



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 any time 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 candidate so 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, Systemic Pharmacology and Mechanism of Drug Action	100 Marks
Paper II (5212)	- Experimental Pharmacology, Bioassay and Biostatistics	100 Marks
Paper III (5213)	- Recent Advances, Biochemical Pharmacology and History	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) Basics of cytology: Structure of cell membrane, Cell organelles, Junctional complexes
- (3) Musculoskeletal system:
 - (a) Bones & their classification, Morphology, ossification, blood supply
 - (b) Muscles: Morphology, classification, blood supply, innervations, functions
- (4) Integumentary system: Thick Skin, Thin skin, layers of dermis & epidermis, Skin appendages, blood supply, innervations, functions
- (5) Cardiovascular system: Morphology of blood vessels, classification of blood vessels, blood capillaries, blood circulation, functions
- (6) Nervous system: Central Nervous system & Peripheral Nervous system, Gross basic Anatomy, Cranial nerves, Spinal nerves, Functions of nerves, Autonomic nervous system
- (7) Endocrine system: Classification, Hormones produced, Control of hormone secretion, basic functions
- (8) Lymphatic system: Formation of lymph, Lymphatic ducts, Thoracic duct, Lymph circulation, functions
- (9) Digestive system: Parts of digestive system, gross anatomy and functions
- (10) Excretory system: Parts of excretory system, gross anatomy of kidney, ureter, urinary bladder, and their functions
- (11) 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
- (12) Basics of genetics: Cell division ,mitosis, meiosis, Cell cycle, Chromosomes

GROSS ANATOMY (Elementary Anatomy including functional, sectional and radiological anatomy):

- (1) Superior Extremity
- (2) Inferior Extremity
- (3) Thorax
- (4) Abdomen
- (5) Pelvis
- (6) Head, Neck & Face Region

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,
- (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 (secretion and functions of bile),
- (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.

CENTRAL NERVOUS SYSTEM

- (1) General organization of CNS & PNS, sensory system (general sensations, receptors, sensory pathways, sensory areas of brain)
- (2) 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 of 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,
- (2) Nature and Sources of Drugs,
- (3) Routes of drug administration,
- (4) Pharmacokinetics, Pharmacodynamics,
- (5) ADR, Pharmacovigilance,
- (6) New drug development,

ANS AND AUTACOIDS:

- (1) Cholinergic and Anticholinergic drugs,
- (2) Adrenergic and Antiadrenergic Drugs, T/t of Glaucoma
- (3) Autacoids: Serotonin and drugs acting on Serotonergic System+ T/t of Migraine, Histamine and Antihistaminics
- (4) NSAID, Drugs used in RA and Gout

PNS:

- (1) Skeletal muscle relaxants
- (2) Local Anaesthetics

CNS:

- (1) General Anesthetics

- (2) Alcohol,
- (3) Anxiolytics, Hypnotics, sedatives,
- (4) Antiepileptics,
- (5) Antipsychotics and Antidepressants
- (6) Antimanic and Mood stabilizers,
- (7) Opioid Analgesics,
- (8) Neurodegenerative disorders

RESPIRATORY SYSTEM:

- (1) Drugs for cough,
- (2) Bronchial asthma and COPD

HORMONES:

- (1) Anterior Pituitary and Posterior Pituitary hormones,
- (2) Thyroid Hormones, Antithyroid drugs,
- (3) Insulin and oral Hypoglycemic drugs,
- (4) Adrenocortical and Androgenic steroids,
- (5) Estrogens, Progesterone and OCPs,
- (6) Vitamin D, Calcium and Drugs affecting calcium Balance

CVS:

- (1) T/t of Hypertension,
- (2) Angina, MI,
- (3) Cardiac Glycosides and Drugs for Heart failure,
- (4) Antiarrhythmic drugs,
- (5) Hypolipidemic drugs

RENAL SYSTEM:Diuretics and Antidiuretics

BLOOD:

- (1) Hematinics, T/t of Iron deficiency anemia and Megaloblastic anemia,
- (2) Anticoagulants, Antiplatelet drugs and Antithrombotic drugs,
- (3) Fibrinolytics and Antifibrinolytics

GIT:

- (1) Drugs for Peptic Ulcer and GERD,
- (2) Drugs for constipation and diarrhea,
- (3) Antiemetics,
- (4) Prokinetic and Digestant drugs

CHEMOTHERAPY:

- (1) General considerations,
- (2) Sulfonamides+ Cotrimoxazole,
- (3) Quinolones,
- (4) Beta Lactam Antibiotics,
- (5) Tetracyclines, Chloramphenicol,
- (6) Aminoglycosides,
- (7) Antitubercular drugs and Antileprosy drugs,
- (8) Antifungal drugs,
- (9) Antimalarial drugs,
- (10) Antiviral drugs,
- (11) Antiamoebic drugs, Antiprotozoal drugs, Anthelmintic drugs

CANCER CHEMOTHERAPY:

- (1) Anticancer drugs,
- (2) Immunosuppressants

MISCELLANEOUS:

- (1) Drugs acting on skin and mucous membranes,
- (2) Antiseptics,
- (3) Disinfectants,
- (4) Vaccines and Vitamins

SPECIAL TOPICS:

- (1) Toxicology and Heavy metal Poisoning,
- (2) Special aspects of Paediatrics and Geriatric Pharmacology,
- (3) Drug Interactions

**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, Systemic Pharmacology and Mechanism of Drug Action

General Pharmacology

- (1) Introduction
 - (a) Definition,
 - (b) Nature & sources of drugs, dosage forms, drug Nomenclature.
 - (c) Complementary Alternative Medicine.
 - (d) Generic name, trade name. Fixed dose combinations, Posology
- (2) Pharmacokinetics
 - (a) Routes of administration : Advantages & disadvantages of important routes used.
 - (b) Absorption : General Principles for passage of drugs across biological membranes, factors affecting absorption, transport, bioavailability.
 - (c) Distribution : Plasma protein binding, biological barriers (BBB & Placental), volume of distribution, tissue storage.
 - (d) Biotransformation : Principle phases (I & II), sites, types with examples. Factors affecting (Induction, Inhibition, tissue storage).
 - (e) Elimination: Routes, Kinetics Half-Life, Loading dose, Maintenance dose. Methods of prolongation of drug effect, Factors modifying dose of a drug.
- (3) 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.
- (4) Adverse drug reactions, pharmacovigilance
- (5) Drug Interactions
- (6) Phases of drug development
- (7) Rational Drug concept, P Drugs,
- (8) Essential drugs
- (9) Evidence based Medicine
- (10) Pharmacoeconomics
- (11) Drug Information.
- (12) Toxicology
 - (a) General principles of treatment of poisoning including snake bite and animal stings.
 - (b) Heavy metal poisoning and heavy metal antagonists
 - (c) Management of over dosage with commonly used therapeutic agents.
- (13) Pharmacogenetics, Pharmacogenomics and Personalized Medicine

Systemic Pharmacology and Mechanism of Drug Action

- (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) Antineoplastic agents
- (10) Immunomodulators
- (11) Drugs acting on blood and blood forming organs
- (12) Hormones and Related drugs
- (13) Miscellaneous -
 - (a) Vitamins (water soluble and fat soluble vitamins)
 - (b) Heavy metals and heavy metal antagonists.
 - (c) Ocular and dermato-pharmacology
 - (d) Recent developments in Pharmacology time to time
 - (e) Gene therapy. Therapeutic gases
 - (f) Free radical biology and antioxidants.
 - (g) Pharmacology of bisphosphonates, melatonin-therapeutic potential
 - (h) Pharmacotherapy of migraine
 - (i) Drug therapy in Alzheimer's disease and male sexual dysfunction
 - (j) Hormone replacement therapy.

Paper II (5212) : Experimental Pharmacology, Bioassay and Biostatistics

Experimental Pharmacology

Experimental methodologies involved in the discovery of drugs (in vivo, in vitro, ex vivo). Animal handling and animal care. Methods of anaesthetizing animals and methods of euthanasia. Restraining and blood collecting methods. Drug screening methods involved in the evaluation of anti-ulcer, antidepressant, antianginal, antihypertensive, antiarrhythmic, antidiabetic, anticataract, anti-platelet, anticancer, antiinflammatory, antidiarrhoeal, antiepileptic analgesic, antithyroid, antipyretic, antiglaucoma, antihyperlipidemic antiasthmatics drugs and cough suppressants. Drug screening methods used in screening antifungal, anthelmintic, antibacterial, antiviral agents, drugs for heart failure, posterior pituitary, adrenal steroid (gluco & mineralo corticoids), testicular, parathyroid, ovarian, thyroid, hormones, Methods involved in testing teratogenicity, carcinogenicity and organ toxicities in animals.

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. Ethical guidelines in utilizing animals for experimental purposes.

Drug Development Process

Methods involved in the development of new drugs. Preclinical toxicological studies. Calculation of LD50 & ED 50. Acute, subacute and chronic toxicity studies. Pre-clinical pharmacokinetic and dynamic studies. High throughput screening (invitro and invivo) for pre-clinical pharmacokinetic and pharmacodynamic studies.

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.

Paper III (5213) : Recent Advances, Biochemical Pharmacology and History

Recent Advances

Recent developments in Pharmacology time to time.

Biochemical Pharmacology

Qualitative testing, titrimetric analysis. Beer and Lambert's law. Basis and working principle of colorimeter, ultraviolet, atomic absorption spectrometers, Fluorescence spectroscopy, NMR and Mass Spectroscopy. Basics of Chromatography. Partition, adsorption and ionexchange chromatography. Column chromatography, thin layer chromatography, paper chromatography, immunoabsorbant chromatography, high performance thin layer Chromatography, high performance liquid chromatography (HPLC) and gas Chromatography. Radio immunoassay. Processing of biological materials for drug analysis. Calculations in drug analysis. Good laboratory practice. Validation of analytical procedure.

History

- (1) Wonder Discoveries in Pharmacology
- (2) Nobel laureates in Pharmacology and their revolutionary discoveries.

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, Pharmacoconomics)
- (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) Diuretic
 - (g) Anti-inflammatory
 - (h) Local anesthetic
- (11) Handling of animals, collection of blood and urine samples.
- (12) Assembly of organ bath and setting of thermostat.
- (13) Isolated tissue preparations:
- (14) To prepare log dose response curve of a suitable drug on:
- (15) Effect of Drugs on guinea pig ileum, frog rectus abdominis, rabbit ileum, rat colon
- (16) To perform bioassay of a suitable drug on:
 - (a) Guinea pig ileum
 - (b) Frog rectus abdominis
- (17) To study the stimulatory and depressant effects of drugs on rabbit gut.
- (18) To study the effect of coronary vasodilator drug on perfused rabbit heart (Langendroff's technique).
- (19) Study of local anesthetics by various animal techniques.
- (20) Determination of pA₂ value of acetylcholine on guinea pig ileum.
- (21) To study the effect of unknown drugs using rabbit eye.
- (22) Screening Tests on animals to study the following activities:
 - (a) Motor in-coordination
 - (b) Anxiolytic effect
 - (c) Anticonvulsant effect
 - (d) Diuretic activity
 - (e) Analgesic effect
- (23) Conditioned Avoidance Response
- (24) Anti-inflammatory effect
- (25) Clinical/human experiments
- (26) Computer Aided Learning (CAL) Program
- (27) 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

Attempt any two questions out of three in each section
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. 12 ½
- Q.2 Name the parts of female reproductive system. Describe ovary in brief. 12 ½
- Q.3 Write short notes on: 12 ½
- (a) Supination and Pronation movement
 - (b) Corpus callosum
 - (c) Synovial Joints

Section B
(PHYSIOLOGY)
(25 Marks)

- Q.1 Write short notes on: 12 ½
- (a) Normal ECG
 - (b) Hypoxia
 - (c) RBCs
- Q.2 Write short notes: 12 ½
- (a) Micturition reflex
 - (b) Role of platelets in thrombus formation
- Q.3 Write short notes: 12 ½
- (a) Function of Hypothalamus
 - (b) Calcitonin

Section C
(BIOCHEMISTRY)

(25 Marks)

- Q.1 Write classification of carbohydrates with properties of Monosaccharides. 12 ½
- Q.2 Write short notes: 12 ½
- (a) Biological Oxidation
 - (b) Enzyme inhibition
- Q.3 Write short notes: 12 ½
- (a) Principles of Electrophoresis
 - (b) DNA polymerase
 - (c) Liver function test

**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

Attempt any two questions out of three in each section
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 Enumerate Differences between: 12 ½
(a) Benign and Nephrotic oedema
(b) Nephrotic and Nephritic syndrome
(c) Acute Myeloid and Chronic Myeloid Leukemia
(d) Hypothyroidism and Hyperthyroidism
- Q.2 Write short notes on: 12 ½
(a) Alcoholic Hepatitis
(b) Complications of Diabetes Mellitus
(c) Gangrene
- Q.3 Write short notes on: 12 ½
(a) Liver function tests
(b) Renal function tests
(c) Prothrombin time

**Section B
(MICROBIOLOGY)
(25 Marks)**

- Q.1 Write short notes on: 12 ½
(a) Bacterial Flagella
(b) Cell wall of Gram negative bacteria
(c) Albert's staining
- Q.2 Write briefly: 12 ½
(a) Kirby-Bauer Disc Diffusion method
(b) Methods of testing disinfectant
(c) Anaerobic culture methods
- Q.3 Write short notes on: 12 ½
(a) Polymerase chain reaction
(b) Biological safety cabinets

Section C

(PHARMACOLOGY)
(25 Marks)

- Q.1 Write short answer: 12 ½
- (a) Define Pharmacovigilance
 - (b) Uses and Adverse effects of Morphine
 - (c) Uses of Propanolol
 - (d) Contraindications of Frusemide
- Q.2 Give Pharmacological basis of following: 12 ½
- (a) Atropine in Pre anesthetic medication
 - (b) Lignocaine and Adrenaline in Ring block anaesthesia
 - (c) Amoxicillin, Metronidazole and Omeprazole in patients with peptic ulcer disease
- Q.3 Write short notes on: 12 ½
- (a) Sequential Block
 - (b) Inhalational route
 - (c) Newer Insulins

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

Paper I
**General Pharmacology, Systemic Pharmacology and
Mechanism of drug action**

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 out of three) 25
(a) P drug concept
(b) Dopamine in shock
(c) Monoclonal antibodies as drugs
- 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 out of three) 25
(a) Ranolazine
(b) Mechanism of action of Metformin
(c) Treatment of Mixed drug infection

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

Paper II
Experimental Pharmacology, Bioassay and Biostatistics

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 out of three)
(a) Screening methods of drugs for Peptic ulcer
(b) Screening methods of Antidepressants
(c) Screening methods of Antifertility agents | 25 |
| Q.3 | Explain the Phase I and Phase II of clinical trials | 25 |
| Q.4 | Write short notes (any two out of three)
(a) Odds Ratio
(b) Case Control studies
(c) Bioequivalence studies | 25 |

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

Paper III

Recent advances, Biochemical Pharmacology and 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 Describe in detail the recent advances in the drug treatment of Multi drug resistant Tuberculosis 25
- Q.2 Write short notes (any two out of three) 25
(a) Good laboratory Practices (GLP)
(b) Role of NMR and Mass Spectroscopy in drug development
(c) Biopharmaceuticals
- Q.3 Classify Penicillins. Explain history, mechanism of action, uses, side effects and recent advances in penicillins 25
- Q.4 Write Short notes (any two out of three) 25
(a) James Black
(b) Probiotics
(c) Dale