

Singhania University

Syllabus For M. Pharm in Pharmacology

Effective from Session

2008-2009

SEMESTER-I

Consist of four papers (Paper-I, II, III & IV)

Paper - I

Teaching Hours - 4 Hrs/week

Duration of Exam - 3 Hrs

Maximum Marks - 100

Paper - II

Teaching Hours - 3 Hrs/week

Duration of Exam - 3 Hrs

Maximum Marks - 100

Paper - III

Teaching Hours - 3 Hrs/week

Duration of Exam - 3 Hrs

Maximum Marks - 100

Paper – IV (Practical)

Teaching Hours - 6 Hrs/week

Duration of Exam - 12 Hrs

Maximum Marks - 100

Paper - I

MODERN PHARMACEUTICAL ANALYTICAL TECHNIQUES (THEORY & PRACTICAL)

1. Principles of separation and applications of TLC. Column chromatography. Paper chromatography, Ion exchange chromatography, Counter current chromatography, G.C., DCCC, HPTLC & HPLC and electrophoresis.

2. **Infrared spectroscopy**

Introduction: The IR absorption process; the modes of vibration bond properties and absorption trends. The Hook's Law & calculations of frequencies for different types of bonds; coupled interactions; hydrogen bonding; radiation source, sample handling, qualitative and quantitative applications and introduction about FT-IR

3. **Ultraviolet spectroscopy :**

Introduction: The nature of electronic excitation, the origin of UV band structure; principle of absorption spectroscopy; Beer and Lambert's Law, Chromophore $\sigma \rightarrow \sigma^*$, $n \rightarrow \sigma^*$, $\pi \rightarrow \pi^*$, $n \rightarrow \pi^*$, transitions; shifts reagents effects of substituents; effect of conjugation' confirmations and geometry; calculation of Lamda maxima, effect of solvents, qualitative and quantitative applications

4. **Nuclear Magnetic Resonance spectroscopy :**

- A. ^1H NMR Spectroscopy: Principle, Instrumentation techniques. Chemical equivalence, spin-spin coupling, The origin of spin-spin splitting, Pascal triangle, the coupling constant chemical shift reagents Pharm. application including interpretation of Proton-NMR spectra.
- B. ^{13}C NMR Spectroscopy: Peak assignments, off resonance decoupling, selective proton decoupling, chemical shift equivalence, chemical shifts and spin coupling.

5. **Mass Spectrometry:**

Basic principle and theory involved, Instrumentation, types of ions, fragmentation, rearrangements; mass spectra of representative compounds, recognition of molecular ion peak, chemical ionization mass spectrometry, field desorption mass spectrometry, mass spectrometry, fast atom bombardment mass spectrometry.

6. **Thermal analysis:**

Introduction to various thermal methods of analysis, basic principle and theory; differential thermal analysis and differential scanning calorimetry and micro calorimetry. Different types of calorimeters and micro calorimeters.

7. **Pharmacological evaluation of drugs in biological fluids: Bioassay.**

8. **Microbiological assays.**

9. **Radioimmunoassays.**

10. Quantitative microscopy of herbal drugs. Lycopodium spore method, stomatal number, stomatal index, palisade ratio, vein-islet number, and vein-termination number.

BIOSTATISTICS AND COMPUTER APPLICATION

1. Methods of collection of data, classification of data, graphical representation of data, frequency, polygon, histogram, measure of central tendency, mean mode and median dispersion and standard deviation.
2. Confidence level, Null hypothesis, calculation of statistical significance between two means, analysis of variance.
3. Association of attributes centigency, classification of attributes, coefficient of association, chi square test.
4. Theory of probability, simple probability, law of probability, Permutation and combinations, ratios percentages and proportions and statistical difference between proportions. Analysis of variance two way ANOVA and multiple comparison procedures.
5. Correlation and regression, least square method and its application, significance of coefficient of correlation, non linear regression.
6. Calculation of ED₅₀, LD₅₀, probit analysis.

II COMPUTER APPLICATIONS

BOOK RECOMMENDED

1. R.M.Silverstein, F.X.Webster, Spectrometric Identification of organic compounds, 6th ed. John Wiley & sons, New-York, 1998.
2. Remington, The science and practice of pharmacy, Mack publishing company. Easton Pennsylvania.
3. Organic spectroscopy by Willam Kemp
4. E. Heftmann, A laboratory handbook of chromatography, New - York.
5. H.H.Willard, L.L.Merritt and J.A.Dean, Instrumental methods of analysis, Van Nostrend Reinhold, New York.
6. WWM. Wenland, Thermal analysis, John Willy and sons, New-York.
7. Principle of instrumental analysis,V ed. By Skoog, Holler-Niemen.
8. Modern analytical chemistry by David Harvey. (MC Graw-Hill international edition).

Paper - II

Pharmacology – I (Basic Principles of Drug Therapy, and Clinical Pharmacology)

I. Definition, Scope, Organization and growth of Clinical Pharmacology, Cellular Transduction Mechanisms, Clinical Pharmacokinetics, Monitoring of Drug Therapy, Adverse Drug Reactions, Patient Compliance, Pharmacogenetics, Paediatric and Geriatric Pharmacology, Drug Interactions, Drug Therapy during pregnancy and lactation.

II. Drugs acting on the autonomic nervous system :

- i) Neurotransmission : The Autonomic and Somatic Motor Nervous System.
- ii) Muscarinic Receptor Agonists and Antagonists.
- iii) Anticholinestrase Agents
- iv) Agents acting at the neuromuscular junction and autonomic ganglia.
- v) Catecholamines, Sympathomimetic Drugs and adrenergic receptor antagonists, Ocular Pharmacology.
- vi) 5-Hydroxy tryptamine (Serotonin) receptor agonists and antagonists.

III. Drugs acting on the Central Nervous System

- i) Neurotransmission and the Central Nervous System
- ii) History and Principles of Anesthesiology
- iii) General Anesthetics
- iv) Local Anesthetics
- v) Hypnotics , Sedatives and Ethanol
- vi) Drugs and the treatment of Psychiatric Disorder : Psychosis, Anxiety : Depression and Mania
- vii) Drugs Effective in the therapy of Epilepsy
- viii) Drugs effective in the therapy of Migraine
- ix) Treatment of Central Nervous system degenerative disorders
- x) Opioid Analgesics and Antagonists
- xi) Drug Addiction and Drug Abuse

BOOKS RECOMMENDED

1. Modern Pharmacology by C.R. Craig and R.E. Stitzel
2. Goodman and Gilman's : The Pharmacological Basis of Therapeutics, edited by Alfred Goodman Gilman, Theodore W. Rall, Alan S Nies, and Palmer Taylor
3. Clinical Pharmacology by D.R. Laurence and P.N. Benett
4. Essentials of Pharmacotherapeutics by F.S.K. Barar
5. Pharmacology by H.P. Rang and M.M. Dale
6. Lewis's Pharmacology revised by James Crossland
7. Oxford Textbook of Clinical Pharmacology and Drug Therapy by D.G. Grahame-Smith and J.K. Aronson.

Paper – III

I. Autocoids : Drug Therapy of Inflammation

- i) Introduction
- ii) Histamine, Bradykinin and their Antagonists
- iii) Lipid- Derived Autocoids : Eicosanoids and platelet Activating factor
- iv) Analgesic-Antipyretic and Anti-Inflammatory agents and Drugs employed in the treatment of Gout.
- v) Drugs used in the treatment of Asthma.

II. Drugs effecting renal, blood and cardiovascular function :

- i) Diuretics
- ii) Drugs used in the treatment of Myocardial Ischemia
- iii) Antihypertensive agents and the drug therapy of hypertension.
- iv) Pharmacological treatment of Heart Failure
- v) Antiarrhythmic Drugs
- vi) Drugs used in the treatment of Hyperlipoproteinemias
- vii) Hematopoietic Agents : Growth factors, Minerals and Vitamins

viii) Anti coagulant, thrombolytic and antiplatelet drugs.

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1. Modern Pharmacology by C.R. Craig and R.E. Stitzel
2. Goodman and Gilman's : The Pharmacological Basis of Therapeutics, edited by Alfred Goodman Gilman, Theodore W. Rall, Alan S Nies, and Palmar Taylor
3. Clinical Pharmacology by D.R. Laurence and P.N. Benett
4. Essentials of Pharmcotherapeutics by F.S.K. Barar
5. Pharmacology by H.P. Rang and M.M. Dale
6. Lewis's Pharmacology revised by James Crossland
7. Oxford Textbook of Clinical Pharmacology and Drug Therapy by D.G. Grahame-Smith and J.K. Aronson.

Paper – IV

Pharmaceutics I Practicals

- Pharmacological techniques employed in the study of various drugs.
- Practicals based on instrumental methods of analysis. A sufficient training will be given through exercises using different kinds of spectral analysis.

SEMESTER-II

Consist of two papers (Paper-I, II, III &IV)

Paper – I

Teaching Hours - 3 Hrs/week

Duration of Exam - 3 Hrs

Maximum Marks - 100

Paper – II

Teaching Hours - 3 Hrs/week

Duration of Exam - 3 Hrs

Maximum Marks - 100

Paper - III

Teaching Hours - 4 Hrs/week

Duration of Exam - 3 Hrs

Maximum Marks - 100

Paper – IV (Practical)

Teaching Hours - 6 Hrs/week

Duration of Exam - 12 Hrs

Maximum Marks - 100

Paper - I

Pharmacology II Recent advances and emerging Trends in Pharmacological Sciences. (Theory)

I. Digestive System

- a) Pharmacotherapy of peptic ulcer, diarrhoea, constipation.
- b) Agents affecting gastrointestinal water, Flux and motility : Emesis and antiemetics; Bile acids and Pancreatic enzymes

II. Therapy of Infectious diseases

- a) General Principles, Antibacterial Drugs Sulphonamides, Quinolones, Penicillins, Cephalosporins, Tetracyclines, Chloramphenicol.
- b) Drugs used in the chemotherapy of Protozoal infections: Malaria
- c) Drugs used in the chemotherapy of Protozoal infections : Trypanosomiasis, Leishmaniasis, Amebiasis, Giardiasis, Trichomoniasis, and other Protozoal infections.
- d) Drugs used in the chemotherapy of Helminthiasis
- e) Drugs used in the chemotherapy of Leprosy, Tuberculosis, Fungal infections, Viral infections
- f) Drugs used in the Chemotherapy of Neoplastic diseases
- g) Immunomodulators : Immunosuppressive agents and Immunostimulants
- h) Newer Chemotherapeutic agents

RECOMMENDED REFERENCE JOURNALS

- 1. Annual Review Pharmacology and Toxicology

Paper - II

I. Hormones and Hormones Antagonists

- a) Adenohypophyseal hormones and their Hypothalamic releasing factors.
- b) Hormones of Posterior pituitary
- c) Thyroid and Antithyroid drugs
- d) Estrogens and Progestins, Antifertility agents
- e) Androgens
- f) Adrenocorticotrophic hormones; Adrenocortical steroids and their synthetic analogs; Inhibitors of the synthesis and actions of adrenocortical hormones.

- g) Insulin, oral hypoglycemic agents and the Pharmacology of pancreatic hormones.
- h) Agents affecting Calcification and bone turnover:
Calcium phosphate, parathyroid hormones, vitamin D, Calcitonin and other compounds.
- i) Vasopressin and other agents affecting the renal conservation of water.

II. Emerging Trends & Recent advances in:

- a) Receptor and G-Protein
- b) Cyclic nucleotides
- c) TNF, Apoptosis
- d) Ion channel modulators
- e) Neurosteroids and Cannabinoids
- f) Nitric oxide
- g) ANF, Anti oxidants : Melatonin
- h) Chiral Pharmacology
- i) Gene therapy
- j) Neuropeptide, Substance P, Angiotensin II modulators.

RECOMMENDED REFERENCE JOURNALS

1. Annual Review Pharmacology and Toxicology

Paper - III

Pharmacology III Pharmacological methods and Toxicology (Theory)

- 1. Principles of Pharmacological and Clinical Evaluation of drugs.**
- 2. Pharmacological Techniques to evaluate drugs belonging to following categories.**
 - a) Antipsychotics, antianxiety agents; nootropics; antidepressants, antiparkinsonian agents, antiepileptics, analgesics, anti-inflammatory agents, local anaesthetics.
 - b) Antihypertensives, antiarrhythmics, antiatherosclerotics, drugs for myocardial infarction.
 - c) Antiulcer drugs, antidiabetics, antitussives
 - d) Evaluation of antioxidants

- e) Transgenic animals, genetically prone animal models
- f) Anti cancer drugs
- g) In-vitro techniques
- h) Antifertility agents

3. Drug Toxicity, Safety Evaluation of new drugs

4. Regulations for Laboratory animal care and ethical requirements

BOOKS RECOMMENDED

1. Modern Pharmacology by C.R. Craig and R.E. Stitzel
2. Goodman and Gilman's : The Pharmacological Basis of Therapeutics edited by Alfred Goodman Gilman, Theodore W. Rall, Alan S. Nies and Palmar Taylor

Paper – IV

PHARMACOLOGY PRACTICAL-I

Duration of Exam. 12 Hrs.

Max. Marks 100

- (I)**
- a) Study of agonist and antagonist
 - b) pD₂ Value
 - c) pA₂ Value
 - d) 5HT bioassay (Comparative, graphical, 4 point)
 - e) Oxytocin bioassay (Graphical)
 - f) Antagonist bioassay
 - g) Ach bioassay (rat fundus)
 - h) Histamine assay guinea pig ileum (Graphical & 4 point assay)
 - i) Blind screening of drugs.

(II) Estimation of drugs in body fluids using modern analytical techniques.

BOOKS RECOMMENDED

1. Fundamentals of Experimental Pharmacology by M.N. Ghosh
2. Screening Methods in Pharmacology, Vol I & II, edited by Robert A. Turner and Peter Hebborn
3. Textbook of invitro Practical Pharmacology by Ian Kitchen

SEMESTER-III

PHARMACOLOGY PRACTICAL-II

(Marks 100)

I. Screening methods in Pharmacology:

Screening of antipsychotics, antianxiety, nootropics, antidepressants, antiparkinson, antipileptics, analgesics, anti-inflammatory, antihypertensive, anti MI, anti ulcer, antidiabetic and antioxidants.

II. Literature survey, preparation of synopsis of the project work.

III. Seminar on the project work.

BOOKS RECOMMENDED

1. Fundamentals of Experimental Pharmacology by M.N. Ghosh, Scientific Book Agency, Calcutta (1984)
2. Pharmacological experiments in Intact preparations Edinburgh University Pharmacology Staff, Livingstone (1968).
3. Pharmacological Experiments on isolated preparations, Edinburgh University Pharmacology Staff, Livingstone (1968)
4. Handbook of Experimental Pharmacology by S.K. Kulkarni, Vallabh Parakashan Delhi, 3rd Edition (1999)
5. Screening Methods in Pharmacology by P. Turner, Vol. I & II, Academic Press, New York and London (1965)
6. Drug discovery and evaluation by H.G. Vogel and W.H. Vogel, Springer-Verlag, Berlin Heideleberg (1997)

SEMESTER-IV

Thesis	300 Marks
Viva Voce	200 Marks