrocyte sedimentation rate and Hemoglobin value.
6. Recording of body temperature, pulse, heart-rate, blood pressure and ECG.

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

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

**Concept of health:** Definition of physical health, mental health, social health, spiritual health determinants of health, indicatory of health, concept of disease, natural history of diseases, the disease agents, concept of prevention of diseases.

**Nutrition and health:** Classification of foods, requirements, diseases induced due to deficiency of proteins, vitamins and minerals-treatment and prevention.

**Demography and family planning:** Demography cycle, fertility, family planning, contraceptive methods, behavioral methods, natural family planning methods, chemical methods, mechanical methods, hormonal contraceptives, population problem of India.

**First aid:** Emergency treatment in shock, snake-bite, burns, poisoning, heart disease, fractures and resuscitation methods, Elements of minor surgery and dressings.

**Environment and health:** Source 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.

**Fundamental principles of microbiology:** Classification of microbes, isolation, staining techniques of organisms of common diseases.

**Communicable diseases:** Causative agents, mode of transmission and prevention. Respiratory infections-chicken pox, measles, influenza, diphtheria, whooping cough and tuberculosis.

**Intestinal infection-**poliomyelitis, Hepatitis, cholera, Typhoid, food poisoning, Hookworm infection.

**Arthropod borne infections-**plague, Malaria, filariases.

**Surface infection-**Rabies, Tranchoma, Tetanus, Leprosy.

**Sexually transmitted diseases-**Syphilis, Gonorrhoea, AIDS.

**Non-communicable diseases:** causative agents, prevention, care and control.

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