M.Sc. Pharmaceutical Chemistry: Semester – II
[Choice Based Credit System]

[Credit 4]

MPC-201: PRINCIPLES OF INORGANIC PHARMACEUTICAL CHEMISTRY -II

UNIT –I: Impurities in Pharmaceutical Substances and their tests

- **a)** Sources of Impurities in Pharmaceutical Chemicals
- **b)** Effects of Impurities
- **c)** Permissible Impurities in Pharmaceutical Substances
- **d)** Methods Used to Purify Inorganic Substances
- **e)** Tests of Purity
- **f)** Limit Test of Chloride, Sulphate, Arsenic, Iron, Lead,

UNIT –II Synthesis, Properties and Uses of Inorganic Compounds of Pharmaceutical Importance

- **a) Topical Drugs :** Dusting Powders, Lubricants, Astringents
- **b) Gastro-Intestinal Drugs:** Antacid, Digestants, Emetics, Adsorbents
- **c) Respiratory Drugs:** Expectorants and Antitussives

UNIT –III: Radiopharmaceuticals

Introduction,Basic Properties, Production of radioisotopes , Quality Control, Stability, Clinical and Medicinal Applications of Radio Isotopes used in Pharmacy, Radioactive pharmaceutical preparations and uses-

1) Sodium iodide I^{131} Capsules
2) Ferric citrate Fe^{59}
3) Sodium phosphate P^{32}
4) Iodine ^{131} & Iodine ^{125}

UNIT –IV: Calcium and Iron Compounds as Pharmaceutical Agents

Role of Calcium in Body, Deficiency Disorder of Calcium, Preparation, Properties and Uses of Calcium Acetate, Calcium Carbonate, Calcium Chloride, Calcium Gluconate, Calcium Hydroxide, Calcium Lactate. Importance of Iron in Human Body, Deficiency Disorder of Iron, Preparation, Properties and Uses of Ferric Ammonium Citrate, Ferrous Fumarate, Ferrous Gluconate, Ferrous Succinate & Ferrous Sulphate.

UNIT- V: Pharmaceutical Aids (Preparation Properties & uses of comp. of following catagories)

a) Absorbents and Adsorbents, **b)** Antioxidant and Preservatives, **c)** Excipients, **d)** Suspending Agents, **e)** Filter Aids, **f)** Colourants, **g)** Tonicity Adjusting Agent, **h)** Colouring, Flavouring and Sweetening agent, **i)** Ointment and Suppository Bases, **j)** Diluents, Binders, Disintegrating Agents, and Lubricants.

Books Suggested

1. A Text Book of Inorganic Medicinal Chemistry , Surendra N Pandya, S.G. Publisher, Varanasi
2. Pharmaceutical Chemistry Inorganic II , G. R. Chatwal, Himalaya Publishing House
3. A Text Book of Inorganic Pharmaceutical Medicinal Chemistry, Quardy & Quardy
4. Text Book of Pharmaceutical Chemistry, Bentley & Driver, Oxford University Press, New Delhi.

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[Credit 4]

MPC-202: PRINCIPLES OF ORGANIC PHARMACEUTICAL CHEMISTRY-II

UNIT –I:

a) **Classification of the Drugs on the Basis of :**
   (i) Chemical Structure (ii) Therapeutic Action (at least one examples of each class)
b) **Drug Receptors:**
   (i) Classification of Receptors (ii) Structure and Nature of Receptors
   (iii) Receptor Theories (iv) Mechanism of Receptors

UNIT –II:

a) **Physico Chemical Properties in Relation to Biological Action :** Study of properties Like Ionization, Partition Coefficients, Acid Base Properties, Hydrogen Bonding and Stereochemistry.

b) Factor Affecting Drug Absorption, Distribution, Metabolism and Elimination, Pathway of Metabolism.

UNIT –III: Reagents in Organic Synthesis:

Preparation and Uses of Complex Metal Hydride – Lithium Aluminium Hydride, Lithium diisopropylamide, Osmium Tetra Oxide, Dicyclo hexyl carbodiisomide, 1-3, Dithiane, Phase Transfer Catalysis, Raney Nickel, Lead Tetra Acetate,Periodic Acid, Diazomethane & Ozone.

UNIT –IV: Heterocyclic Compounds:

Synthesis, Reactivity, Chemical Properties, Applications and Biological Significance of Following Heterocyclic Compounds :

a) Mono Hetero atoms systems : Indole, Quinoline, Isoquinoline,
b) Multi Hetero atoms systems : Diazole- Pyrazole, Imidazole, Oxazole,

UNIT –V: Addition to Carbon Hetero Multiple Bonds

Mechanism of Metal Hydride Reduction of Saturate and Unsaturated Carbonyl Compounds-Acid Ester and Nitriles. Addition reactions of Grignard Reagents, Organozinc and Organolithium reagent to carbonyl and unsaturated carbonyl compounds. Mechanism of Condensation Reaction Involving Enolates – Aldol, Knoevenagel, Claisen, Mannich, Benzoin, Perkin and Stobbe Reactions, Hydrolysis of Esters and amides.

Books Suggested

1. Advanced Organic Chemistry-Reactions, Mechanism and Structure, Jerry March, John Wiley.
2. Advanced Organic Chemistry, F.A. Carey and R.J. Sunderg, Plenum.
3. A Guide Book to Mechanism in Organic Chemistry, Peter Sykes, Longman.
4. Structure and Mechanism in Organic Chemistry, C.K. Ingold, Comell University Press.
5. Organic Chemistry, R.T. Morrison and R.N. Boyd, Prentice-Hall.
6. Modern Organic Reactions, H.O. House, Benjamin.
7. Principles of Organic Synthesis, R.O.C. Norman and J.M. Coxon, Blackie Academic &* Professionals.
8. Pericyclic Reactions, S.M. Mukherji, Macmillan, India
9. Medicinal Chemistry, Wilson & Gisvold.
10. An introduction to Medicinal Chemistry Patrick, Graham.
11. Text Book of Organic Medicinal & Pharmaceutical Chemistry, Wilson & Grisvold, Lippincott Williams & Wilkins.

M.Sc. Pharmaceutical Chemistry: Semester – II
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[Credit 4]

MPC-203 : PRINCIPLES OF PHYSICAL PHARMACY – II

UNIT –I: Rheology:
Introduction, Newtonian Systems, Non-Newtonian Systems, Thixotropy, Determination of Rheological Properties, Viscoelasticity, Psychorheology, Applications to Pharmacy.

UNIT –II: Coarse Dispersions:
Suspensions, Interfacial Properties of Suspended Particles, Formulation of Suspensions & Emulsions, Theories of Emulsification, Physical Stability of Emulsions, Preservation of Emulsions, Rheologic Properties of Emulsions Microemulsions, Semisolids, Drug Kinetics in Coarse Disperse Systems, Drug Diffusion in Coarse Disperse Systems.

UNIT –III: Drug Product Design:

(A) Prodrug and Drug Carriers: Prodrug Liposomes, Monolithic and reservoir devices (microcapsules, Nano capsules and nanoparticles)

(B) Routes of administration: Ocular administration, Nasal administration, Buccal administration, pulmonary administration, Gastrointestinal administration, Rectal administration, Transdermal administration.

UNIT –IV: Polymer Science
Historical Background, Pharmaceutical Applications of Polymers, Definitions, Molecular Weight Determination from Solution Viscocity, Conformation of Dissolved Linear Macromolecules, Polymers as Thickening Agents, Polymer Solution-Overview, Solvent Selection, Preparing Polymer Solutions.

UNIT –V:
Thermodynamics of Polymer Solutions, Phase Separation, Gel Formation, Coacervation and Microencapsulation, Polymers in the solid state-Overview, Mechanical Properties, Interchain Cohesive Forces, Crystallinity, Tacticity, Morphology, Orientation, Thermodynamics of Fusion and Crystallization, Glass-Rubber Transition, Plasticization, Elastomers, Fabrication Technology, Future Trends in Pharmaceutical and Other Biomedical Uses of Polymers.

Books Suggested

1. Physical Chemistry, P.W. Atkins, ELBS Publication.
2. Physical Pharmacy: Physical Chemical Principles in the Pharmaceutical science Martin, Pilar Bustamante, A.H.C. Chun , Lippincott Williams & Wilkins
3. Micelles, Theoretical and Applied Aspects, V. Moraoi, Plenum Publication.
4. Introduction to Polymer Science, V.R. Gowarikar, N.V. Vishwanathan and J. Sridhar, Wiley Eastern.
5. Essentials of Physical Pharmacy, Sunjiv Aggarwal, Anmol Publication
6. Physical Pharmacy , David Attwood, Alexender T. Florence, Pharmaceutical Press

M.Sc. Pharmaceutical Chemistry : Semester – II
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[Credit 4]

MPC-204 : PHARMACEUTICAL ANALYSIS - II

UNIT –I: Chromatographic Method

Introduction of Chromatography ,Classification of chromatography.

Principles, technique and Applications of Thin Layer Chromatography, Column Chromatography ,Paper Chromatography, Gas-Liquid Chromatography in Pharmaceutical Analysis.

UNIT –II:

Principle, Techniques and Applications of High Performance Liquid Chromatography (HPLC), Ion Exchange Chromatography, Size Exclusion or Gel Chromatography.

UNIT –III: Solvent Extraction

Principle of Liquid-Liquid Extraction and Solid-Liquid Extraction, Distribution Law, Factor Favouring Solvent Extraction, Sequences of the Extraction Process, Extraction Techniques – Batch Extraction, Stripping Extraction, Continuous Extraction and Soxhlet Extraction, Important Applications of Liquid-Liquid Extraction.

UNIT –IV: Titrimetry and Gravimetry

Introduction , Apparatus and experimental technique of graviametric analysis, Introduction of titrimetric method,Determination of Dissolved Oxygen (DO), Biological Oxygen Demand (BOD), Chemical Oxygen Demand (COD), Arsenic, Cadmium, Calcium and Magnesium by Titrimetric and Gravimetric Methods.

UNIT –V: Naphelometry and Turbidimetry

Theory of Naphelometry and Turbidimetry, Instrumentation - Single and Double Beam. Factors Affecting Measurements, Applications of Turbidimetry and Naphelometry.

Books Suggested

1. Pharmaceutical analysis Parimoo, CBS Publisher.
2. Pharmaceutical Analysis theory and practice Kamboj,P.C., Vallabh Publication.
3. A T.B. of Pharmaceutical Analysis I Rao, G. Devala, Birla Publication .
4. A T.B. of Pharmaceutical Analysis II Rao, G. Devala, Birla Publication
5. Pharmaceutical Analysis, Ashutosh Kar, CBS Publisher
6. Pharmaceutical Analysis Practical Sheorey, Sonal, Hanrao, Career Publications
7. Environmental Chemistry,A.K. De, wiley Eastern.
8. Instrumental Methods of Chemical Analysis, G.W. Ewing, McGraw Hill Book Company
9. Fundamental of Analytical Chemistry, Douglas A. Skoog, Donald M. West, F. James Holler , Ceneage Learning India Pvt Ltd.

M.Sc. Pharmaceutical Chemistry
SEMESTER-II

[Choice Based Credit System]

[Credit 3]

LAB COURSE –I

Duration of Exam : 6 Hrs.

Maximum Marks : 75 **Minimum Marks:30**

(i)	Volumetric Assay	20 **Marks**
(i)	Gravimetric Assay	20 **Marks**
(ii)	Chromatography	18 **Marks**
(iv)	Practical Record	07 **Marks**
(v)	Viva	10 **Marks**

(I) Volumetric Assay 20 **Marks**

(a) Assay of Ampicilline (b) Assay of Aspirin
(c) Assay of Aluminium Hydroxide (d) Assay of Magnesium Sulphate
(e) Assay of Lithium Carbonate.

(II) Gravimetric Assay 20 **Marks**

(a) Assay of Sodium Sulphate (ppt. of $BaSO_4$)

(III) Chromatography 18 **Marks**

(a) Separation of Paracetamol and Ibuprofen by TLC.
(b) Separation of Vitamins by TLC.
(c) Separation of α-amino acid by Paper Chromatography

(iv) Practical Record 07 **Marks**

(v) Viva 10 **Marks**

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SEMESTER-II

LAB COURSE –II
[Choice Based Credit System]

[Credit 3]

Duration of Exam : 6 Hrs.

Maximum Marks : 75 **Minimum Marks:30**

(i)	Quantitative Analysis	20 **Marks**
(ii)	Physical Pharmacy	20 **Marks**
(iii)	Physical parameters of Tablets	20 **Marks**
(iv)	Practical Record	07 **Marks**
(v)	Viva	10 **Marks**

(I) Quantitative Analysis **20 Marks**

(a) Potentiometric Analysis of Sulphanilamide by titration with $NaNO_2$
(b) Conductmetric Analysis of Chlorides in Drugs.
(c) Determination of COD (Chemical Oxygen Demand) of Water sample.
(d) Estimation of Phenols using bromate bromide solution/ or Acetylation Method.
(e) Estimation of Glucose by fehlings solution Method.
(f) Conductmetric Analysis of basicity of Sodium potassium Tartrate.

(II) Physical Pharmacy **20 Marks**

(a) Determination of Heat of Ionization of Acetic Acid.
(b) Investigate the auto Catalytic reaction between $KMnO_4$ and Oxalic Acid.
(c) Investigate the adsorption of oxalic acid by activated charcoal and test validity of Freundlich and Lanmuir, isotherms.
(d) To construct phase diagram for three component system (e.g Chloroform-Acetic Acid-Water).
(e) Determination of Partition Coefficient of Iodine in CCl_4 and water.

(III) Physical parameters of Tablets **18 Marks**

(a) Hardness (b) Friability
(c) Disintegration Test of Coated and Uncoated Tablets and Capsules.
(d) Dissolution Test of Coated and Uncoated Tablets and Capsules.

(iv) Practical Record **07 Marks**

(v) Viva **10 Marks**

Books Suggested

1. Vogel's Textbook of Quantitative Analysis, revised, J. Bassett, R.C. Denney, G.H. Jeffery and J. Mendham, ELBS.
2. Vogel's Textbook of Practical Organic Chemistry, A.R. Tatchell, John Wiley.
3. Practical Physical Chemistry, A.M. James and F.E. Prichard, Longman.
4. Findley's Practical Physical chemistry, B.P. Levitt, Longman.
5. Experimental Physical Chemistry, R.C. Das and B. Behera, Tata McGraw Hill.
6. Text Book of Quantitative Chemical Analysis, Vogel, Pearson Education.
7. Practical Pharmaceutical Chemistry, Beckett & Stenlake Vol.-II, CBS Publishers & Distribution.