

## **FIRST SEMESTER**

**BOP-111**

### **PHARMACEUTICAL CHEMISTRY-I (INORGANIC PHARMACEUTICAL CHEMISTRY)**

An outline of methods of preparation, tests of identification and special tests (if any), of the individually mentioned inorganic pharmaceuticals.

#### **Unit I**

Sources of impurities & their control. Limit tests for iron, arsenic, lead, heavy metals, chloride and sulphate.

**Pharmaceutical aids and necessities:** Pharmaceutically acceptable glass. Water (Purified water, Water for injection, Sterile water for injection). Acids and bases (Sodium hydroxide, Phosphoric acid).

#### **Unit II**

**Topical agents:** Protectives (Calamine, Titanium dioxide, Talc, Kaolin). Astringents (Zinc sulphate, Alums). Anti-infectives (Boric acid, Hydrogen peroxide, Iodine, Povidone-Iodine, Potassium permanganate, Silver nitrate).

**Dental products:** Dentifrices, anti-caries agents (Sodium fluoride).

**Gases and vapors:** Inhalants (Oxygen), anesthetics (Nitrous oxide).

#### **Unit III**

**Gastrointestinal agents:** Acidifying agents (Dilute hydrochloric acid). Antacids (Bismuth subcarbonate, Aluminium hydroxide, Calcium carbonate, Magnesium hydroxide, Magnesium oxide { light and heavy }, Magnesium carbonate { light and heavy }, Combination antacids. Cathartics (Disodium hydrogen phosphate, Magnesium sulphate). Protective and Adsorbents (Activated charcoal, Aluminium sulphate).

**Miscellaneous agents:** Expectorants (Ammonium chloride, Potassium iodide). Antioxidants (Sodium metabisulphite).

#### **Unit IV**

**Major intra and extracellular electrolytes:** Physiological ions, electrolytes used for replacement therapy (Sodium chloride, Potassium chloride, Calcium gluconate, Calcium lactate, Magnesium chloride), physiological acid-base balance (Sodium dihydrogen phosphate, Sodium acetate, Sodium bicarbonate), combination therapy including ORS.

**Essential and trace elements:** Iron and haematinics (Ferrous fumarate, Ferrous gluconate, Ferrous sulphate, Ferric ammonium citrate). Mineral supplements (Cu, Zn, Cr, Mn, I).

#### **Unit V**

**Inorganic radiopharmaceuticals:** Radioactivity, units of radioactivity and radiation dosimetry, measurement of radioactivity, hazards and precautions in handling of radiopharmaceuticals, clinical applications of radiopharmaceuticals.

**Co-ordination compounds and complexation:** Co-ordination theory, chelates and their pharmaceutical importance, poison antidotes (Sodium thiosulphate), novel applications of metals in pharmacy.

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**PHARMACEUTICAL CHEMISTRY-I  
(INORGANIC PHARMACEUTICAL CHEMISTRY) PRACTICAL**

**Suggested Practicals**

1. To perform limit test of chloride, sulphate, iron, heavy metal and arsenic in the given sample. Identification tests for acidic and basic radicals.
2. Preparation of following compounds- Boric acid, Magnesium sulphate, Heavy magnesium carbonate, Calcium Carbonate Alum, Zinc sulphate.

**BOOKS RECOMMENDED:**

1. Pharmacopoeia of India, 1996 Edition.
2. Block J.H., Roche E., Soine, T. and Wilson, C., Inorganic, Medicinal & Pharmaceutical Chemistry, Lea & Febiger.
3. Atherden L.M., Bentley and Driver's Text Book of Pharmaceutical Chemistry, Oxford University Press.
4. Miessler, G.L. and Tarr, D.A. Inorganic Chemistry, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
5. Svehla, G. and Sivasankar, B. Vogel's Qualitative Inorganic Analysis, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
6. Rao K.S. and Suresh, C.V. Pharmaceutical Inorganic Chemistry, PharmaMed Press.
7. Chenchu Lakshmi, N.V. Pharmaceutical Inorganic Chemistry: Theory and Practice, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).

**BOP-112**

**PHARMACEUTICS-I (GENERAL PHARMACY)**

**Unit I**

**History of pharmacy and Pharmacopoeia:** Origin & development of pharmacy, scope of pharmacy, introduction to Pharmacopoeias - IP, BP, USP & International Pharmacopoeia. Introduction to National Formularies and Extra Pharmacopoeia. Typical parts of a monograph of Indian pharmacopoeia. An introduction to contents of the IP.

**Unit II**

**Prescription:** Definition, types of prescription, handling of prescription, legality of prescription and specific Latin terms used in modern day prescription (sos, od, bd, tid, qid)

**Pharmaceutical additives:** Coloring, flavoring & sweetening agents, co-solvents, preservatives and their applications.

**Unit III**

**Pharmaceutical calculations:** Posology, calculation of doses for infants; Enlarging and reducing recipes, percentage solutions, alligation method, alcohol dilution, proof spirit, basic concept of isotonicity. Weights and measures, weighing of solids and measurement of liquids.

**Unit IV**

**Introduction to Pharmaceutical dosage forms:** Classification, formulation methods of powders, mixtures and syrups and elixirs.

**Definitions:** Solutions, spirits, infusions, paints, elixirs, mouth washes, gargles, lotions, liniments, pastes, ointments, creams, inhalations, dusting powders and lozenges.

**Unit V**

**Size Reduction:** Definition, principles and laws governing size reduction, factors affecting size reduction. Study of hammer mill, ball mill and fluid energy mill. Introduction to sieving methods, laws and factors affecting energy requirements for size reduction, different methods of size reduction.

**Mixing:** Theory of mixing, solid-solid, solid-liquid & liquid-liquid mixing equipments.

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**PHARMACEUTICS-I (GENERAL PHARMACY) PRACTICAL**

**Suggested Practicals**

**I:** Preparation of following classes of Pharmaceutical dosage forms (involving the use of calculations in metrology) as official in IP, BP, USP/NF.

a) Aromatic Waters

1. Chloroform Water BP
2. Concentrated Peppermint Water BP
3. Rose Water NF

b) Mixtures

1. Chalk Mixture, Paediatric BP
2. Light Magnesium Carbonate and Kaolin Mixture

c) Syrups

1. Simple Syrup BP/USP/IP

2. Ferrous Sulphate Syrup USP

d) Powders

1. ORS Powder IP
2. Absorbable Dusting Powder USP/N
3. Effervescent Compound Powder (BPC)

**II. Study of the role of pharmaceutical additives in formulations**

- a. Colouring agent: 1. Compound Sodium Chloride Mouthwash BP  
2. Phenol Gargle BPC
- b. Flavouring agent: 1. Orange Tincture IP  
2. Potassium Citrate Mixture BP
- c. Sweetening agents: 1. Simple Elixir IP
- d. Cosolvents: 1. Camphor Water IP  
2. Compound Iodine Throat Paint IP(Mandl's Paint)
- e. Preservatives: 1. Zinc Sulphate and Zinc Chloride Mouthwash BPC  
2. Calamine Lotion
- f. Surfactants: 1. Cresol with Soap Solution IP  
2. Turpentine Liniment BP

**III:** Experiments to illustrate principles of size reduction using Ball Mill.  
Effect of size of balls, number of balls and time on the efficiency of ball mill.

**IV:** Experiments to illustrate mixing efficiency. Solid-Solid mixing.

**BOOKS RECOMMENDED:**

1. Pharmacopoeia of India, The Controller of Publications, Delhi.
2. British Pharmacopoeia, Her Majesty's Stationary Office, University Press, Cambridge.
3. Carter S.J., "Cooper and Gunn's Tutorial Pharmacy, CBS Publishers, Delhi.
4. Rawlins E.A., Bentley's Text Book of Pharmaceutics, ELBS Bailliere Tyndall.
5. Lachman L, Liberman H.A and Kanig J.L., Theory and Practice of Industrial Pharmacy, Lea & Febiger.
6. Cooper and Gunn's Dispensing for Pharmaceutical Students, CBS Publishers, New Delhi.
7. Aulton M.E, Text Book of Pharmaceutics, Vol., I & II. Churchill Livingstone.
8. United States Pharmacopoeia (National Formulary).
9. Remington, The Science and Practice of Pharmacy Vol. I & II. Mack Publishing Co., Pennsylvania.
10. Jain N.K., Modern Dispensing Pharmacy, 2nd Ed

**BOP-113**

## **ANATOMY, PHYSIOLOGY & PATHOPHYSIOLOGY- I**

### **Unit I**

Introduction to human body and organization of human body.

Functional and structural characteristics of cell.

Detailed structure of cell membrane and physiology of transport process.

Structural and functional characteristics of tissues- epithelial, connective, muscle and nerve.

### **Unit II**

**Skeletal system:** Structure, composition and functions of skeleton. Classification of joints, types of movements of joints.

**Muscular system:** Anatomy & physiology of skeletal and smooth muscle, energy metabolism, types of muscle contraction, muscle tone.

### **Unit III**

Demography and family planning, medical termination of pregnancy.

**First aid:** Emergency treatment of shock, snake bites, burns, poisoning, fractures and resuscitation methods

### **IV**

**Sense organs:** Basic anatomy and physiology of the eye (vision), ear (hearing), taste buds, nose (smell), and skin (superficial receptors).

### **Unit V**

**Communicable diseases:** Brief outline, their causative agents, modes of transmission and prevention (Chicken pox, measles, influenza, diphtheria, whooping cough, tuberculosis, poliomyelitis, helminthiasis, malaria, filariasis, rabies, trachoma, tetanus, leprosy).

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**ANATOMY, PHYSIOLOGY & PATHOPHYSIOLOGY -I PROJECT**

**Suggested Practicals**

1. Preparation of charts/ models of the following :
  - A. Joints,
  - B. Sense organs (eye, ear, taste buds, skin, nose)
  - C. Resuscitation methods
  - D. Malaria life cycle
  - E. Neurotransmission
  - F. Structure of cell
  - G. Transport across cell membrane
  - H. Mechanism of muscle contraction
  - I. Human Skeleton
  - J. Structure of neuron
2. Preparation of charts/ models on selected topics from the course content.

**BOOKS RECOMMENDED:**

1. Marieb E.N. Human Anatomy and Physiology, Benjamin Cummings (Pearson Education Inc.).
2. Park K., Preventive and Social Medicine, Banarsidas Bhanot.
3. Seeley R.R., Stephens T.D. and Tate P. Essentials of Anatomy and Physiology, McGraw-Hill.
4. Tortora G.J, and Anagnostikos NP Principles of Anatomy and Physiology, Harper & Row Publishers, New Delhi.
5. Ross & Wilson Anatomy and Physiology in Health and Illness, Churchill Livingstone.
6. Chatterjee C.C. Human Physiology, Medical Allied Agency, Calcutta.
7. Parmar N.S. Health Education and Community Pharmacy, CBS Publishers, Delhi.
8. Keele, C.A., Niel, E and Joels N, Samson Wright's Applied Physiology, Oxford University Press.
9. Dandiya, P.C., Zafer, Z.Y.K., and Zafer, A. Health Education and Community Pharmacy, Vallabh Prakashan.

**BOP-114**

**PHARMACEUTICAL ANALYSIS-I**

**Unit I**

Significance of quantitative analysis in quality control different techniques of analysis, preliminaries and definitions, precision and accuracy. Fundamentals of volumetric analysis, methods of expressing concentration, primary and secondary standards.

**Unit II**

**Acid base titrations:** Acid base concepts, role of solvent, relative strengths of acids and bases, ionization, law of mass action, common-ion effect, ionic product of water, pH, hydrolysis of salts, Henderson- Hasselbach equation, buffer solution, neutralization curves, acid base indicators, theory of indicators, choice of indicators, mixed indicators, polyprotic system.

**Unit III**

**Oxidation reduction titrations:** Concepts of oxidation and reduction, redox reactions, strengths and equivalent weights of oxidizing and reducing agents, theory of redox titrations, redox indicators, oxidation reduction curves, iodimetry and iodometry, titrations involving ceric sulphate, potassium iodate, potassium bromate, potassium permanganate.

**Unit IV**

**Precipitation titrations:** Precipitation reactions, solubility products, effect of acids, temperature and solvent upon the solubility of precipitate. Argentometric titrations and titrations involving ammonium or potassium thiocyanate, mercuric nitrate indicators, Gaylussac method, Mohr's method, Volhard's method and Fajan's method.

**Unit V**

**Gravimetric analysis:** Precipitation techniques, solubility products, the colloidal state, supersaturation, coprecipitation, post-precipitation, digestion, washing of the precipitate, filtration, filter papers and crucibles, Ignition, thermogravimetric curves, specific examples like barium as barium sulphate, aluminium as aluminium oxide, organic precipitants.

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**PHARMACEUTICAL ANALYSIS- I PRACTICAL**

The students should be introduced to the main analytical tools through demonstration. They should have a clear understanding of a typical analytical balance, the requirements of a good balance, weights, care & use of balance, methods of weighing, and errors in weighing. The students should also be acquainted with the general apparatus requiring various analytical procedures.

1. Standardization of analytical weights and calibration of volumetric apparatus.
2. Acid Base Titrations: Preparation and standardization of acids and bases, some exercises related with determination of acids and bases separately or in mixture form, some official assay procedures, e.g. boric acid, should also be covered.
3. Oxidation Reduction Titrations: Preparation & standardization of some redox titrants e.g. potassium permanganate, potassium dichromate, iodine, sodium thiosulphate etc. Some exercises related to determinations of oxidizing & reducing agents. Exercises involving potassium iodate, potassium bromate, iodine solution and ceric ammonium sulphate.
4. Precipitation Titrations: Preparation and standardization of titrants like silver nitrate and Ammonium thiocyanate, titrations according to Mohr's, Volhard's and Fajan's methods.
5. Gravimetric Analysis: Preparation of Gooch crucible for filtration and use of sintered glass crucible.

Determination of water of hydration, some exercise related to gravimetric analysis should be covered.

**BOOKS RECOMMENDED:**

1. Mendham J., Denney R.C., Barnes J.D., Thomas M, Jeffery G.H., Vogel's Textbook of Quantitative Chemical Analysis, Pearson Education Asia.
2. Connors K.A., A Text book of Pharmaceutical Analysis , Wiley Inter-science.
3. Beckett A.H., and Stenlake J.B., Practical Pharmaceutical Chemistry, Vol. I&II. The Atherden Press of the University of London.
4. British Pharmacopoeia, Her Majesty's Stationary Office, University Press, Cambridge.
5. Alexeyev V. Quantitative Analysis. CBS Publishers & Distributors.
6. The Pharmacopoeia of India.



**BOP-115**

## **COMPUTER FUNDAMENTALS**

### **Unit I**

Definition and overview of computer, computer classification, computer organization, computer code, input devices, output devices, storage devices. Computer software, types of software.

Overview of computer networks, LAN, MAN, WAN. Internet, network topology.

Internetworking: Bridges, repeaters and routers.

### **Unit II**

**Introduction:** Operating system and function, evolution of operating system, batch, interactive, time sharing and real time system. Single user operating system and multi-user operating system.

Basics in MS-DOS, internal and external commands in MS-DOS.

### **Unit III**

Introduction to MS-OFFICE-2007, word 2007 document creation, editing, formatting table handling, mail merge. Excel-2007, editing, working retrieval, important functions, short cut keys used in EXCEL.

### **Unit IV**

MS-Power point 2007-Job Profile, elements of Power point , ways of delivering presentation, concept of Four P's (planning, preparation, practice and presentation) ways of handling presentations e.g. creating, saving slides show controls, adding formatting, animation and multimedia effects. Database system concepts, data models schema and instance , database language. Introduction to MS-Access 2007, main components of access tables, queries, reports, forms table handling, working on query and use of database.

### **Unit V**

Computer applications in pharmaceutical and clinical studies, uses of internet in pharmaceutical industry.

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**COMPUTER FUNDAMENTALS PRACTICAL**

**Suggested Practicals**

Software Lab to be used for the following:-

1. Windows, Managing Windows, Working with Disk, Folders and files.
2. MS-Office 2003 (MS Word, MS Power point, MS Excel, MS Access).
3. Computer Operating System like DOS and Windows.
4. Internet Features (E-mail, Browser etc.).

**BOOKS RECOMMENDED:**

1. Sinha R.K., Computer Fundamentals, BPB Publications.
2. Raja Raman V., Computer Programming in 'C', PHI Publication.
3. Hunt N and Shelley J., Computers and Common Sense, Prentice Hall of India.
4. Tiwari, N.K., Computer fundamentals with Pharmacy Applications.
5. Rao G.N., Biostatistics and Computer Applications.
6. Mansfield R., Working in Microsoft Office, Tata McGraw-Hill Publishing Company Ltd.
7. Leon M. and Leon A., Fundamentals of Computer Science and Communication Engineering", UBS Publishers Distributors Ltd.
8. Norton, P. Peter Norton's Introduction to Computers, Tata McGraw-Hill.