All India Institute of Medical Sciences

AIIMS Bibinagar, Hyderabad

Telangana - 508126

अखिल भारतीय आयुर्विज्ञान संस्थान (एम्स), बीबीनगर, हैदराबाद,
तेलंगाना – 508126

Dept. of Pharmacology

M.D. Pharmacology Curriculum and Syllabus

M.D. Pharmacology Curriculum and Syllabus

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1. Course Overview

Title of Degree	**:**	M.D. Pharmacology (Doctor of Medicine in Pharmacology)
Duration of Course	**:**	Three years (i.e., 36 months from the date of admission) January Session : Commences from 1st January July Session : Commences from 1st July
Eligibility	**:**	M.B.B.S. with NMC/MCI or State Medical Council Registration Must have completed the required period of 12 months Compulsory Rotatory Residential Internship/ Practical Training atleast by a day before the course commencement. i.e., latest by 31st December (for the January Session) and 30th June (for the July Session)
Selection Criteria	**:**	Through Institute of National Importance-Combined Entrance Examination (INI-CET)/ National Eligibility Entrance Test-PG
Nature of Work	**:**	Three years full-time continuous residency course
Remuneration	**:**	Pay Level 10 plus NPA and other allowances as admissible under the rules in the first year of the residency as per 7th CPC as applicable. As per the prevailing rules in AIIMS, New Delhi and other applicable MoHFW, GoI rules
Proposed Number of Candidates	**:**	One per session (January and July Sessions)
Postgraduate Teacher	**:**	Faculty having a total of eight years teaching experience out of which at least five years teaching experience as Assistant Professor gained after obtaining the postgraduate (M.D.) degree shall be recognized as postgraduate teachers in Pharmacology.
Guide Allotment	**:**	A student shall be earmarked to a regular faculty with requisite experience and eligibility. The senior most faculty shall be the guide for the first student and followed by the immediate next senior, and so on, on a rotation basis.
Attendance	**:**	Minimum 80% attendance in each calendar year
Assessment Pattern	**:**	Formative Assessment Exams shall be conducted every 6 months. The last of this exam would be a Pre-Final/ Pre-Professional Exam (Model Exam) conducted one month before the Final/ Professional Exam.

Students shall be examined both in Theory and Practical/ Viva-voce.

Dissertation : Protocol synopsis with title submission within six months of joining the course.
Student must have submitted the completed dissertation atleast 6 months before appearing in the Final Examination under the supervision of the guide.
January Session : By the month of June
July Session : By the month of December

M.D. Degree : Degree shall be awarded by AIIMS Bibinagar on successful completion of training of three years and passing the Final Examination.

Examiners : Two internal and two external examiners (Total: 4).
Out of the two internal examiners one shall be Head of the Department (Chief Examiner/ Moderator) and the 2nd Internal examiner shall be selected on a rotation basis from the available PG teachers.

2. Preamble

The purpose of PG education is to create specialists who would provide high quality health care and advance the cause of science through research and training.

Pharmacology consists of both the basic and clinical sciences. Experimental pharmacology, a subdomain of basic sciences, is essential to understand drug action in diseases as well as for the pharmaceutical industry for drug discovery and development. Clinical pharmacology is essential for enhancing prescribing practice in medicine, adverse drug reactions, clinical trial and pharmacovigilance. The job prospects for a medical pharmacologist are in academics (as teaching-research faculty positions), pharmaceutical industry (as medical science liaison/ medical advisors), clinical research organization (as clinical investigators), pharmacovigilance (as drug safety physicians), hospitals (as clinical pharmacologists), research organizations, drug regulatory bodies and as medical writer, drug safety consultants, and medication reconciliation advisors.

Accordingly, a post graduate (MD) student in Pharmacology should be competent to meet the job requirements at all these places catering to various domain-specific skills and attributes. The applied nature of the discipline, the move towards integrated course structures, the widening of discipline boundaries and increasing number of students seeking postgraduation degree raise issues concerning maintaining and improving competency as along with maintenance of academic standards. These issues also necessitate integration with other biomedical and clinical disciplines.

A few common traits or skills across the various job profiles are good knowledge of the subject and excellent soft skills. It is ideal for aspiring pharmacologists to focus on improving their soft skills in addition to gaining in-depth knowledge of basic and clinical pharmacology.

3. Goal and Objectives

The M.D. Pharmacology curriculum is designed is such a way to mould and create a "Medical Pharmacologist" possessing requisite knowledge, skills, attitudes, values and responsiveness, so that she or he may function appropriately and effectively in diverse areas as mentioned above. The following course objectives are in place to achieve this goal.

At the end of three-year course in Pharmacology the candidate should be able to

- Apply the knowledge of general pharmacology, molecular pharmacology, systemic pharmacology and clinical pharmacology in drug development and support rational use of drugs.
- Use relevant and contemporary educational tools to teach pharmacology for undergraduate students while facilitating theory lectures, demonstrating practical sessions, and other miscellaneous sessions.
- Write scientifically robust research protocols and to conduct experimental studies (*in vitro, in silico* and *in vivo*) in animals and clinical studied/ trials in humans.
- Plan and conduct research work, applying the principles of research methodology including biomedical statistics.
- Write and publish research papers in peer reviewed journals; critically review and comment on published research papers.
- Monitor adverse drug reactions and facilitate reporting of adverse drug reactions.
- Set up clinical trial units and therapeutic drug monitoring centres.
- Carry out screening of drugs for pharmacological and toxicological profiles.
- Provide drug/ poison information services, whenever required.

4. Syllabus (Course Content)

4.1 General Pharmacology and Allied Sciences

- Sources and nature of drugs; routes of drug administration and novel drug delivery systems.
- Principles of drug action, agonist, antagonist, partial agonist, inverse agonist, spare receptors and types of antagonism.
- Molecular mechanisms of drug action including drug receptor interactions, transducer mechanisms, second messenger systems in transmembrane signalling, G – protein coupled receptors, tyrosine kinase linked receptors, ion channel linked receptors, nuclear receptors, toll like receptors and silent receptors.
- Pharmacokinetic principles: factors governing transport of drugs across biological Membranes (drug transporters – P-glycoprotein); basis of selective distribution of drugs in the body; biotransformation and elimination of drugs; drug elimination kinetics and its clinical importance; bioavailability and bioequivalence.
- Drug interactions, fixed dose combinations and combined use of drugs.
- Adverse effects of drugs including drug toxicity, hypersensitivity, idiosyncrasy, tolerance, dependence, teratogenicity, mutagenicity and carcinogenicity.
- Dose –response relationships, variation in drug response and factors governing it.
- Physiological processes and biochemical mechanisms relevant to the understanding of drug action.
- Etiopathogenesis of diseases relevant to the understanding of therapeutic effect of drugs.
- Basic concepts of immunology needed to understand the immunomodulatory action of drugs.
- Basic knowledge of microbes, viruses and parasites needed to understand the action of anti-microbial and anti-parasitic drugs.
- Ethnopharmacology, chronopharmacology, pharmacoepidemiology, translational pharmacology and reverse pharmacology.
- Essential drugs, P list, rational prescribing.
- Structure – activity relationships in drug action

- Apoptosis pathway and drugs acting on it
- Molecular biology in Pharmacology: pharmacogenomics, proteomics, epigenetics, gene

  expression, PCR, Northern blot, Southern blot, Western blot, antisense oligonucleotides,

  molecular targets of drug actions, and others

❖ **Practical skills:**

- To be able to discuss the action of drugs acting on varied receptors – Chart/ Model-based
- To be able to extract DNA from blood and do genotype analysis using PCR and electrophoresis techniques

4.2 Systemic Pharmacology

- **Pharmacology of drugs acting on**
- Autonomic nervous system
- Cardiovascular system
- Central and peripheral nervous system
- Endocrine system
- Respiratory system
- Renal system
- Haemopoietic system
- Gastrointestinal system
- **Pharmacology of**
- Autacoids and other chemical mediators
- Antibacterial drugs
- Antiviral drugs
- Antifungal drugs
- Antimalarial drugs
- Antimycobacterial drugs
- Antiparasitic drugs
- Cancer Chemotherapy

- Chelating agents
- Nutraceuticals
- Immunoglobulins and vaccines

- **Miscellaneous**
  - Vitamins, minerals, and antioxidants
  - Ocular pharmacology
  - Immunopharmacology
  - Therapeutic gases
  - Dermatological pharmacology
  - Gene therapy
  - Stem cell therapy
  - Pharmacotherapy of migraine
  - Neurodegenerative disease
  - Male sexual dysfunction

❖ **Practical skills:**

- To demonstrate the vasomotor reversal of Dale phenomenon (simulation)
- To find out the effect of a drug on various systems in a healthy volunteer or patient using ECG, PFT, psychometric tests etc.

4.3 Experimental Pharmacology, Research Methodology and Biostatistics

- Principles governing animal experimentation and their limitations in drug evaluations.
- Anesthesia and euthanasia of experimental animals.
- Screening methods for drug activities and animal models used in the evaluation of drugs for actions like – antihypertensive, antianginal, antiarrhythmic, cardiotonic, analgesic, antiepileptic, antipyretic, antipsychotic, antidepressant, anxiolytic, hypnotic, antiparkinsonian, anti-inflammatory, skeletal muscle relaxant, local anaesthetic, antihistaminic, hypoglycemic, antifertility, antitussive, antiulcerogenic, antitumour, diuretics, antiemetics, general anaesthetics, antiplatelet, antihyperlipidemic, antidiarrheal, hepatoprotective agents, antiobesity drugs, antidiabetic drugs, antithyroid drugs, antifertility drugs, antiglaucoma dugs, anticancer drugs, and drugs affecting learning and memory.

- General principles of bioassay of drugs, methods of bioassay of – acetylcholine, histamine, 5-HT, adrenaline/noradrenaline, insulin, digoxin, glucocorticoids, androgens, estrogens, progestins, anabolic steroids, antimicrobials and antimalarials.
- Toxicity studies including acute, sub-acute and chronic toxicity evaluation in animals.
- Basics of cell cultures techniques and in vitro cell culture based on drug toxicity testing.
- Methods involved in testing teratogenicity, carcinogenicity and mutagenicity in animals.
- Transgenic animals, alternative to animal experiments
- Evaluation of addicting liability of drugs, methods of studying intestinal absorption of drugs, methods of studying biotransformation and excretion of drugs.
- Basic principles of physicochemical, chromatographic, radio-immuno and enzyme linked immunoassay of drugs.
- Research methodology including GLP, IAEC, CPCSEA, OECD, SOPs, and others.
- Biostatistics as applied to measurement of drug action.
- Calculation of basic statistical parameters (mean, median, mode, standard deviation, standard error, p value etc), parametric and non-parametric tests (Student 't' test, Wilcoxon, ANOVA etc), meta-analysis.

❖ **Practical skills:**

- Evaluation of various drugs using appropriate animal models.
- To demonstrate the action of agonist and antagonist in an intact animal or an isolated tissue and by animal simulation programs
- Estimation of drug concentration using colorimeter, spectrophotometer, HPLC, and LCMS/MS.
- Calculation of statistical significance in the given data for Student's paired and unpaired 't' test, applying ANOVA to the given set of concentration vs time data of two drug formulations to comment about their bioequivalence.
- In vitro drug toxicity testing using cell cultures techniques.
- Writing a research proposal on animals for ethics committee approval.

4.4 Clinical Pharmacology and Recent Advances in Pharmacology

- Scope of clinical pharmacology and its relevance to optimum use of drugs.
- Preclinical data needed by regulatory authorities before undertaking clinical trial of a new drug.
- Clinical trials: GCP, protocol designing, placebos, phases of clinical trial – their purpose and methodology.
    - ICH guidelines
- Ethical aspects of clinical trials and studies of drugs in human beings.
    - ICMR Ethical Guidelines and its extension such as for children, stem cell research.
- Drug regulations: drug regulatory requirements for clinical trials in India, drugs and cosmetic act, drug price control order
    - The New Drugs and Clinical Trials Rules, 2019
- Pharmacovigilance, hemovigilance, materiovigilance, cosmetovigilance, addictovigilance (medicovigilance)
- Therapeutic drug monitoring: dosage strategies, influence of hepatic, renal, cardiovascular, hormonal, gastrointestinal diseases and ageing on pharmacokinetics of drugs.
- Drug utilization studies, pharmacoeconomics, rational prescribing and concept of essential drugs.
- Bioavailabilty/ bioequivalence studies, Contract Research Organizations (CROs), DSMB/ IDMC, Drug promotion practices
- Perinatal, paediatric, and geriatric pharmacology
- Environmental toxicology and basic principles of management of drug poisoning.
- Medication adherence.
- Evidence-based medicine, real-world evidence studies and pragmatic clinical trials
- Patient safety and medication errors.
- Pharmacogenomics, personalized medicine and precision medicine.
- Application of nanotechnology in pharmacotherapeutics
- Recent advances in the understanding of drug action and their future therapeutic relevance.

❖ **Practical skills:**

- Calculation of pharmacokinetic parameters and clearance from given concentration vs time data.
- Writing for the approval of Investigational New Drug (IND) and New Drug Application (NDA) by regulatory authorities.
- Writing a protocol to conduct phase I II and III clinical trials for a new drug.
- Drafting an informed consent document (PIS and ICF)
- ADR analysis and reporting
- SOP for Phase I/II/III/IV clinical trial
- Writing a research proposal involving humans for ethics committee approval.

5. List of Practical Exercises

- **Experimental Pharmacology**
- Care and handling of laboratory animals
- Biological sample collection from experimental animals
- Instruments and equipments in experimental pharmacology
- Preparation and use of physiological salt solutions
- Bioassay of histamine on guinea pig ileum
    - Dose response curve
    - Matching assay
    - Three-point assay
    - Four-point assay
    - Bioassay of Ach on rat colon
    - Competitive antagonism demonstration
- Bioassay of acetylcholine on rat colon
- Effect of drugs on spontaneous motor activity using actophotometer
- Evaluation of analgesics by Eddy's hot plate and Tail flick method
- Effect of analgesics in Tail flick method
- Evaluation of antidepressants by forced swim test
- Effect of antidepressants in tail suspension test
- Evaluation of antiulcer agents - pylorus ligation method
- Evaluation of antiulcer agents – NSAID-induced ulcer
- Evaluation of antipsychotics - Cook's pole climbing apparatus
- Evaluation of antiepileptics - Maximal electro shock method
- Effect of antiepileptics in pentylenetetrazole-induced convulsions
- **Clinical Pharmacology**
- Study of absorption and bioavailability in man
- Effect of drugs on the pulmonary function tests in bronchial asthma patients.
- Effect of drugs on ambulatory blood pressure, heart rate and ECG
- Overnight polysomnography studies
- **Analytical Techniques**
- Chemical test for identification of drugs (Qualitative)

- Preparation of serial dilution of solutions
- Estimation of sodium salicylate by colorimetry and spectrophotometry
- Separation and detection of a drug by thin layer chromatography
- Paper chromatography
- Estimation of phenytoin level by HPLC
- Biostatistics and Research Methodology
- Presentation of data in tabular and different graphical forms
- Selection of statistical tests
- Analysis of data - manual & software (unpaired & paired t test, one way ANOVA, Wilcoxon test, Mann-Whitney test, regression & correlation)
- Protocol writing
- Literature search
- Study designs
- Styles of reference writing and use of reference manager softwares
- Preparation of master chart and entering in spread sheets
- Sample size calculation and power analysis
- Critical review of published article
- Effective thesis writing
- Publishing a research article

6. Teaching-Learning Methods

- Learning in a MD program is primarily self-directed and in Pharmacology consists of academic (including medical education), research, and laboratory work.
- PG Teacher:

  Faculty having a total of eight years teaching experience out of which at least five years teaching experience as Assistant Professor gained after obtaining the postgraduate (M.D.) degree shall be recognized as postgraduate teachers in Pharmacology.
- Course Duration: Three years (i.e., 36 calendar months)
  - January Session : Commences from 1st January
  - July Session : Commences from 1st July
- Each MD student should have presented in the following departmental academic sessions,
  - Journal Club : once in two months
  - Subject Review : once in two months
  - Debates : once in six months
- Hence, at the end of three years, a MD Pharmacology student should have presented a minimum of 12 journal clubs and subject reviews each. It is mandatory for all the MD students to actively participate and raise queries during the session. The presenting MD student shall be evaluated by the faculty.
- Debates on topics of interest can be conducted. The sessions shall be moderated by faculty.
- The MD students are expected to perform bioassay every month under the supervision of faculty in initial years of training and also independently later on.
- Case discussions are clinically relevant cases are to be conducted regularly – on a case-to-case basis.
- The MD students are encouraged to actively participate workshops, symposia, conferences, and CMEs. However, each student needs to summarize and present on the topics that were covered in the scientific sessions when they report back to duty.
- They are also expected to present oral papers or posters related to their dissertation topics or other research works in scientific meetings at institutional, regional, national, and international forums.

- Log book:

  During the training period, the post graduate student should maintain a Log Book giving details of experimentation done and skills acquired. The log book shall be used to aid the internal evaluation of the student. The Log books shall be checked and assessed periodically by the faculty members imparting the training.

- Compulsory Rotatory Postings (6 months):

  The MD students during their entry into second year of training shall be posted in the following divisions/ departments only in the Morning Sessions (*except, CROs),

  - ADR Monitoring Centre : 15 days
  - Therapeutic Drug Monitoring Centre : 15 days
  - Clinical Trials Unit : 15 days
  - Pharmacogenomics Lab : 15 days
  - Medication Safety Lab : 15 days
  - Emergency Dept./ Casualty : 15 days
  - Critical Care Services (MICU/ SICU/ PICU): 15 days
  - General Medicine : 15 days
  - General Surgery : 15 days
  - Paediatrics : 15 days
  - Obstetrics & Gynaecology : 15 days
  - CROs : 15 days*

  At the end of the external postings, the students have to make a presentation in the departmental meeting regarding what they have learnt.

- The MD students are to be actively involved and facilitate in the conduct of MBBS and other undergraduate practical sessions.
- Further, final MD students shall be allocated few MBBS theory classes and the same can be moderated by a faculty.
- A MD postgraduate is expected to possess a minimum 80% attendance in each calendar year as eligibility for appearing in the final exams.

7. Formative Assessment

- Formative assessment should be continual and should assess medical knowledge, patient care, procedural & academic skills, interpersonal skills, professionalism, self-directed learning and ability to practice in the system.
- The MD student to be assessed periodically as per categories listed in postgraduate student appraisal form present as part of the log book.
- The MD student shall also be assessed at regular intervals (every 6 months) both in theory and practical, as follows,
    - At the end of six months (June/ December)
        - UG Paper I + UG Practicals + Viva Voce
    - At the end of twelve months (December/ June)
        - UG Paper II + UG Practicals + Viva Voce
    - At the end of eighteen months (June/ December)
        - PG Paper I + PG Practicals + Viva Voce
    - At the end of twenty-four months (December/ June)
        - PG Paper II + PG Practicals + Viva Voce
    - At the end of thirty months (June/ December)
        - PG Paper III + PG Practicals + Viva Voce
    - At the end of thirty-two months (October/ April)
        - PG Paper IV + PG Practicals + Viva Voce
- A pre-professional/ send-up/ model exam can be conducted a month before the final exams.
- These formative assessments shall aid the candidate in improvement of his/ her knowledge, skills, attitude, and other competencies.
- A combination of both formative and summative assessment is vital for the successful completion of the PG programme.

8. Dissertation

- MD students are required to submit a dissertation as a partial fulfilment of their course curriculum.
- Dissertation work involves carrying out an original research project by a MD student under the guidance/supervision of a faculty member within the course period and submitting a report in the form of a book.
- Research proposal to be submitted within 6 months of joining date after due to concurrence and necessary inputs from all the faculty members in an intradepartmental meeting
- The research proposals are further to be registered and obtained formal approval, wherever required and mandated, from appropriate and relevant authorities (SAC/ IRC/ IEC/ IAEC/ IBSC/ IC-SCT/ CDSCO/ DBT/ AERB/ CTRI/ HMSC)
- Each student will be allotted a guide as soon as he/she joins the department.
- Guides are to be allotted on a rotation-cum-seniority basis. The senior most faculty with requisite eligibility shall be the guide for the first student and so on. No faculty will normally guide more than two MD students at a time.
- Co-guide shall be from the department or from other departments/ disciplines related to the dissertation topic. The guide will choose the co-guides. Not more than three co-guides and not more than one co-guide from the same department will be allowed.
- The guide shall organize quarterly and half-yearly dissertation progress meetings and submit the minutes of the meetings to all the concerned stakeholders
- The MD student shall make a formal departmental presentation before submission for final approval.
- The dissertation copies shall be submitted both in hard and soft copies both to the Research Cell, the Departmental Library, the Institutional Library, and to other specified divisions.
- Prior acceptance/ approval of dissertation shall be a prerequisite for the candidate to appear in the final/ professional examination.

9. Summative Assessment

- At the end of three years of the M.D. Pharmacology course, an "eligible" postgraduate shall be assessed in the final/ professional examination in the following aspects,
    - Theory : 400 marks
        - Paper I : 100 marks
        - Paper II : 100 marks
        - Paper III : 100 marks
        - Paper IV : 100 marks
    - Practical : 300 marks
    - Viva-voce : 100 marks
- **Examiners:**
    - Board of examiners shall consist of four members.
    - Examiners should be a PG teacher with appropriate qualification and experience.
    - Two will be internal examiners and other two will be external examiners.
    - Out of the two internal examiners one shall be Head of the Department (Chief Examiner/ Moderator) and the 2nd Internal examiner shall be selected on a rotation basis from the available PG teachers.
    - The two external examiners can be invited from other INIs or established Govt./ Pvt. Institutes.
- **Passing guidelines:**
    - Theory : Minimum 50% of aggregate marks (i.e., ≥ 200 marks)
      And minimum 40% in each of the papers (i.e., ≥ 40 marks)
    - Practical + Viva-voce: Minimum 50% of aggregate marks (i.e., ≥ 200 marks)
- **Topics, Pattern, and Mark Distribution:**
    - Theory (10 x 10 = 100 marks)
        - Paper I : **General Pharmacology and Allied Sciences**
        - Paper II : **Systemic Pharmacology**
        - Paper III : **Experimental Pharmacology, Research Methodology and Biostatistics**
        - Paper IV : **Clinical Pharmacology and Recent Advances in Pharmacology**

- Practical
  - Experimental Pharmacology :100 marks
    - Bioassay (1 x 60: 60 marks)
    - Drug Evaluation-Short Experiments (4 x 10: 40 marks)
  - Clinical and Analytical Pharmacology : 100 marks
    - Case-based discussion (25 marks)
    - Drug review (25 marks)
    - ADR reporting and causality assessment (25 marks)
    - Drug assay/ Pharmacokinetic calculation (25 marks)
  - Medical Education, Research Methodology, and Soft Skills : 100 marks
    - Pedagogy/ Microteaching (25 marks)
    - Critical review of published original research/ JC (25 marks)
    - Protocol designing/ writing (25 marks)
    - Biostatistics (25 marks)
- Viva-voce : All topics (Grand viva/ general)

10. Reference Books and Journals

Books (Latest Editions)

- Goodman & Gilman's The Pharmacological Basis of Therapeutics | Laurence L. Brunton et al | McGraw- Hill Education
- Basic & Clinical Pharmacology | Bertram G. Katzung | McGraw- Hill Education/ Lange
- Rang and Dale's Pharmacology | James Ritter et al | Elsevier
- Clinical Pharmacology | Morris Brown et al | Elsevier
- Essentials of Medical Pharmacology | K. D. Tripathi | Jaypee
- Pharmacology & Pharmacotherapeutics | RS Satoskar, Nirmala Rege & SD Bhandarkar | Elsevier
- Pharmacotherapy: A Pathophysiologic Approach | Joseph T. DiPiro et al | McGraw-Hill Education
- Principles of Pharmacology: The Pathophysiologic Basis of Drug Therapy | David E. Golan | Wolters Kluwer
- Medical Statistics from Scratch: An Introduction for Health Professionals | David Bowers | Wiley Blakwell
- Drug Screening Methods | SK Gupta | Jaypee
- Lippincott Illustrated Reviews: Pharmacology | Karen Whalen | Wolters Kluwer
- Avery's Drug Treatment | Trevor M. Speight, Nicholas H.G. Holford | Wiley India Pvt Ltd
- Pharmacoeconomics From Theory to Practice | Renee J. G. Arnold | CRC Press
- Fundamentals of Experimental Pharmacology | M. N. Ghosh | Hilton & Company
- Guide to Drug Development: A Comprehensive Review and Assessment | Bert Spilker | Lippincott Williams & Wilkins
- Introduction to Basics of Pharmacology and Toxicology Volume 1: General and Molecular Pharmacology: Principles of Drug Action | Gerard et al | Springer
- Introduction to Basics of Pharmacology and Toxicology Volume 2 : Essentials of Systemic Pharmacology : From Principles to Practice | Abi Albon et al | Springer

Journals

- British Journal of Pharmacology
- Pharmacology & Therapeutics
- Alimentary Pharmacology & Therapeutics
- Pharmacological Research
- Trends in Pharmacological Sciences
- Clinical Pharmacology & Therapeutics
- British Journal of Clinical Pharmacology
- European Journal of Pharmacology
- Pharmacological Reviews
- Annual Review of Pharmacology and Toxicology
- Journal of Pharmacology and Experimental Therapeutics
- Cancer Chemotherapy and Pharmacology
- Molecular Pharmacology
- Drugs
- Fundamental and Clinical pharmacology
- European Journal of Clinical Pharmacology
- Frontiers in Pharmacology
- Pharmacogenomics Journal
- Pharmacogenetics and Genomics
- Journal of Ethnopharmacology
- Nature
- Science
- Lancet
- JAMA
- Indian Journal of Pharmacology
- Journal of Pharmacology and Pharmacotherapeutics

11. Model Question Papers

Paper I: General Pharmacology and Allied Sciences

Time: 3 hours **Max. Marks: 100**

Instructions:

- Attempt all questions in order.
- Each question carries 10 marks.
- Read the question carefully and answer to the point neatly and legibly.
- Start the question to a question on a fresh page or leave adequate space between two answers.
- Draw table/diagrams/flowcharts wherever appropriate.

1. Methods of Pharmacovigilance with their advantages and limitations. (5)
   Pharmacogenomics interlink with pharmacovigilance, giving examples. (5)

2. Difference between partial agonist and inverse agonist giving suitable examples. (4)
   Define median lethal dose and median effective dose and their importance in Therapeutics. (6)

3. Define bioavailability and how it is determined. Give suitable examples. (5)
   What is the difference between pharmaceutical equivalent and therapeutic equivalent? Give suitable examples. (5)

4. Role of Placebo in clinical trials. (5)
   Mention advantages and disadvantages of fixed dose combination. (5)

5. Principles and steps in preparing National List of Essential Medicine (NLEM). (5)
   Potential uses of NLEM in rational therapeutics. (5)

6. Define plasma half-life of a drug and its clinical significance with suitable examples. (5)
   Nanotechnology in drug delivery system. (5)

7. Define drug dependence and its mechanisms. (5)
   Principles of treatment of drug dependence with suitable examples. (5)

8. Compare and contrast between Therapeutic Index and Therapeutic Window. (5)
   Factors influencing first pass metabolism of drugs and therapeutic implication of this phenomenon. (2 + 3)

9. Define chronopharmacology. (2)
   Aims of chronopharmacology. (3)
   Utility of chronopharmacology in clinical practice. (5)

10. ABC transporters. (5) Clinical relevance of these transporters. (5)

Model Question Papers (Contd.)

Paper II: Systemic Pharmacology

Time: 3 hours **Max. Marks: 100**

Instructions:

- Attempt all questions in order.
- Each question carries 10 marks.
- Read the question carefully and answer to the point neatly and legibly.
- Start the question to a question on a fresh page or leave adequate space between two answers.
- Draw table/diagrams/flowcharts wherever appropriate.

1. Mention the various classes of anti-depressant drugs along with examples for each class. (4)
   Enumerate the mechanism(s) of actions, uses and side effects of TCAs. (2+2+2)

2. Pharmacotherapy of MDR & XDR tuberculosis. (5)
   Adverse effects, precautions and important drug interactions of rifampicin. (5)

3. Enumerate dual PPAR agonists. (2)
   Mechanisms of action, advantages and therapeutic potential of dual PPAR agonists. (3+2+3)

4. Uses and side effects of chloroquine. (2+2)
   Pharmacotherapy of chloroquine resistant malaria. (6)

5. Mechanism of action, uses and side effects of NSAIDs. (2+2+2)
   Enumerate DMARDs used in rheumatoid arthritis. (4)

6. Pharmacotherapy of CHF. (5)
   Role of Angiotensin Receptor Neprilysin Inhibitor (ARNI) in CHF. (5)

7. Third generation β-blockers. (5)
   Their role in therapy of cardiac disorders. (5)

8. Etiopathogenesis and management of ‘On-Off’ phenomenon due to Levodopa. (5+5)

9. Current strategies to overcome antimicrobial resistance (5)
   Pharmacotherapy of osteoporosis (5)

10. Molecular adaptations responsible for opiate withdrawal. (5)
    Role of various agents used in opiate withdrawal. (5)

Model Question Papers (Contd.)

Paper III: Experimental Pharmacology, Research Methodology and Biostatistics

Time: 3 hours **Max. Marks: 100**

Instructions:

- Attempt all questions in order.
- Each question carries 10 marks.
- Read the question carefully and answer to the point neatly and legibly.
- Start the question to a question on a fresh page or leave adequate space between two answers.
- Draw table/diagrams/flowcharts wherever appropriate.

1. Principle, applications and limitations of:
   a) HPLC (5)
   b) ELISA (5)

2. Write the in-vitro and animal toxicity tests required for new drug development. (5)
   What are preclinical evaluation methods for potential antiepileptic new chemical entity? (5)

3. What are the ethical and regulatory issues in use of animals in biomedical research? (5) Composition and functions of Institutional Ethics Committee for research in human subjects. (5)

4. What is High Throughput Screening in drug development? (5)
   Experimental screening methods for potential antiarrhythmic activity of New Chemical Entity (NCE). (5)

5. Which are the sampling errors in drug screening program? (2)
   What is the impact of sampling errors? (3)
   Enumerate the ways of reducing these errors. (5)

6. Define pA2 value. (2)
   Method of determination of pA2 value. (4)
   Applications of pA2 determination. (4)

7. Parametric versus Non-Parametric tests. (5) Co-efficient of Variation. (5)

8. What is a surrogate marker in a clinical trial? (5)
   What are their merits and demerits? (5)

9. Role and responsibilities of DSMB in clinical trials. (5)
   Clinical trial registry of India – Role and functioning. (5)

10. Informed consent in clinical trials. (5)
    Ethical issues in clinical trials in vulnerable population. (5)

Model Question Papers (Contd.)

Paper IV: Clinical Pharmacology and Recent Advances in Pharmacology

Time: 3 hours **Max. Marks: 100**

Instructions:

- Attempt all questions in order.
- Each question carries 10 marks.
- Read the question carefully and answer to the point neatly and legibly.
- Start the question to a question on a fresh page or leave adequate space between two answers.
- Draw table/diagrams/flowcharts wherever appropriate.

1. Enumerate the different preparations and advantages of newer insulins. (5)
   Role of incretin-based therapy for diabetes mellitus. (5)

2. List the therapeutics against COVID-19. (3)
   Elaborate on their mechanism of action and clinical use in COVID-19. (3+4)

3. Define co-analgesics and give suitable examples. (2+3)
   WHO guidelines for the treatment of chronic pain. (5)

4. Biosimilars (5)
   Pharmacotherapy of Alzheimer's disease. (5)

5. Enumerate giving reasons of life saving and life style drugs giving examples. (5)
   What is the pharmacological rationale and dosage schedule of adrenaline in anaphylactic shock? (5)

6. Enumerate drugs causing nephrotoxicity and mention measures to clinically monitor the patient on nephrotoxic drug. (5)
   What role Pharmacogenomics can have in drug discovery? (5)

7. Off label use of drugs with examples. (4)
   Medication errors, types and role of pharmacologist to control in hospital (6)

8. Orphan drugs. (5)
   Drug patents. (5)

9. Current status of malaria and dengue vaccine. (5)
   Antibiotic stewardship programme. (5)

10. Define biomarker. (2)
    Uses of biomarkers for personalized medicine. (3)
    Biomarker regulatory validation. (5)