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## 1. PHARMACEUTICS –I

### Theory (75 hours)

1. **Introduction of different dosage forms.** Their classification with examples-their relative applications. Familiarisation with new drug delivery systems.
2. Introduction to Pharmacopoeias with special reference to the Indian Pharmacopoeia.
3. **Metrology**–Systems of weights and measures. Calculations including conversion from one to another system. Percentage calculations and adjustments of products. Use of alligation method in calculations, Isotonic solutions.
4. **Packing of Pharmaceuticals**–Desirable features of a container–types of containers. Study of glass and plastics as materials for containers and rubber as material for closures-their merits and demerits. Introduction to aerosol packaging.
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 Standard for powders. Sedimentation methods of size separation. Construction and working of cyclone separator.
7. **Mixing and Homogenisation**–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 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, 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.
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 process.

- (i) Sterilization with moist heat,
- (ii) Dry heat sterilization,
- (iii) Sterilization by radiation,
- (iv) Sterilization by filtration and
- (v) Gaseous sterilization.

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

14. **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. 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 capsules; filling of capsules; handling and storage of capsules, Special applications of capsules.
16. **Study of immunological products** like sera vaccines, toxoids & their preparations.

► **PRACTICAL ≈ PHARMACEUTICS –I (100 Hours)**

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

1. Aromatic waters	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.

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**2. PHARMACEUTICAL CHEMISTRY -I**

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**Theory (75 hours)**

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 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 sulphide.
    - (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 nitrate.

**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.**

**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, 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.

**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, chloride, sulphate, Iron and Heavy metals.

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

► **PRACTICAL ≈ PHARMACEUTICAL CHEMISTRY –I (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.

- 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.

### 3. PHARMACOGNOSY

#### Theory (75 hours)

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.
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.
5. Occurrence, distribution, organoleptic evaluation, chemical constituents including tests wherever applicable and therapeutic efficacy of following categories of drugs.
  - (a) **Laxatives:** Aloes, Rhuburb, 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) **Antihypertensives**-Rauwolfia.
  - (g) **Antitussives**-Vasaka, Tolu balsam, Tulsi.
  - (h) **Antirheumatics**-Guggul, Colchicum.
  - (i) **Antitumour**-Vinca.
  - (j) **Antileprotics**-Chaulmoogra Oil.
  - (k) **Antidiabetics** -Pterocarpus, Gymnema, Sylvestro.
  - (l) **Diuretics**–Gokhru, Punarnava.
  - (m) **Antidysentrics**-Ipecacuanha.
  - (n) **Antiseptics and disinfectants**- Benzoin, Myrrh. Nim, curcuma.
  - (o) **Antimalarials**–Cinchona.
  - (p) **Oxytocics**-Ergot.

- (q) **Vitamines**-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, Picrorhiza, Dioscorea, Linseed, Shatavari, Shankhapusphi, Pyrethrum, Tobacco.
6. Collection and preparation of crude drug for the market as exemplified by Ergot, opium, Rauwolfia, Digitalis, Senna.
  7. Study of source, preparation and identification of fibres used in sutures and surgical dressings—cotton, silk, wool and regenerated fibre.
  8. Gross anatomical studies of Senna, Datura, Cinnamon, Cinchona, Fennel, Clove, Ginger, Nux vomica & Ipecacuanha.

► **PRACTICAL ≈ PHARMACOGNOSY (75 hours)**

1. Identification of drug 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.

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## **4 . BIOCHEMISTRY AND CLINICAL PATHOLOGY**

### **Theory (50 hours)**

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, Diseases related to carbohydrate metabolism.
4. Brief chemistry and role of **Lipids**, Classification, qualitative tests. Diseases related to lipids metabolism.
5. Brief chemistry and role of **Vitamins and Coenzymes**.
6. Role of minerals 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 ≈ BIOCHEMISTRY AND CLINICAL PATHOLOGY (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 and staining).
4. Practice in injecting drugs by intramuscular, subcutaneous and intravenous routes. Withdrawal of blood samples.

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## **5 HUMAN ANATOMY AND PHYSIOLOGY**

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

- 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 and 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 systems with special reference to the names and positions of main arteries and veins. Blood pressure and its recording. Brief information about cardiovascular disorders.
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, position, 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.** Locations of the glands, their hormones and functions. Pituitary, thyroid, Adrenal and Pancreas.
15. **Reproductive system** -Physiology and Anatomy of Reproductive system.



**► PRACTICAL ~ HUMAN ANATOMY AND PHYSIOLOGY (50 hours)**

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 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 Hemoglobin value.
6. Recording of body temperature, pulse, heart rate, blood pressure and ECG.

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## **6. HEALTH EDUCATION AND COMMUNITY PHARMACY**

### **Theory (50 hours)**

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, disease induced due to deficiency of proteins, Vitamins and minerals –treatment and prevention.
3. **Demography and family planning**—Demography cycle, fertility, family planning, contraceptive methods, behavioural methods, natural family planning method, chemical method, 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.
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.
7. **Communicable diseases** —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.
8. **Non –communicable 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 products and their dose schedule. Principles of disease control and prevention, hospital acquired infection, prevention and control. Disinfection, types of disinfection, disinfection procedures, for faeces, urine, sputum, room linen, dead –bodies, instruments.