फार्मास्युटिकल केमेस्ट्री द्वितीय सेमेस्टर

प्रथम	Principles of Inorganic Pharmaceutical Chemistry -II	85	15	28	05
द्वितीय	Principles of Organic Pharmaceutical Chemistry-II	85	15	28	05
तृतीय	- Principles of Physical Pharmacy-II	85	15	28	05
चतुर्थ	Pharmaceutical Analysis-II	85	15	28	05
पंचम	Computer For Pharmaceutical Chemistry	85	15	28	05
	Practical :- 1- Laboratory Course -I 2- Laboratory Course -II	50 50	–		

M.Sc. Pharmaceutical Chemistry: Semester – II

MPC-201: PRINCIPLES OF INORGANIC PHARMACEUTICAL CHEMISTRY

Max Marks: ~~35~~ 85 **Min Passing Marks:** ~~12~~ 28

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

Basic Properties, Production, Quality Control, Stability, Clinical and Medicinal Applications of Radio Isotopes used in Pharmacy and Medicinal preparations of Diagnostic and Therapeutic Agents.

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

a) Absorbents and Adsorbents, **b)** Antioxident 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 Medicical Chemistry, Quardy & Quardy
4. Text Book of Pharmaceutical Chemistry, Bentley & Driver, Oxford University Press, New Delhi.

M.Sc. Pharmaceutical Chemistry: Semester – II

MPC-202: PRINCIPLES OF ORGANIC PHARMACEUTICAL CHEMISTRY

Max Marks: 85 **Min Passing Marks: 12** 28

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 :**
   (i) Factor Affecting Drug Absorption, Distribution, Metabolism and Elimination
   (ii) Study of properties Like Ionization, Partition Coefficients, Acid Base Properties, Hydrogen Bonding and Stereochemistry,

b) **Drug Metabolism :**
   Metabolic Changes of Drugs in the body, Factor Affecting Metabolism, Pathway of Metabolism.

UNIT –III: **Reagents in Organic Synthesis :**

Preparation and Uses of Complex Metal Hydride – Lithium Aluminium Hydride, Gilmen's Reagents, Lithium diisopropylamide, Osmium Tetra Oxide, Dicyclohexylcarbodiisomide, 1-3, Dithiane, Phase Transfer Catalysis, Wilkinson's Catalyst, 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 of Grignard Reagents, Organozinc and Organolithium reagents to carbonyl and unsaturated carbonyl compounds. Mechanism of Condensation Reaction Involving Enolates – Aldol, Knoevenagel, Claisen, Mannish, Benzoin, Perkin and Stobbe Reactions, Hydrolysis of Esters and amides, Ammonolysis of Esters.

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.

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M.Sc. Pharmaceutical Chemistry: Semester -- II

MPC-203 : PRINCIPLES OF PHYSICAL PHARMACY

Max Marks: ~~35~~ 85 Marks: ~~12~~ 28

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

MPC-204 : PHARMACEUTICAL ANALYSIS

Max Marks: ~~35~~ 85 **Min Passing Marks:** ~~12~~ 28

UNIT –I: Chromatographic Method
Principles, Techniques and Applications of Thin Layer Chromatography, Column Chromatography, Gas-Liquid Chromatography in Pharmaceutical Analysis.

UNIT –II:
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 Soxhelt Extraction, Important Applications of Liquid-Liquid Extraction.

UNIT –IV: Titrimetry and Gravimetry
Determination of Dissolved Oxygen (DO), Biological Oxygen Demand (BOD), Chemical Oxygen Demand (COD), Arsenic, Cadmium, Lead, Mercury, 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.

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M.Sc. Pharmaceutical Chemistry: Semester – II

MPC-205 : COMPUTER FOR PHARMACEUTICAL CHEMISTRY

Max Marks: ~~35~~ 85 **Min Passing Marks: ~~12~~** 28

Unit-I: Introduction to computers and Computing

Basic structure and functioning of computer with a PC as illustrative example. Memory I/O devices. Secondary storage Computer languages. Operating systems with DOS as an example Introduction to UNIX and WINDOWS. Principles of programming Alogrithms and flow-charts.

Unit-II: Computer Programming in FORTRAN/C/BASIC

Elements of the computer language. Constants and variables. Operations and symbols Expressions. Arithmetic assignment statement. Input and output Format statement. Termination statements. Branching statements as IF or GO TO statement. LOGICAL variables. Double precession variables. Subscripted variables and DIMENSION. DO statement FUNCTION AND SUBROUTINE. COMMON and DATA statement.

Unit-III: Programming in Pharmaceutical Chemistry

Developing of small computer codes involving simple formula in pharmaceutical chemistry such as Van der Waals equation, Chemical kinetics (determination of Rate constants) Radioactive decay (Half Life and Average Life). Determination of Normality, Molarity and Molality of solutions.

Unit-IV: Use of Computer Programmes

Operation of PC. Data Processing, Running of standard Programs and Packages such as MS WORD, MS EXCEL -special emphasis on calculations and chart formations.MS-POWER POINT, X-Y plot. Simpson's Numerical Integration method. Programmes with data preferably from physical pharmacy laboratory.

Unit V: Internet

Application of Internet for Pharmaceutical Chemistry with search engines, various types of files like PDF, JPG, RTF and Bitmap. Scanning, OMR, Web camera.

Book Suggested:

1. Fundamentals of Computer : V. Rajaraman , Prentice Hall Publ.
2. Computers in Chemistry : K.V. Raman , Tata Mc Graw Hill Publ.
3. Computer Programming in FORTRAN IV-V Rajaraman , Prentice Hall Publ.
4. Computers in Pharmacy, Rakesh Gupta, Anmol Publ.
5. Coputer Fundamentals with pharmacy Applications, n.k. Tiwari,SB. Publication.

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M.Sc. Pharmaceutical Chemistry

SEMESTER-II

LAB COURSE –I

Maximum Marks : 50 **Duration of Exam : 8 Hrs.**

(i)	Volumetric Assay	12
(ii)	Gravimetric Assay	12
(iii)	Chromatography	12
(iv)	~~Dairy~~ Diary	6
(v)	Viva	8

LAB COURSE –II

Maximum Marks : 50 **Duration of Exam : 8 Hrs.**

(i)	Quantitative Analysis	12
(ii)	Physical Pharmacy	12
(iii)	Physical parameters of Tablets	12
(iv)	~~Dairy~~ Diary	6
(v)	Viva	8

LAB COURSE –I

Maximum Marks : 50

(I) Volumetric Assay 12

(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 12

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

(III) Chromatography 12

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

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LAB COURSE –II

Maximum Marks : 50

(I) **Quantitative Analysis** 12

(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.

(II) **Physical Pharmacy** 12

(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).

(III) **Physical parameters of Tablets** 12

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

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.

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