

**SYLLABUS****DIPLOMA IN PHARMACY (PART-I)****1.1 PHARMACEUTICS-I****Theory (75 hours)****UNIT I**

1. Introduction to different dosage forms, their classification with examples—their relative applications. Familiarization with new drug delivery systems.
2. Introduction to Pharmacopoeias with special reference to the Indian Pharmacopoeia.
3. 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.
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 closure-their merits and demerits. Introduction to aerosol packaging.

**UNIT II**

5. Size reduction—objectives 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 sifting. 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 homogeniser, planetary mixer; agitated powder mixer; triple roller mill; propeller mixer, colloid mill and hand homogenizer, double cone mixer.

**UNIT III**

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, filter candles, metafilter.

9. Extraction and galenicals—(a) Study of percolation and maceration and their modification, continuous hot extraction—applications 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.

#### **Unit-IV**

11. 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.
12. Introduction to drying processes—study of tray dryers, fluidized bed dryer, vacuum dryer and freeze dryer.
13. Sterilization—concept of sterilization and its differences from disinfection—thermal resistance of micro-organisms. Detailed study of the following sterilization processes.
  - (i) Sterilization with moist heat,
  - (ii) Dry heat sterilization,
  - (iii) Sterilization by radiation,
  - (iv) Sterilization by filtration and
  - (v) Gaseous sterilization.

Aseptic techniques, applications of sterilization processes in hospitals particularly with reference to surgical dressings and intravenous fluids. Precautions for safe and effective handling of sterilization equipment.

#### **UNIT V**

14. Processing of tablets—definition; different type 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. Tablet coating-sugar coating; film coating, enteric coating and microencapsulation (tablet coating may be dealt in an elementary manner).
15. Processing of capsules—hard and soft gelatin capsules; different sizes of capsules; filling of capsules; handling and storage of capsules. Special applications of capsules.
16. Study of immunological products like sera, vaccines, toxoids and their preparations.

**PRACTICAL (100 hours)**

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

S. No	Name of preparation	No. of practical
1.	Aromatic water	3
2.	Solutions	4
3.	Spirits	2
4.	Tinctures	4
5.	Extracts	2
6.	Creams	2
7.	Cosmetic preparations	3
8.	Capsules	2
9.	Tablets	2
10.	Preparations involving sterilization	2
11.	Ophthalmic preparations	2
12.	Preparations involving aseptic techniques	2

**Books Recommended : (Latest editions)**

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

**1.2 PHARMACEUTICAL CHEMISTRY -I****Theory (75 hours)**

## UNIT I

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\*, calcium hydroxide, hydrochloric acid, strong ammonium hydroxide, sodium hydroxide and official buffers.
  - (B) Antioxidants—hypophosphorous acids, sulphur dioxide, sodium bisulphite, sodium metabisulphite, sodium thiosulphate, nitrogen and sodium nitrite.
  - (C) Gastrointestinal agents—
    - (i) Acidifying agents—dilute hydrochloric acid.
    - (ii) Antacids—sodium bicarbonate, aluminium hydroxide gel, aluminium phosphate, calcium carbonate, magnesium carbonate, magnesium trisilicate, magnesium oxide, combinations of antacid preparations.
      - (iii) Protectives and adsorbents—bismuth subcarbonate and kaolin.
      - (iv) Saline cathartics—sodium potassium tartrate and magnesium sulphate.
  - (D) Topical agents—
    - (i) Protectives—talc, zinc oxide, calamine, zinc stearate, titanium dioxide, silicone polymers.
    - (ii) 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.
    - (iii) Sulphur and its compounds—sublimed sulphur, precipitated sulphur, selenium sulfide.
    - (iv) Astringents—alum and zinc sulphate.
  - (E) Dental products—sodium fluoride, stannous fluoride, calcium carbonate, sodium metaphosphate, dicalcium phosphate, strontium chloride, zinc chloride.
  - (F) Inhalants—oxygen, carbon dioxide, nitrous oxide.
  - (G) Respiratory stimulants—ammonium carbonate.
  - (H) Expectorants and emetics—ammonium chloride\*, potassium iodide, antimony potassium tartrate.

- (I) Antidotes—sodium nitrite.

## **UNIT II**

2. Major intra and extracellular electrolytes—
- (A) Electrolytes used for replacement therapy—sodium chloride and its preparations, potassium chloride and its preparations.
- (B) Physiological acid-base balance and electrolytes used—sodium acetate, potassium acetate, sodium bicarbonate injection, sodium citrate, potassium citrate, sodium lactate injection, ammonium chloride and its injection.
- (C) Combination of oral electrolyte powders and solutions.

## **UNIT III**

3. Inorganic official compounds of iron, iodine and calcium; ferrous sulfate and calcium gluconate.

## **UNIT IV**

4. Radio pharmaceuticals and contrast media—radioactivity—alpha; beta and gamma radiations, biological effects of radiations, measurement of radioactivity, G.M. counter; radio isotopes—their uses, storage and precautions with special reference to the official preparations. Radio opaque contrast media—barium sulfate.

## **UNIT V**

5. 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, chlorides, sulfates, iron and heavy metals.
6. 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 chlorides, sulfates, arsenic, iron and heavy metals.

3. Assay of inorganic pharmaceutical (involving each of the following methods) compounds 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)**

Indian Pharmacopoeia.

**1.3 PHARMACOGNOSY**

**Theory (75 hours)**

**UNIT I**

1. Definition, history and scope of pharmacognosy including indigenous system of medicine.
2. Various systems of classification of drugs of natural origin.
3. Adulteration and drug evaluation; significance of pharmacopoeial standards.

**UNIT II**

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

**UNIT III**

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—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 systems—hyoscyamus, belladonna, aconite, ashwagandha, ephedra, opium, cannabis, nux vomica.
- (f) Anithypertensives—rauwolfia.
- (g) Antitussives—vasaka, tolu balsam, tulsi.
- (h) Antirheumatics—guggal, colchicum.
- (i) Antitumour—vinca.
- (j) Antileprotics—chaulmoogra oil.
- (k) Antidiabetics—pterocarpus, gymnema sylvestro.
- (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 flavouring 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, picrohiza, dioscorea, linseed, shatavari, shankpushpi, pyrethrum, tobacco.

#### UNIT IV

- 6. Collection and preparation of crude drugs from the market as exemplified by ergot, opium, rauwolfia, digitalis, senna.

#### UNIT V

- 7. Study of source, 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 and ipecacuanha.

**PRACTICAL (75 hours)**

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, cinnamon, cinchona, coriander, fennel, clove, ginger, nuxvomica, ipecacuanha.
4. Identification of fibres and surgical dressings.

**1.4 BIOCHEMISTRY AND CLINICAL PATHOLOGY**

**Theory (50 hours)**

**UNIT I**

1. Introduction to biochemistry.

**UNIT II**

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. Diseases related to carbohydrate metabolism.
4. Brief chemistry and role of lipids, classification, qualitative tests. Diseases related to lipid metabolism.
5. Brief chemistry and role of vitamins and coenzymes.

**UNIT III**

6. Role of minerals and water in life processes.
7. Enzymes—brief concept of enzymatic action and factors affecting it, therapeutic and

pharmaceutical importance.

#### **UNIT IV**

8. Brief concept of normal and abnormal metabolism of proteins, carbohydrates and lipids.

#### **UNIT V**

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 (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)**

#### **UNIT I**

1. Scope of anatomy and physiology, definition of various terms used in anatomy. Definition of various terms used in Anatomy

**UNIT II**

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 and function of skeleton, classification of joints and their function, joint disorders.

**UNIT III**

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 names and positions of main arteries and veins, blood pressure and its recording, brief information about cardiovascular disorders.

**UNIT IV**

8. Various parts of respiratory system and their functions. Physiology of respiration.
9. Various parts of urinary system 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.

**UNIT V**

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 various parts of digestive system and their functions. Structure and functions of liver, physiology of digestion and absorption.

14. Endocrine glands and hormones. Locations of glands, their hormones and functions—  
pituitary, thyroid, adrenal and pancreas.
15. Reproductive system—physiology and anatomy of reproductive system.

**PRACTICAL (50 hours)**

1. Study of the human skeleton.
2. Study with the help of charts and models, of the following system 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 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 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 (50 hours)****UNIT I**

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.

**UNIT II**

3. Demography and family planning—demography cycle, fertility, family planning, contraceptive methods, behavioural methods, natural family planning methods, chemical methods, mechanical methods, hormonal contraceptives, population problem of India.
4. First aid—emergency treatment in shock, snake bite, burns, poisoning, heart disease, fractures and resuscitation methods. Elements of minor surgery and dressings.

**UNIT III**

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 common diseases.

**UNIT IV**

7. Communicable disease—causative agents, modes 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 infection.
  - (c) Arthropod borne infections—plague, malaria, filariasis.
  - (d) Surface infections—rabies, trachoma, tetanus, leprosy.
  - (e) Sexually transmitted diseases—syphilis, gonorrhoea, AIDS.

**UNIT V**

8. Non-communicable diseases—causative agents, prevention, care and control. Cancer, diabetes, blindness, cardiovascular diseases.
9. Epidemiology—scope, methods, uses, dynamics of disease transmission, immunity and immunisation, immunological products and their dose schedule. Principles of disease

control and prevention, hospital acquired infection, prevention and control. Disinfection, types of disinfection procedures, for faeces, urine, sputum, room linen, dead bodies and instruments.