



MAHATMA GANDHI UNIVERSITY
of
MEDICAL SCIENCES & TECHNOLOGY
JAIPUR

Syllabus

M.Sc. (Medical) PHARMACOLOGY

(3 Years Degree Course)

Notice

1. Amendment made by the Board of the Management of University in Rules/Regulations of Post Graduate Medical Courses shall automatically apply to the Rules/Regulations of the Mahatma Gandhi University of Medical Sciences & Technology (MGUMST), Jaipur.
2. The University reserves the right to make changes in the syllabus/books/guidelines, fees-structure or any other information at anytime without prior notice. The decision of the University shall be binding on all.
3. The Jurisdiction of all court cases shall be Jaipur Bench of Hon'ble Rajasthan High Court only.

RULES & REGULATIONS

M.Sc. (Medical) PHARMACOLOGY

ELIGIBILITY FOR ADMISSION:

For admission a candidate should have passed qualifying examination as under :

1. B.Sc. (with at least one subject of Biological sciences) / MBBS / B.D.S. / B.A.M.S. / B.H.M.S. / B.P.T. / B.O.T / B.Pharma / B.Sc. Nursing / B.Sc. Biotech. / B.V.Sc. and A.H. from a recognized University / Institution. B.Sc. graduate with Physics and Chemistry as optional subjects could be considered for M.Sc. Biochemistry.
2. Minimum 50% marks in the qualifying examination are required for consideration for admission.

DURATION OF COURSE:

1. The period of training for M.Sc. (Med.) course shall be of 3 years from the date of registration.
2. M.Sc.(Med.) Part-I shall be of 1 year duration.
3. M.Sc.(Med.) Part II of 2 years duration from the date of passing M.Sc.(Med.) Part-I Examination.
4. Only those candidates will be allowed to appear at M.Sc.(Med.) Pt. II examination, who have passed M.Sc.(Med.) Pt. I examination completely.
5. The students who have been registered late in the Medical College will not be allowed to appear in the regular examination and they will be required to complete the period of study prescribed and fulfill the requirement of attendance.
6. The candidate will undertake the Post-graduate training as a full time post graduate in the department concerned or as an in service trainee in the discipline concerned. The candidate after passing M.Sc. (Med.) Pt. I Examination shall also be required to participate in the Under-graduate training in his subject. The Head of the Department concerned shall certify that the student has been regular and undergone training programme according to the requirements.

ATTENDANCE:

1. The M.Sc.(Med.) Part-I & Part-II Course will have compulsory 75% attendance in theory and practical separately in the opted branch.
2. A candidate lacking the prescribed attendance and progress in any theory and/or practical paper shall not be permitted to appear in the examination.

M.Sc. (Medical) Pharmacology Part I

EXAMINATION AND ASSESSMENT

1. The examination in M.Sc. (Med.) Pt. I shall consist of Theory papers only.
2. Theory
 - (a) Each theory paper shall be of 3 hours
 - (b) Paper I of all branches shall consist of 3 sections viz. A, B and C (Anatomy, Physiology, Biochemistry). Each section will consist of 3 questions out of which the candidate will have to attempt 2 questions. Each section will be of 25 marks.
 - (c) Paper II of Anatomy, Physiology and Pharmacology shall consist of three sections viz. A,B and C of subjects Pharmacology, Pathology and Microbiology, each of 25 marks (Total-75 marks). In case of Biochemistry and Microbiology, paper II shall consist of two sections viz. A and B of subjects Pathology and Microbiology, each of 38 and 37 marks respectively (Total 75 marks).
 - (d) Each section will be answered in separate answer books.
 - (e) A common paper shall be set by the external examiner of respective branches for Paper I, which shall be used in all branches. A common paper shall be set by external examiner for Paper II of Anatomy, Pharmacology and Physiology and a separate

paper for Paper II of Biochemistry and Microbiology. The answer copies shall be evaluated by the senior most Internal examiner.

- (f) In order to pass the examination, the candidate must secure a minimum of 50% marks in each paper.
- (g) A candidate who has failed in one or more paper of M.Sc. (Med.) Pt. I examination must appear in that failing paper in the Supplementary Examination which will be conducted by the University within 4-6 months.
- (h) A candidate shall be permitted a maximum of 4 attempts or for 2 years to complete the Part-I M.Sc. examination from the year of admission.

SCHEME OF EXAMINATION:

Anatomy

Paper I (5010)	Anatomy, Physiology and Biochemistry	75 marks
Paper II (5020)	Pathology, Microbiology and Pharmacology	75 marks

Physiology

Paper I (5010)	Anatomy, Physiology and Biochemistry	75 marks
Paper II (5020)	Pathology, Microbiology and Pharmacology	75 marks

Biochemistry

Paper I (5010)	Anatomy, Physiology and Biochemistry	75 marks
Paper II (5030)	Pathology and Microbiology	75 marks

Pharmacology

Paper I (5010)	Anatomy, Physiology and Biochemistry	75 marks
Paper II (5020)	Pathology, Microbiology and Pharmacology	75 marks

Microbiology

Paper I (5010)	Anatomy, Physiology and Biochemistry	75 marks
Paper II (5030)	Pathology and Microbiology	75 marks

M.Sc. (Medical) Pharmacology Part II

EXAMINATIONS:

1. Thesis

- (a) Each candidate after passing M.Sc. (Med.) Pt. I Examination will submit plan for the thesis on the proposed subject through his Guide, Head of the Department and the Head of Institution shall forward it to the University for registration of the candidates as to reach the Registrar's Office within six months from the date of his/her declaration of the result of M.Sc. Pt. I Examination. The thesis/ dissertation will be submitted to the University at least 4 months before the date fixed for the M.Sc. (Med.) Pt. II examination. In exceptional circumstances the thesis/ dissertation could also be accepted atleast 3 months before the date fixed for the examination on the recommendation to that effect made by the guide and the Principal.
- (b) No candidate will be permitted to change the subject of his/her thesis/ dissertation without prior approval of the University.
- (c) The thesis/ dissertation may relate to the study of series of at least 30 clinical cases in the same subject/ specialty or may be research on specific problem. The presentation of material in the thesis/dissertation should be precise and concise and the number of pages should not exceed 100. The thesis/ dissertation shall embody the result of candidate's own work. This work shall include precise methods of investigations. He

will be required to submit 4 type written copies of the thesis/ dissertation prepared under direction and guidance of the guide. Approval by the examiner of the thesis submitted by a candidate shall be pre-condition for his admission to the written Part of the M.Sc. (Med.) Pt. II Examination. The Thesis shall be evaluated by two external examiners and two internal examiners of the branch concerned. It will be deemed to have been approved, if it is approved by a majority of the examiners and, similarly, it will be deemed to have been rejected if it is not approved by a majority of the examiners. If two examiners approve the thesis and the other two reject it shall be referred to a fifth examiner (external) whose judgment shall be treated as final. In case the thesis submitted by a candidate is rejected, he shall be required to submit a fresh thesis/ dissertation.

- (d) A candidate who has submitted his/her thesis/ dissertation once and the same has duly been approved by the examiners, will not be required to submit a fresh one if he/she reappears for the examination in the same branch on a subsequent occasion. Thesis / Dissertation may also form the basis of the oral examination and due credit may be given for the same. The examiner may also inform the University about any outstanding thesis in a particular branch. The approved thesis or dissertation will be the property of the University and could be published with the permission of the University.
- (e) If a candidate seeks admission to an examination in any other branch, he shall be required to submit a fresh thesis/ dissertation.

2. Theory

- (a) There will be three papers in all branches for M.Sc. (Med.) Part-II Examination, each of three hours duration.
- (b) All papers of the all branches will be set by the External Examiner.
- (c) Paper I and II will be assessed by the External Examiners who have set the question paper and whose question paper have been utilized in the examination and Paper III will be assessed by Internal Examiner viz Head of the Dept. of the Subject concerned.

3. Practical & Oral

There shall be a Practical & Oral examination in all branches conducted by Two Internal Examiners and Two External Examiners who will be appointed by the University.

1. Practical	200 Marks
2. Viva-voce	

4. Result

- (1) The candidate shall be required to secure at least 50% marks in theory papers and 50% marks in practical including viva-voce separately to pass the examination.
- (2) In case a student passes either in theory or in practical only, the student shall be considered to have failed in the whole examination and he will have to appear in both the theory and practical in the subsequent examination.
- (3) A candidate shall be permitted a maximum of 4 attempts or for 5 years to complete M.Sc. (Med.) Part-II from the date of initial admission in M.Sc. (Med.) Part I.
- (4) The provisional certificate and degree will be issued by the University after the candidate's having passed the theory & practical examination of M.Sc. Part II, along with approval of the Thesis/Dissertation.
- (5) No grace marks will be provided in M.Sc examinations. No Revaluation shall be permitted in the M.Sc examinations. However, the student can apply for scrutiny of the answer books.

SCHEME OF EXAMINATION:

Name of Paper	No. of Questions to be set	No. of Questions to be answered
Paper I	4	4
Paper II	4	4
Paper III	4	4

Anatomy

Paper I (5201)	- Human Gross Anatomy	100 Marks
Paper II (5202)	- Neuroanatomy, Microanatomy and History of Anatomy	100 Marks
Paper III (5203)	- Developmental Anatomy, Genetics, Recent Advances, Comparative Anatomy & Evolution	100 Marks

Physiology

Paper I (5241)	- Bio-Physics and Bio-Chemistry and Physiology (including) Histology of Muscles, Nervous, Circulation and Respiration.	100 Marks
Paper II (5242)	- Physiology (including Histology Except topics included in the first paper)	100 Marks
Paper III (5243)	- Comparative Animal Physiology and History of Physiology, Genetics and Principles of Biostatistics	100 Marks

Bio-chemistry

Paper I (5231)	- General Bio-Chemistry & Metabolism	100 Marks
Paper II (5232)	- Nutrition, Environmental & Clinical Biochemistry	100 Marks
Paper III (5233)	- Molecular Biology & Immunology, Biostatistics & Research methodology	100 Marks

Pharmacology

Paper I (5211)	General Pharmacology Principles, Clinical Pharmacology & History	100 Marks
Paper II (5212)	-Systemic Pharmacology, Chemotherapy and Recent Advances	100 Marks
Paper III (5213)	Experimental Pharmacology, Biostatistics & Biochemical Pharmacology	100 Marks

Microbiology

Paper I (5221)	- General Bacteriology and Immunology	100 Marks
Paper II (5222)	- Systematic Bacteriology and Clinical Microbiology	100 Marks
Paper III (5223)	- Virology, Mycology, Parasitology and Recent Advanced in Microbiology	100 Marks

M.Sc. (Medical) Part I

**ANATOMY
(For all Branches)**

GENERAL ANATOMY:

- (1) Anatomical terminology, Anatomical planes, Anatomical positions, Clinical positions, Terms related to movements
- (2) Musculoskeletal system:
 - (a) Bones & their classification, Morphology, ossification, blood supply
 - (b) Muscles: Morphology, classification, blood supply, innervations, functions
- (3) Integumentary system: Thick Skin, Thin skin, layers of dermis & epidermis, Skinappendages, blood supply, innervations, functions
- (4) Cardiovascular system: Morphology of blood vessels, classification of blood vessels, blood capillaries, blood circulation, functions
- (5) Nervous system: Central Nervous system & Peripheral Nervous system, Gross basic Anatomy, Cranial nerves, Spinal nerves, Functions of nerves, Autonomic nervous system
- (6) Lymphatic system: Formation of lymph, Lymphatic ducts, Thoracic duct, Lymph circulation, functions
- (7) Digestive system: Parts of digestive system, gross anatomy and functions
- (8) Excretory system: Parts of excretory system, gross anatomy of kidney, ureter, urinary bladder, and their functions
- (9) Reproductive system: Male reproduction system- gross anatomy of penis, testis, epididymis, vas-deferens, seminal vesicles and prostate. Female reproductive system- gross anatomy of ovaries, uterine tube, uterus, vagina, menstruation cycle

PHYSIOLOGY **(For all Branches)**

CELL PHYSIOLOGY:

- (1) Membrane transport, Bio-membrane potentials, Nernst equation,
- (2) Composition of ECF and ICF, Goldmann equation.

NERVE-MUSCLE:

- (1) Neuron (structure, functions and classification) and neuroglia,
- (2) Action potential, neuromuscular junction,
- (3) Skeletal muscle (structure, mechanism of contraction).
- (4) Smooth muscle (structure, mechanism of contraction).

BLOOD:

- (1) Function and composition,
- (2) Erythrocytes,
- (3) Hemoglobin,
- (4) Blood groups,
- (5) Leucocytes,
- (6) Thrombocytes,
- (7) Immunity (basics).

CARDIOVASCULAR SYSTEM:

- (1) Cardiac muscle,
- (2) Physiological Anatomy of heart and conduction system,
- (3) Normal ECG, cardiac cycle, heart sounds,
- (4) Cardiac output and blood pressure,
- (5) Coronary circulation,
- (6) Common symptoms of cardiovascular illness (basics only).

RESPIRATION:

- (1) Functional Anatomy of the respiratory system,
- (2) Mechanism of breathing, dead space, surfactant, dynamic and static lung volumes and capacities,
- (3) Transport of oxygen and carbon dioxide,
- (4) Regulation of respiration: neural and chemical
- (5) Cyanosis,
- (6) Hypoxia,
- (7) Oxygen therapy,
- (8) Artificial respiration.

GASTROINTESTINAL TRACT:

- (1) Functional Anatomy,
- (2) salivary glands (secretion and functions of saliva, deglutition),
- (3) Stomach (composition, regulation of secretion and functions of the gastric juice),
- (4) Liver and its functions.
- (5) Pancreas (secretion and function),
- (6) Intestinal secretion (composition and functions), movement of intestines,
- (7) Hormones of GIT (Basic only).

EXCRETORY SYSTEM:

- (1) Functions of kidney,
- (2) Juxta glomerular apparatus,
- (3) Formation of urine, counter current mechanism,
- (4) Role of kidney in maintenance of acid base balance,
- (5) Renal function tests

AUTONOMIC NERVOUS SYSTEM:

- (1) Organization of the ANS,
- (2) Neurotransmitters,
- (3) Effect of Sympathetic and Parasympathetic stimulation on different organ systems.

ENDOCRINE SYSTEM

- (1) Introduction
- (2) Enumerate the endocrine glands and their functions

REPRODUCTIVE SYSTEM

- (1) Introduction
- (2) Menstrual cycle , male/female sex hormones
- (3) Methods of contraceptions

CENTRAL NERVOUS SYSTEM

- (1) General organization of CNS & PNS,
- (2) Sensory system (general sensations, receptors, sensory pathways, sensory areas of brain)
- (3) Motor system: (Spinal reflexes, reflex arc, corticospinal and extra pyramidal tracts)

BIOCHEMISTRY

(For all Branches)

BASICS OF BIOCHEMISTRY:

- (1) Cell structure and function and transport through the biological membrane.
- (2) Chemistry of Biomolecules – carbohydrate, lipids, amino acids, proteins and nucleic acids.
- (3) Chemistry of Blood & Haemoglobin.
- (4) Enzymes – Nature and classification, concepts, Kinetic, mechanism of action.
- (5) Bioenergetics and Biological oxidation.
- (6) Metabolism of Carbohydrates, Proteins, Lipids and Nucleotides.
- (7) Integration of metabolism.
- (8) Nutrition, Vitamins & Minerals.
- (9) Detoxification & Xenobiotics.
- (10) Molecular Biology.
- (11) Organ function tests.
- (12) Immunology.
- (13) Analytical & Physical Biochemistry – Electrolytes, buffer systems, Law of mass action, viscosity, surface tension, osmosis, Donnan equilibrium, Dialysis, free energy, high energy linkages, molecular weight determination.
- (14) Principles, working & applications of : a) Colorimetry b) Spectrophotometry c) Flame Photometry d) Fluorimetry e) Atomic absorption spectroscopy g) Ultra centrifugation.

PHARMACOLOGY
(For all Branches except Microbiology and Biochemistry)

GENERAL PHARMACOLOGY:

- (1) Introduction to Pharmacology
- (2) Nature and Sources of Drugs & Drug Information
- (3) Dosage forms & Drug Nomenclature
- (4) Routes of drug administration,
- (5) Drug delivery systems
- (6) Pharmacokinetics (Absorption, Distribution, Metabolism and Excretion of drugs)
- (7) Therapeutic drug Monitoring
- (8) Pharmacogenomics and Pharmacogenetics
- (9) Drug receptors and Pharmacogenetics
- (10) Factors Modifying Drug Action
- (11) Drug administered in special situations: Pregnancy, Lactation, Pediatrics & Geriatrics.
- (12) Adverse drug reactions & Pharmacovigilance
- (13) Aspects of Pharmacotherapy & Clinical pharmacology
- (14) Drug Interactions
- (15) Drug development process and Regulations
- (16) Rational Drug concept
- (17) Essential drug concept
- (18) Fixed Drug Combinations
- (19) Evidence based Medicine

II Classification and pharmacological actions of drugs acting on various systems: -

1. Autonomic nervous system
2. Peripheral Nervous System
3. Central nervous system
4. Renal system
5. Cardiovascular System
6. Gastrointestinal system
7. Respiratory system
8. Uterine motility

III. Classification and pharmacological actions of

1. Autacoids and related drugs
2. Chemotherapy of microbial diseases
3. Antineoplastic agents
4. Immunomodulators
5. Drugs affecting blood
6. Hormones and Related drugs
7. Vitamins

RECOMMENDED TEXTBOOKS

- Goodman & Gilman's The Pharmacological Basis of Therapeutics, ed. Laurence Brunton, Bruce A. Chabner, Bjorn Knollman.
- Essentials of Medical Pharmacology, by KD Tripathi
- Basic and Clinical Pharmacology, by Bertram G. Katzung and Anthony J. Trevor

MICROBIOLOGY
(For all branches)

GENERAL BACTERIOLOGY:

- (1) Cell Structure
 - (a) Microscopy, staining,
 - (b) Detailed structure in comparison to Eukaryotic cell, Morphological change during growth.
- (2) Microscopy
 - (a) Various optical methods available for viewing micro organism and their applications.
- (3) Overview of Microbial Worlds
 - (a) Basic principles and Purpose of Classification systems
- (4) Growth Survival of Micro-organism
 - (a) Growth
 - (b) Growth parameters
 - (c) Definition and measurement of bacterial growth
 - (d) Survival of micro-organisms in natural environment
 - (e) Role of antimicrobial agents.
- (5) Cultivation of micro-organisms
 - (a) Growth requirements
 - (b) Sources of metabolic energy
 - (c) Nutrition
 - (d) Environmental and other factors affecting growth
 - (e) Methods of cultivation
- (6) Microbial Metabolism
 - (a) Metabolism of biosynthesis and growth
 - (b) Biosynthesis pathways
 - (c) Energy Yielding metabolism
 - (d) Regulation of metabolic pathways
- (7) Bacterial Genetics
 - (a) Structure and replication of bacterial DNA plasmids
 - (b) Variation :
 - i. Mutation
 - ii. Transfer of genetic material
 - (c) Recombine DNA technology
- (8) Control of micro organism
 - (a) Sterilization & Disinfection
 - (b) Antimicrobial agents & bacterial resistance
- (9) General Principles in clinical microbiology
 - (a) Collection and handling of various samples
 - (b) Laboratory safety
 - (c) Quality control
 - (d) Antimicrobial susceptibility and assay
 - (e) Laboratory animals-handling and care

PATHOLOGY
(For all branches)

INTRODUCTION TO PATHOLOGY:

- (1) Definition
- (2) Cause of cell injury
- (3) Reversible and irreversible injury
- (4) Pathologic calcification
- (5) Cellular adaptations in brief.

INFLAMMATION AND REPAIR:

- (1) Acute and Chronic inflammation
- (2) Chemical mediators of inflammation

HEALING:

- (1) By primary and secondary intention
- (2) Factors affecting wound healing

HEMODYNAMIC DISORDERS:

- (1) Edema
- (2) Shock

NEOPLASIA:

- (1) Definition, Nomenclature
- (2) Characteristic of benign and malignant neoplasm
- (3) Metastasis in brief
- (4) Carcinogenesis in brief.

HAEMOPOIETIC SYSTEM:

- (1) Anemia
- (2) IDA, Megaloblastic, Thalassaemia, SCA, G6PD, deficiency, Haemophilia, Leukaemia
- (3) Lab investigation of haemorrhagic disorders.

LIVER:

- (1) Liver function test, Jaundice, Hepatitis-B

KIDNEY:

- (1) Stones, Nephrotic Syndrome, Renal Function Test
- (2) ARF, CRF
- (3) Glomerular nephritis in brief.

THYROID:

- (1) Goitre, Thyroiditis
- (2) Hypo and Hyperthyroidism

BONE:

- (1) Osteomyelitis, TB
- (2) Common Tumors

GALL BLADDER:

- (1) Gall stones, Cholecystitis

BLOOD GROUPS AND COAGULATION

PANCREAS:

- (1) Diabetes Mellitus, Pancreatic Function Test

1. SYLLABUS

1.1 Theory

Paper I (5211) : General Pharmacology Principles, Clinical Pharmacology & History

General Pharmacology

- (1) Introduction
 - (a) Definition,
 - (b) Nature & sources of drugs & drug information, dosage forms, drug Nomenclature.
- (2) Routes of drug administration: Advantages & disadvantages of important routes used.
- (3) Drug delivery systems
- (4) Pharmacokinetics
 - (a) Absorption: General Principles for passage of drugs across biological membranes, factors affecting absorption, transport, bioavailability.
 - (b) Distribution: Plasma protein binding, biological barriers (BBB & Placental), volume of distribution, tissue storage.
 - (c) Biotransformation: Principle phases (I & II), sites, types with examples. Factors affecting (Induction, Inhibition, tissue storage).
 - (d) Elimination: Routes, Kinetics Half-Life, Loading dose, Maintenance dose. Methods of prolongation of drug effect, Factors modifying dose of a drug.
- (5) Pharmacodynamics I
 - (a) Principles of drug action,
 - (b) Mechanism of drug action,
 - (c) Receptors - Agonist, partial agonist, inverse agonist, antagonist
 - (d) Receptors - Transducer mechanism.
 - (e) Dose-response relationship,
 - (f) Drug efficacy & potency, Therapeutic index, LD 50 & ED 50,
 - (g) Synergism and Drug antagonism.
 - (h) Factors modifying drug action
- (6) Adverse drug reactions, pharmacovigilance
- (7) Drug Interactions
- (8) Rational Drug concept, P Drugs
- (9) Essential drug concept
- (10) Evidence based Medicine
- (11) Pharmacoeconomics
- (12) Fixed Dose Combinations
- (13) Pharmacogenetics, Pharmacogenomics and Personalized Medicine
- (14) Cell based and Recombinant DNA therapies
- (15) Alternative Medicines: Herbals & Nutraceuticals
- (16) Drugs administered in special situations: Pregnancy, Lactation, Paediatrics & Geriatrics
- (17) Pharmacoeconomics

Clinical Pharmacology

(1) Drug Regulations

Drug and Cosmetics Act, Drug Price Control order, Application for Investigational New Drug (IND), Application for New drug Discovery (NDD) according to Indian Control Authority & USFDA guidelines. Conducting bio-equivalence studies. Ethical considerations in utilizing

human subjects for drug discovery process. Helsinki's declaration. ICH-GCP Guidelines.

(2) Phases of Clinical trial

(3) Therapeutic drug Monitoring

(4) Clinical Pharmacokinetics

History

(1) Wonder Discoveries in Pharmacology

(2) Nobel laureates in Pharmacology and their revolutionary discoveries.

Paper II (5212): Systemic Pharmacology, Chemotherapy and Recent Advances

(1) Autonomic nervous system and Peripheral Nervous System

(2) Central nervous system

(3) Autacoids

(4) Drugs affecting kidney function and Cardiovascular system

(5) Drugs affecting gastrointestinal and respiratory system

(6) Drugs affecting uterine motility

(7) Chemotherapy of parasitic infections

(8) Chemotherapy of microbial diseases

(9) Antiviral Drugs

(10) Antineoplastic agents

(11) Immunomodulators

(12) Drugs acting on blood and blood forming organs

(13) Hormones and Related drugs

(14) Miscellaneous -

(a) Vitamins (water soluble and fat-soluble vitamins)

(b) Antioxidants.

(c) Drug addiction and Drug abuse

(d) Dermatological pharmacology

(e) Ocular pharmacology

(f) Toxicology

-Heavy metal poisoning and heavy metal antagonists

-Management of over dosage with commonly used therapeutic agents.

(15) Recent developments in Pharmacology time to time

Paper III (5213): Experimental Pharmacology, Biostatistics & Biochemical Pharmacology

Experimental methodologies involved in the discovery of drugs (in vivo, in vitro, ex vivo). Animal handling and animal care. Ethical guidelines in utilizing animals for experimental purposes. Methods of anaesthetizing animals and methods of euthanasia. Restraining and blood collecting methods. Preclinical toxicological studies. Calculation of LD50 & ED 50. Acute, subacute and chronic toxicity studies. Pre-clinical pharmacokinetic and dynamic studies. High throughput screening (in vitro and in vivo) for pre-clinical pharmacokinetic and pharmacodynamic studies. Methods involved in testing teratogenicity, carcinogenicity and organ toxicities in animals.

Drug screening methods involved in the evaluation of anti-ulcer, prokinetic agents, antiemetics, antianginal, antihypertensive, antiarrhythmic, antidiabetic, antifertility agents, anti-platelet, analgesic, antipyretic, antiinflammatory, antiepileptics, antidepressants, antianxiety, antipsychotics, sedatives-hypnotics, antiparkinsonian local anaesthetics, muscle relaxants, antihyperlipidemics, antiasthmatics, cough suppressants, diuretics & anticancer drugs. Behavioral pharmacology models and evaluation of drugs affecting learning and memory.

Biostatistics

Calculation of basic statistical parameters (mean, median, mode, standard deviation, standard error etc.) Null hypothesis, parametric and non parametric tests (student 't' test, Wilcoxon, ANOVA etc.) Meta analysis.

Biochemical Pharmacology

Basic principles and applications of simple analytical methods • Principles of quantitative estimation of drugs, endogenous compounds and poisons using Colorimetry, Spectrophotometry, flame photometry, High Performance Liquid Chromatography (HPLC) and enzyme-linked immunosorbent assay (ELISA). Good laboratory practice.

1.2 Practical

Clinical Pharmacology & Therapeutics

- (1) Rational basis of therapeutics (P-drug concept, Essential drugs)
- (2) Rational use of drugs
- (3) Evaluation of fixed dose combinations and Rational Drug Therapy.
- (4) Dosage forms and calculations
- (5) Instructions for use of dosage forms.
- (6) Preparing instructions for patients regarding use of some drugs.
- (7) Clinical Pharmacokinetics
- (8) Clinical drug evaluation
- (9) Clinical trial designing
- (10) Clinical trial ethics
- (11) Medico-legal aspects of clinical trials
- (12) Pharmacovigilance
- (13) Drugs and Cosmetic Act
- (14) Data archiving and management
- (15) Drug audit (Pharmacoepidemiology, Pharmacoeconomics)
- (16) Evidence Based Medicine
- (17) Statutory and legal requirements for conduct of clinical trials (including drug schedules)

Experimental Pharmacology

- (1) Study of some basic instruments used for isolated tissue experiments.
- (2) Study of some basic animal techniques:
- (3) Techniques for injection of drugs and collection of blood samples, feeding of animals.
- (4) Different laboratory animals and their application in experimental pharmacology, breeding data, housing and animal feeds.
- (5) Preparation and administration of a drug solution in appropriate strength and volume.

- (6) Study design
- (7) Bioassay
- (8) CPCSEA
- (9) Alternatives to animal experiments (cell culture, cell lines)
- (10) Screening for Pharmacological activity with special reference to the following activities:
 - (a) Analgesic-Antipyretic
 - (b) Anticonvulsant
 - (c) Sedative-hypnotics
 - (d) Anti-depressant
 - (e) Anti-parkinsonian
 - (f) Anti-inflammatory
 - (g) Local anesthetic
 - (h) Motor in-coordination
 - (i) Anxiolytic effect
 - (j) Conditioned Avoidance Response
 - (k) Anti-inflammatory effect
- (11) To prepare log dose response curve of a suitable drugs
- (12) Effect of Drugs on guinea pig ileum, frog rectus abdominis, rabbit ileum
- (13) To perform bioassay of a suitable drug on:
 - (a) Guinea pig ileum
 - (b) Frog rectus abdominis
- (14) To study the stimulatory and depressant effects of drugs on rabbit gut.
- (15) To study the effect of coronary vasodilator drug on perfused rabbit heart (Langendroff's technique).
- (16) Determination of pA₂ value of acetylcholine on guinea pig ileum.
- (17) To study the effect of unknown drugs using rabbit eye.
- (18) Clinical/human experiments
- (19) Computer Aided Learning (CAL) Program
- (20) Proficiency in using CAL programs for demonstration of effects of drugs on animals.

Chemical Pharmacology Exercises

- (1) Identification of unknown compounds by using chemical tests.
- (2) Estimation of drug level using colorimetry, spectrophotometry, fluorimetry, flame photometry, high performance liquid chromatography (HPLC), enzyme linked immunoassay.

Biostatistics

Use of calculators and electronic spread sheets for understanding of:

- (1) Elements of data collection and presentation of data
- (2) Measures of central tendency and dispersion
- (3) Non parametric tests

- (4) Parametric tests (including ANOVA)
- (5) Correlation and regression
- (6) Sampling techniques, randomization, sample size estimation.
- (7) Scales of measurement, data display, and measures of central tendency (mean, median, mode).
- (8) Dispersion of data (variance, standard deviation).
- (9) Selection of tests (of significance) and their applicability.
- (10) Correlation and regression analysis.
- (11) Statistical software.

Computer Skills

- (1) Use of audio-visual aids.
- (2) Use of computers in biomedical research.
- (3) Computer assisted learning.
- (4) Computer based illustration and data presentation.

Research Methodology

- (1) Literature search and bibliography.
- (2) Data management and presentation.
- (3) GCP and GLP.
- (4) Formulation of research topic, study design, blinding procedures and protocol writing.
- (5) Ethical principles of animal & human experimentation. Publication ethics.

2. BOOKS & JOURNALS:

Latest Edition of :-

Core books:

1. The Pharmacological Basis of Therapeutics - Goodman & Gilman
2. Basic and Clinical Pharmacology - BG Katzung
3. Pharmacology - Rang, Ritter. Flower and Henderson
4. Essential of Medical Pharmacology - K.D.Tripathi
5. Principles of Pharmacology - KK Sharma & HL Sharma

Reference books:

1. Applied Therapeutics - Kimble, Young, Corelli and Alldredge
2. Methods in Biostatistics - B K Mahajan
3. Clinical Pharmacology - Bennett and Brown
4. Fundamentals of Experimental Pharmacology - Ghosh M.N.
5. The Pathophysiologic basis of Drug Therapy - David E Golan, Armen, Ehrin
6. Screening Methods - Vogel and Vogel
7. Pharmacology - George M Brenner, Craig W Sterens
8. Pharmacology & Pharmacotherapeutics - RS Satoskar
9. Practical manual of Experimental and Clinical Pharmacology – Bikash Medhi and Ajay Prakash.

Journals:

1. Annual Review of Pharmacology and Toxicology
2. British Journal of Pharmacology
3. British Medical Journal
4. European Journal of Clinical Pharmacology
5. Indian Journal of Pharmacology

6. Japanese Journal of Clinical Pharmacology
7. Journal of Anesthesiology and Clinical Pharmacology
8. Journal of Association of Physicians of India
9. The Lancet
10. The New England Journal of Medicine
11. Trends in Pharmacological Sciences

M.Sc (Med) Part –I (Main) Examination Month Year

**BRANCH: ANATOMY, PHYSIOLOGY, PHARMACOLOGY, BIOCHEMISTRY AND
MICROBIOLOGY**

Paper I

Anatomy, Physiology and Biochemistry

Time: Three Hours

Maximum Marks: 75

Q. 1 is compulsory from each section and attempt any one question from rest of two questions in each sections Use separate answer book for each Section.

All the parts of one question should be answered at one place in sequential order

**Section-A
(ANATOMY)
(25 Marks)**

- | | | |
|-----|---|----|
| Q.1 | Name the endocrine glands. Describe Suprarenal glands in brief. | 13 |
| Q.2 | Write short notes on
(a) Synovial Joint
(b) Gross Anatomy of Liver | 12 |
| Q.3 | Write short notes on:
(a) Supination and Pronation movement
(b) Corpus callosum | 12 |

**Section B
(PHYSIOLOGY)
(25 Marks)**

- | | | |
|-----|---|----|
| Q.1 | Mention the respiratory centers. Explain the neural regulation of respiration | 13 |
| Q.2 | Write short notes:
(a) Micturition reflex
(b) Role of platelets in thrombus formation | 12 |
| Q.3 | Write short notes:
(a) Function of Hypothalamus | 12 |

**Section C
(BIOCHEMISTRY)
(25 Marks)**

- | | | |
|-----|---|----|
| Q.1 | Write classification of carbohydrates with properties of Monosaccharides. | 13 |
| Q.2 | Write short notes:
(a) Biological Oxidation
(b) Enzyme inhibition | 12 |
| Q.3 | Write short notes:
(a) DNA polymerase
(b) Liver function test | 12 |

M.Sc (Med) Part –I (Main) Examination Month Year
BRANCH: ANATOMY, PHYSIOLOGY, PHARMACOLOGY

Paper II
Pathology, Microbiology and Pharmacology

Time: Three Hours
Maximum Marks: 75

Q. 1 is compulsory from each section and attempt any one question from rest of two questions in each sections Use separate answer book for each Section.

All the parts of one question should be answered at one place in sequential order

Section-A

(PATHOLOGY)
(25 Marks)

- Q.1 Discuss in detail cause and mechanism of irrepressible cell injury. 13
- Q.2 Write short notes on: 12
(a) Alcoholic Hepatitis
(b) Complications of Diabetes Mellitus
- Q.3 Write short notes on: 12
(a) Liver function tests
(b) Renal function tests

Section B
(MICROBIOLOGY)
(25 Marks)

- Q.1 Define Sterilization. How does it differ from disinfection?
Classify the various agents used in sterilization. Add a note on the principle and functioning of autoclave. 13
- Q.2 Write short notes on: 12
(a) Kirby-Bauer Disc Diffusion method
(b) Methods of testing disinfectant
- Q.3 Write short notes on: 12
(a) Polymerase chain reaction
(b) Biological safety cabinets

Section C
(PHARMACOLOGY)
(25 Marks)

- Q.1 Classify the various routes of drug administration. Enumerate advantages and disadvantages of parenteral route. 13
- Q.2 Give Pharmacological basis of following: 12
(a) Atropine in Pre-anesthetic medication
(b) Lignocaine and Adrenaline in Ring block anesthesia
- Q.3 Write short notes on: 12
(a) Sequential Block
(b) Inhalational route

M.Sc (Med) Pharmacology Part –II (Main)
Examination Month Year
PHARMACOLOGY

Paper I

General Pharmacology Principles, Clinical Pharmacology & History

Time: Three Hours
Maximum Marks: 100

Attempt all questions

All the parts of one question should be answered at one place in sequential order

- Q.1 What are the possible targets of drug action? Describe the G proteins as targets of action for different drugs. 25
- Q.2 Write short notes (any two): 25
(a) P drug concept
(b) James Black
(c) Explain the Phase I and Phase II of clinical trials
- Q.3 Define Adverse drug reactions and classify them. Describe the roles and responsibilities of Pharmacovigilance program of India. 25
- Q.4 Write short notes (any two): 25
(a) Probiotics
(b) Therapeutic drug monitoring
(c) Newer drug delivery systems

M.Sc (Med) Pharmacology Part –II (Main)
Examination Month Year
PHARMACOLOGY

Paper II
Systemic Pharmacology, Chemotherapy & Recent Advances

Time: Three Hours
Maximum Marks: 100

Attempt all questions
All the parts of one question should be answered at one place in sequential order

- Q.1 Describe in detail the recent advances in the drug treatment of Multi drug resistant Tuberculosis. 25
- Q.2 Write short notes (any two): 25
(a) Mechanism of action, uses and adverse effects of heparin
(b) Incretin based antidiabetic drugs
(c) Pharmacotherapy of GERD
- Q.3 Classify Antidepressants. Explain mechanism of action, uses, side effects of SSRIs and recent advances in therapy of depression 25
- Q.4 Write short notes (any two): 25
(a) Chemotherapy induced vomiting
(b) HMG-CoA reductase inhibitors
(c) Selective COX-2 inhibitors

M.Sc (Med) Pharmacology Part –II (Main)
Examination Month Year PHARMACOLOGY

Paper III

Experimental Pharmacology, Biostatistics & Biochemical Pharmacology

Time: Three Hours

Maximum Marks: 100

Attempt all questions

All the parts of one question should be answered at one place in sequential order

- | | | |
|------|--|----|
| Q.1 | Describe experimental evaluation of analgesic drugs. | 25 |
| Q.2 | Write short notes (any two):
(d) Screening methods of drugs for Peptic ulcer
(e) Screening methods of Antidepressants
(f) Screening methods of Antifertility agents | 25 |
| Q.3. | Explain in detail parametric and non-parametric tests | 25 |
| Q.4 | Write short notes (any two):
(d) Odds Ratio
(e) Role of NMR and Mass Spectroscopy in drug development
(f) Euthanasia | 25 |