

DEPARTMENT: PHARMACOLOGY**FIRST YEAR**

Subject Code	Name of subject	Teaching Scheme			Marking System			
					Theory		Practical	
		Theory (Hrs)	Practical (Hrs)	Total Hrs	Internal	External	Internal	External
08200101	Modern Analytical Techniques (Common for all Stream)	4	-	4	50	100	-	-
08204101	Research methodology regulatory ethics in pharmacological research	3	4	7	50	100	50	100
08204102	Advances in Pharmacology & pharmacotherapeutics	3	6	9	50	100	50	100
08204103	Pharmacometrics and biological evaluation of drugs	3	6	9	50	100	50	100
Total Hour		13 +	16	= 29	Total Marks 600 + 300 =900			

**RESEARCH METHODOLOGY AND REGULATORY ETHICS IN
PHARMACOLOGICAL RESEARCH**

SUBJECT CODE: 08205101

Theory (Four hours per week)

Hours Per Week		Marking System			
Theory	Practical	Theory		Practical	
4	-	Internal	External	Internal	External
		50	100	-	-

Objective of the Course

- The aim of this course is to make student familiar with the methodology and regulatory guidelines of clinical research.

Student Learning Outcomes:

- At the end of this course, the student should be able to identify research problem, hypothesistesting and how to document research report after conducting research. Further they will also be familiar with various types of intellectual property rights. Students should also be able to understand how the clinical trials are conducted as per guidelines and what are the processes require for approval of drug.

Instructional Methods:

- Faculty member/s shall explain in a class room using black board, multimedia projector along with video based methods and actual case studies.

Sr. No	Topic	Hours
1	INTRODUCTION TO RESEARCH Introduction to research and research methodology: Meaning of research, Objectives of research, Motivations in research, different types of research, research approaches, steps involved in research process, Significance of research.	2
2	LITERATURE SURVEY & RESEARCH PROBLEM FORMULATION Purpose, Methods and Use of literature survey, locating relevant information, use of library & electronic databases, patent data base, preparation & presentation of literature review, research article reviews,	8

	identification of gaps in research, selecting the problem, formulation of research problem, definition of research objectives, preparing research proposals	
3	<p>SCIENTIFIC WRITING & PRESENTATION</p> <p>Research report and thesis writing (Title, abstract, key words, introduction, methodology, results, discussion, conclusion, acknowledgement, references), types of research paper (research articles, review article, short communications), instructions to Authors, steps involved in the process of publications (registration, new article submission, submitting articles electronically, review process, tracking the process, submitting revised articles), importance of publishing a research paper, Citations, Citation index, Quality indices, Impact factor, etc.</p> <p>Importance, types, content, posters, oral presentation, importance of body language -posture, gestures, eye contact, facial expressions, stage, fright, volume, pitch, speed, pause & language, visual aids & seating, questionnaire.</p>	9
4	<p>PROJECT PROPOSALS</p> <p>a) COST MANAGEMENT: Different types of cost, Cost analysis of the project- cost incurred on raw materials, procedure, instrumentations & clinical trials.</p> <p>b) RESEARCH GRANTS: Introduction to various research funding organization and their funding schemes (AICTE, UGC, CSIR, ICMR, DST, DBT, GUJCOST, etc.)</p> <p>c) INDUSTRY- INSTITUTION COLLABORATION: Industrial-institution interaction, Industrial projects, significance, feasibility reports.</p> <p>d) MORALS: Issues related to plagiarism, collaborative models and ethics, acknowledgements.</p>	8
5	<p>Introduction to Experimental Design</p> <p>Basic Biostatistics used in experimental design: Study of F Test, t test, Chi Square Test, ANOVA and Normal Distribution in Pharmacy. Numerical Problems related to above. Introduction to Design of Experiments, Terminologies used in Experimental Design such as factors, levels, confounding, Response, Screening, Optimization, etc. Application of Experimental Design in various pharmaceutical fields. Methods of selection of different designs. Screening studies using Placket and Burman Design and Taguchi Design.</p>	7
6	Factorial Design, Response Surface Methodology & Applications	8

	Full and fractional factorial designs, Design layout, How to implement the Design in Pharmaceutical Research. Evolution of full and reduced mathematical models in experimental design. Application of Factorial Designs. Introduction to Central Composite Design, axial points prediction, Contour Plots, 3D Plots, Box Behnken Design and Validation of optimized model. Application of Response Surface Methodology. Parallel, Crossover Designs and clusters designs used in clinical trials and their applications. Pharmacoinformatics, Methodology, Tools and Application in Pharmacy field.	
7	Introduction to Patents, Patent Claims & Patent Websites Patents Definition, Need for patenting, Types of Patents, Condition to be satisfied by an invention to be patentable, Introduction to patent search, The essential elements of patents, Guidelines for preparations of laboratory notebook, non-obviousness in patents, Introduction to Patent Claims, Drafting of patent claims, important patent related websites. How to search Patents in different websites.	5
8	Trademark protection and WO patents Brief introduction to trademark protection and WO patents, Introduction to “The Patents Act 1970” and “The Patents Rule 2003”, with special emphasis on the forms to be submitted along with a patent application.	3
9	Clinical trials Introduction and designing Various phases of clinical trials Post Marketing surveillance – methods Principles of sampling Inclusion and exclusion criteria Methods of allocation and randomization Informed consent process Monitoring treatment outcome Termination of trial Safety monitoring in clinical trials	10
10	Documents in clinical study Investigator Brochure (IB), Protocol & Amendment in Protocol , Case Report Form (CRF), Informed Consent Form (ICF) , Content of Clinical Trial Report Essential Documents in Clinical Trial	10
11	Ethical guidelines in clinical research History, ICH-GCP & its Principles Indian GCP (CDSCO Guidelines) ICMR Guidelines - Ethical Guidelines for Biomedical Research on Human Subjects Schedule Y Roles & Responsibility of various clinical trial personnel as per ICH GCP Sponsor Investigator Monitor Auditors	10
12	Institution Ethics Committee / Independent Ethics Committee	3

13	Quality Assurance in clinical Research	3
14	BA/BE studies: Introduction, Regulatory requirements and methodology	4
15	Regulations for laboratory animal care and research, CPCSEA guidelines, Institutional animal ethics Committee, OECD guidelines	10

Recommended study materials :(Latest edition)

1. Rick NG. Drugs from Discovery To Approval. John Wiley & Sons.
2. Allen Cato, Lynda Sutton Clinical Drug Trials and Tribulations Second Edition, Revised and Expanded. Marcel Dekker,
3. Deborah Rosenbaum, Michelle Dresser. Clinical Research Coordinator Handbook Second Edition Practical Clinical Trials Series GCP Tools and Techniques Interpharm/CRC New York Washington, D.C.
4. TamasBartfai, Graham V. Lees. Drug Discovery from Bedside to Wall Street. Elsevier Academic Press. London.
5. Ronald D. Mann, Elizabeth B. Andrews. Pharmacovigilance. John Wiley & Sons Ltd.
6. Shayne C. Gad. Drug Safety Evaluation. A John Wiley & Sons, Inc., Publication
7. Bert Spilker. Guide to Clinical Trials. 8. Sandy Weinberg. Guidebook For Drug Regulatory Submissions. A John Wiley & Sons, inc.
8. Duolao Wang and AmeetBakhai Clinical Trials A Practical Guide to Design, Analysis, and Reporting. Remedica 2006
9. Various Guidelines like: ICH – GCP- International Conference on Harmonisation of Technical requirements for registration of pharmaceuticals for human use. ICH Harmonised Tripartite Guideline. Guideline for Good Clinical Practice. E6
10. ICMR Guideline – Ethical Guidelines for Biomedical Research on Human Subjects. Indian GCP – Central Drugs Standard Control Organization.
11. Good Clinical Practices – Guidelines for Clinical Trials on Pharmacuetical Products in India. New Delhi: Ministry of Health; 2001. Schedule Y

MODERN ANALYTICAL TECHNIQUES

SUBJECT CODE: 08200101

Theory (Four hours per week)

Hours Per Week		Marking System			
Theory	Practical	Theory		Practical	
3	4	Internal	External	Internal	External
		30	70	30	70

Objective of the course:

To make students familiar with the principles of modern analytical techniques and application of analytical instruments in pharmacy

Students learning outcomes/objectives:

A] Knowledge:

- 1) Students will be able to analyze various drugs in single and combination dosage forms
- 2) The student will be able to understand the fundamental concept of modern analytical techniques, which is important for qualitative as well as quantitative analysis of drug substances and drug product
- 3) Illustrate the relevance & significance of advanced analytical techniques to Pharmaceutical Sciences.
- 4) Understand the basic principles of chromatographic, spectroscopic and scattering methods.
- 5) Apply spectroscopic methods for analysis of Raw materials and Formulation.
- 6) Develop an in-depth knowledge and critical awareness of the application of modern analytical methods.
- 7) Understand and apply different spectroscopic and separation on raw materials
- 8) Explain types, instrumentation and applications of spectroscopic, chromatographic and separation techniques
- 9) Define and compare the terms used in spectroscopic methods like UV-VIS Spectroscopy, IR Spectroscopy, NMR and Mass Spectroscopy.
- 10) Understand & apply the theory and operational principles of UV-VIS Spectroscopy, IR Spectroscopy etc .
- 11) Understand the basic concepts and applications of Mass Spectroscopy.
- 12) Elucidate the structure of organic compounds by various spectroscopic methods.

B. Skills:

1. Clarify and understand the correct use of laboratory instruments like UV-Visible spectrophotometer, High Performance Liquid Chromatography, Flame Photometer with calibration of various instruments used in pharmaceutical analysis laboratory together with safety measures to be followed.
2. Develop practical hand in analytical methods by estimation of analyte concentration in pure form and in formulation with thorough understanding of principle and procedures used in different analytical techniques.
3. Develop UV and HPLC method for simultaneous estimation of Drugs
4. Various advanced analytical instrumental techniques for identification, characterization and quantification of drugs using IR, HPLC and TLC

Instructional Methods:

- Faculty member/s shall explain in a class room using black board, multimedia projector along with video based methods and actual case studies.

THEORY (3 HOURS/WEEK)

Chapter No.	Topics	Hours Allotted
1	UV-VISIBLE SPECTROSCOPY Theory of UV-Spectroscopy, absorption law and limitations, choice of solvent and solvent effects. Applications of UV-Visible spectroscopy, Woodward–Fischer rules for calculating absorption maximum, interpretation of spectra, multi-component assay, difference spectra and derivative spectra.	06
2	INFRARED SPECTROPHOTOMETRY: Introduction, basic principles, and sampling techniques, interpretation of spectra, applications in Pharmacy. FT-IR, Attenuated Total Reflectance (ATR), near infrared Spectroscopy (NIR) -theory and applications,.	06
3	NUCLEAR MAGNETIC RESONANCE SPECTROSCOPY: Fundamental Principle and Theory, Instrumentation, solvents, chemical shift, and factors affecting chemical shift, spin-spin coupling, coupling constant, and factors influencing the value of coupling constant, spin-spin decoupling, proton exchange reactions, simplification of complex spectra, FT-NMR, 2D -NMR and applications in Pharmacy, interpretation of spectra. C13 NMR-Introduction, Natural abundance, C13 NMR Spectra and its structural applications.	08
4	MASS SPECTROMETRY Principle, Theory, Instrumentation of Mass Spectroscopy, Different types of ionization like electron impact, chemical, field, FAB and MALDI, Analyzers of Quadrupole and Time of Flight, Mass fragmentation and its rules, Fragmentation of important functional groups like alcohols, amines, carbonyl groups and alkanes, Meta stable ions, Mc Lafferty rearrangement, Ring rule, Isotopic peaks, Tandem Mass Instruments, Interpretation and Applications of Mass spectroscopy	08
5	ATOMIC ABSORPTION AND PLASMA EMISSION SPECTROSCOPY: Principle, instrumentation, interferences and applications in Pharmacy.	04
6	X-RAY DIFFRACTION METHODS: Introduction, generation of X-rays, X-ray diffraction, Bragg's law, X-ray powder diffraction, interpretation of diffraction patterns and applications	04

7	OPTICAL ROTARY DISPERSION: Principle, Plain curves, curves with cotton effect, octant rule and its applications with example, circular dichroism and its relation to ORD.	03
8	THERMAL METHODS OF ANALYSIS: Theory, instrumentation and applications of Thermo Gravimetric Analysis (TGA), Differential Thermal Analysis (DTA), Differential Scanning Calorimetry (DSC). And Thermo Mechanical Analysis (TMA).	04
9	CHROMATOGRAPHIC TECHNIQUES: a) Classification of chromatographic methods based on mechanism of separation. Theories of chromatographic separation. b) Principles, elution techniques, instrumentation, derivatization and applications of gas chromatography, HPLC and HPTLC. c) Principles, elution techniques, applications of ion exchange and ion pair chromatography, affinity chromatography, size exclusion chromatography, and chiral chromatography, super fluid chromatography (SFC), GC-MS, UPLC and LC-MS-stability studies and its applications.	15
10	ELECTROPHORESIS: Principle, Instrumentation, Working conditions, factors affecting separation and applications of the following: a) Paper electrophoresis b) Gel electrophoresis c) Capillary electrophoresis d) Zone electrophoresis e) Moving boundary electrophoresis f) Iso electric focusing	03
11	RADIO IMMUNO ASSAY: Introduction, Principle, Theory and Methods in Radio Immuno Assay, Related ImmunoAssay procedures and applications of RIA Techniques. Enzyme immuno assay- ELISA and EMIT	03
12	REFERENCE STANDARDS Source, preparation, characterization, usage, storage , records and Concept of Working standard.	02
13	ELECTRON MICROSCOPY: Introduction to Scanning Electron Microscopy and Travelling Electron Microscopy.	02
14	PREFORMULATION	07

PRACTICAL (4 HOURS/WEEK)

1. Find out the wavelength maxima of drugs.
2. Study of effect of solvent on wavelength maxima of drugs.
3. Find Beer's law limit of drugs in suitable solvent(linearity-range).
4. Find out the isobestic point for (any one) combined drug
5. Multicomponent analysis by UV-Spectrophotometry
 - a)Absorbance corrected for interference method
 - b)Simultaneous equation method
 - c)Absorbance ratio method
 - d)Area under curve method
 - e)First derivative spectrophotometric method
6. Assay of drugs official in various pharmacopoeias (Any five). This should cover UV-spectrophotometry, titrimetric, HPLC methods. The titrimetric method should include potentiometric end point determination.
7. Interpretation of some unknown intermediates and drugs.
 - a. Interpretation of UV spectra (At least two exercise),
 - b. Interpretation of IRspectra (At least two exercise),
 - c. Interpretation of NMRspectra (At least two exercise) and
 - d. Interpretation of Mass spectra(At least two exercise)

[Note: For interpretation NMR and Mass spectral data, the spectra can be obtained from available literature]

8. Experiment on Flame Photometer.
9. Experiment on Fluorimetry.

Reference Books:

1. M. Orchin and H.H. Jaffe – Theory and applications of Ultraviolet spectroscopy. (John Wiley and Sons. N.Y).
2. Silverstein, Basseler, Morrill- Spectrometric identification of organic compounds (John Wiley and Sons. N.Y).
3. Willard, Merritt, Dean – Instrumental methods of analysis (CBS Publishers and Distributors, Delhi).
4. J.R. Dyer – Application of absorption Spectroscopy of Organic Compounds (Prentice Hall,London).
5. C.N.R. Rao – Chemical Applications of Infrared spectroscopy. (Academic Press, N.Y.).
6. L.M. Jackmann and B.D. Sternhell – Application of NMR spectroscopy in organic chemistry(Pergamon Press, London.).
7. F.W. McLafferty and F. Turecek- Interpretation of Mass Spectra.
8. R.J. Hamilton and P. A. Sewell- Introduction to High Performance Liquid Chromatography.(Chapman and Hall, London).
9. J.W. Munson- Pharmaceutical Analysis: Modern methods –Part A and Part B (MarcelDekker, Inc., New York).
10. Introduction to Spectroscopy, 3rd edition, Pavia, Lampman, Kriz, Thomson Publisher.
11. Analytical chemistry: A Modern Approach to Analytical Science, 2nd edition by Kellner,Mermet, Otto, Valcarcel Wiley ECH.
12. Ewing's Analytical Instrumentation Handbook, 3rdedition, edited by Jack, Cazes, Marcel Dekker.
13. P.D. Sethi – Quantitative Analysis of Drugs in Pharmaceutical Formulations (VBS Publishers, Delhi).
14. Pharmacopoeia of India (latest edition).
15. United State Pharmacopoeia (latest edition).

16. British Pharmacopoeia (latest edition).
17. A.H. Beckett, J.B. Stenlake – Practical Pharmaceutical Chemistry, Part I and Part II (CBS Publishers Delhi)
18. F. D. Snell and C. T. Snell- Colorimetric Methods of analysis (Van Nostrand Reinhold Company, N.Y.).

Specialization Subject

Paper-I: ADVANCES IN PHARMACOLOGY & PHARMACOTHERAPEUTICS

SUBJECT CODE: 08204101

Theory (Three hours per week)

Hours Per Week		Marking System			
Theory	Practical	Theory		Practical	
3	6	Internal	External	Internal	External
		30	70	30	70

Objective of the Course

- To make students familiar with the molecular level concepts of biology applicable in pharmacology and to make students familiar with the recent advancements in pharmacology & to acquaint students with principles of pharmacotherapeutics and drug use in various diseases

Student Learning Outcomes:

- At the end of the course, the student will be able to understand cellular targets for drug action and their pharmacological actions, possible management plan with adverse reactions and interaction of pharmacotherapy used in treatment of diseases.

Instructional Methods:

- Faculty member/s shall explain in a class room using black board, multimedia projector along with video based methods and actual case studies.

Outline of the Course

(Theory)

3 Hr/Week

Sr No	Topic	Minimum Number of hours
1	Biological membrane and transport mechanisms across the cell membrane, transporters of therapeutic importance.	2
2	Advanced Pharmacodynamics: Receptors and signal transduction mechanism: Types of receptors, Ion channels as drug target	5
3	Pharmacology of purines and peptides.	2

4	Molecular biology therapeutic prospects of apoptosis and necrosis	3
5	Cellular and molecular mechanisms of Drug dependence, Microbial resistance.	2
6	Drugs acting on the peripheral nervous system: Sympathomimetics, Sympatholytics, Parasympathomimetics, Parasympatholytics, Ganglion blockers & Stimulants, Neuromuscular blockers, local anesthetics.	10
7	Drugs and Autacoids : Eicosanoids, Polypeptides, Histamine, 5-HT	5
8	Antimicrobial and Antineoplastic agents : Introduction to infectious disease, general principles of Chemotherapy and management of infectious disease, Sulphonamides& Co-trimoxazole, Penicillins, Cephalosporins, Macrolide antibiotics, Aminoglycosides, Quinolones, Tetracycline & Chloramphenicol, Chemotherapy of Tuberculosis & Leprosy, Antifungal agents, Anti-viral agents, Anti-protozoal agents, Anthelmintics, Anticancer agents	10
9	Immunopharmacological agents: Immunostimulants, Immunosuppressant	3
Important disorders/conditions (etiology, pathophysiology, complications, diagnosis, Prognosis), their control and management with special emphasis on pharmacology of drugs (mechanism of action, ADME, therapeutics use, and adverse effects, toxicities and possible drug interaction) of the following:		
10	Central Nervous system: Neurodegenerative Disorders (Parkinson's disease, Alzheimer's disease, Huntington's chorea, Spasticity), behavioral disorder-(Anxiety, Insomnia, Depression and Mania), Psychoses, Epilepsy, Migraine	10
11	Cardiovascular and hemopoietic system: Hypertension, Acute Coronary Syndrome, Angina Pectoris, Atherosclerosis, Congestive Heart Failure, Arrhythmias, Thromboembolic disorder, Anemia	10
12	Endocrine system: Disorders of thyroid gland and Parathyroid gland, Diabetes, Adrenocortical dysfunction	4
13	Gastro-intestinal System: Peptic Ulcer, Inflammatory Bowel Disease, Vomiting, Constipation, Diarrhea	4

14	Urogenital system: Renal Failure, Infertility, dysmenorrhoea	4
15	Disorders of eye: Glaucoma	1

Syllabus for Practicals: (Six hours per week)

1. Introduction to experimental animals, ethics in pharmacological experiments, CPCSEA Guidelines
2. Methods for euthanasia, anesthesia, dosing (i.v., oral, i.p., s.c., i.m.) and blood collection by various techniques
3. To study the effects of various agonists (pD₂) and antagonist (pA₂) using isolated preparations (rat ileum, guinea pig ileum, rat fundus strip, rat anococcygeus muscle, rat vas deferens, rat uterus, guinea pig taenia coli, rat/guinea pig heart, guinea pig tracheal chain, rat aortic strip)
4. To study the effects of calcium channel blockers on responses of various agonists on rat/guinea pig ileum
5. To study the effect of various drugs on rat blood pressure by invasive/non invasive techniques
6. Case studies based on disorders mentioned in theory section

Recommended study materials: (Latest edition)

1. Rang and Dale's pharmacology-- Elsevier Churchill Livingstone.
2. Lange's Basic and clinical pharmacology, Katzung B.G. Masters S.B., Trevor A.G. Tata McGraw Hill.
3. Pharmacology and Pharmacotherapeutics by R S Satoskar
4. Goodman and Gilman's pharmacological basis of therapeutics, Edited by Laurence Brunton, Bruce Chabner and Bjorn Knollman, McGraw Hill.
5. Advances in pharmacology, Academic Press.
6. Clinical Pharmacy and therapeutics by Roger Walker
7. Trends in Pharmacological Sciences, Cell Press Elsevier Publication.
8. Lewis's Pharmacology – James Crossland – Churchill Livingstone
9. Modern Pharmacology with clinical applications- Craig, Charles R.
10. Lippincott's illustrated reviews of Pharmacology- Mycek Mary J.
11. Goth's Medical Pharmacology- Wesley G. Clark
12. Principles of pharmacology.--H. L. Sharma
13. Essentials of medical pharmacology --K. D. Tripathi
14. Principles of Pharmacology –The Pathophysiological Basis –Golan David E.
15. Pharmacotherapy- A Pathophysiological Approach-Joseph T. Dipiro.
16. Guide to Good Prescribing: A Practical manual, WHO Action programme on Essential Drugs Geneva.

Specialization Subject

Paper-II: PHARMACOMETRICS AND METHODS OF BIOLOGICAL EVALUATION OF DRUGS

SUBJECT CODE: 08204102

Hours Per Week		Marking System			
Theory	Practical	Theory		Practical	
3	6	Internal	External	Internal	External
		30	70	30	70

Objective of the Course

- The aim of this course is to acquaint students with experimental methods of pharmacology.

Student Learning Outcomes:

- At the end of this course, the student will be able to plan and evaluate pharmacological agent using common biological evaluation techniques

Instructional Methods:

- Faculty member/s shall explain in a class room using black board, multimedia projector along with video based methods and actual case studies.

Outline of the Course (Theory)

Sr No	Topic	Minimum Number of contact hours
1	Biological standardization, general principles, Scope and limitation of bio-assay, bioassay of some official drugs.	8
2	Preclinical drug evaluation of its biological activity and toxicity- Toxicity test in animals including acute, sub-acute and chronic	14

	toxicity, ED50 and LD50 determination, special toxicity test like teratogenicity and mutagenicity. Various guidelines for toxicity studies. Animal experiments assessing safety of packaging materials.	
3	Pyrogens: Sources, Chemistry and properties of bacterial pyrogens and endotoxins, Official pyrogen tests.	5
4	Microbiological assay of antibiotics and vitamins	3
5	<p>Biological evaluation of drugs--Screening and evaluation (including principles of screening, development of models for diseases : In vivo models / In vitro models / cell line study) techniques of the following:</p> <ul style="list-style-type: none"> • Parasympathomimetics, Parasympathetic blocking agents, Sympathomimetics, Sympathetic blocking agents, Ganglion stimulants and blockers, Neuromuscular stimulants and blockers • General and local Anesthetics, Sedatives and Hypnotics, Antiepileptics, Psychopharmacological agents, Analgesics, Anti-inflammatory agents, Antiparkinson's drugs, CNS Stimulants. • Cardiotonics, Anti-hypertensive drugs, Anti-arrhythmic drugs, Drugs used in Ischemic Heart Diseases, Drugs used in Atherosclerosis. • Drugs used in Peptic Ulcer, Respiratory disorders, Hormone and Endocrine disorders. Anti fertility agents inflammatory bowel disease and diuretics. • Various models for Cataract, glaucoma. 	45

Syllabus for Practical (Six hours per week)

1. Bioassays of drugs: Bioassay of agonists (Graphical, Matching, 3 Point, 4 point method) and bioassay of antagonists using various isolated preparations.
2. Toxicity studies
3. Evaluation of drugs based on theory syllabus.

Illustrative examples

1. Evaluation of the antiepileptic activity of drug using maximum electro convulsive shock seizures (M. E. S.) and chemical induced convulsions methods.
2. Determination of the time required for induction and recovery from anesthesia for various volatile general anesthetics.
3. Evaluation of the effect of pentobarbitone sodium and diazepam in mice.
4. Evaluation of the effect of various tranquilizers and sedatives on motor co-ordination by rota rod test in mice.

5. Evaluation of the effects of drugs on spontaneous motor activity and to evaluate their nature as CNS stimulants or depressants.
6. Evaluation of the antiparkinsonian activity of drugs by phenothiazine induced catatonia.
7. Evaluation of the effect of psychotropic drugs on condition avoidance response.
8. Evaluation of the compulsive behavior (stereotypy) induced by apomorphine and its modification by chlorpromazine in mice.
9. Evaluation of anxiolytic (antianxiety) effect of diazepam in mice using elevated plus maze apparatus.
10. Study the effect of caffeine in human volunteers.
11. Evaluation of the effect of cimetidine in drug induced gastric (peptic) duodenal ulcers and hyper secretion of gastric acid in rats.
12. Evaluation of the antisecretory and ulcer protective effect of cimetidine in pylorus-ligated rats.
13. Evaluation of the analgesic potency of drug by thermal method.
14. Evaluation of analgesic effect of morphine in mice using hot plate method.
15. Evaluation of the analgesic effect of drugs by acetic acid induced writhing method in mice.
16. Evaluation of the anti-inflammatory property of indomethacin against carrageenan induced acute paw oedema in rats.
17. Evaluation of the effects of various drugs (diuretics) on the output of the urine in rats.

Recommended study materials: (Latest edition)

1. Handbook of Experimental Pharmacology- Goyal R.K.
2. Handbook of Experimental Pharmacology- Kulkarni S.K.
3. Drug Discovery and Evaluation in Pharmacology assay: Vogel
4. Design and analysis of animal studies in pharmaceutical development, Chow, Shein, Ching.
5. Evaluation of Drug Activity: Pharmacometrics D.R. Laurence
6. Animal and Clinical pharmacologic Techniques in Drug Evaluation-Nodine and Siegler
7. Pharmacology and Toxicology- Kale S.R. 7. Fundamentals of experimental Pharmacology- Ghosh M.N.
8. Screening methods in pharmacology (vol I & II)–R.A. Turner

