



**Chirayu**  
University

# **Syllabus**

**M.Sc. (Medical) BIOCHEMISTRY**

**(3 Years Degree Course)**

**RULES & REGULATIONS**  
**M.Sc. (Medical) BIOCHEMISTRY**

**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) Microbiology Part-I**

**EXAMINATION AND ASSESSMENT**

The examination in M.Sc. (Med.) Part I shall consist of Theory papers only.

**(1) 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	Anatomy, Physiology and Biochemistry	75 marks
Paper II	Pathology, Microbiology and Pharmacology	75 marks

##### **Physiology**

Paper I	Anatomy, Physiology and Biochemistry	75 marks
Paper II	Pathology, Microbiology and Pharmacology	75 marks

##### **Biochemistry**

Paper I	Anatomy, Physiology and Biochemistry	75 marks
Paper II	Pathology and Microbiology	75 marks

##### **Pharmacology**

Paper I	Anatomy, Physiology and Biochemistry	75 marks
Paper II	Pathology, Microbiology and Pharmacology	75 marks

##### **Microbiology**

Paper I	Anatomy, Physiology and Biochemistry	75 marks
Paper II	Pathology and Microbiology	75 marks

#### **M.Sc. (Medical) Biochemistry 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:**

<b>Name of Paper</b>	<b>No. of Questions to be set</b>	<b>No. of Questions to be answered</b>
Paper I	4	4
Paper II	4	4
Paper III	4	4

**Anatomy**

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

**Physiology**

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

**Bio-chemistry**

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

**Pharmacology**

Paper I	- General Pharmacology, Systemic Pharmacology and Mechanism of Drug Action	100 Marks
Paper II	- Experimental Pharmacology, Bioassay and Biostatistics	100 Marks
Paper III	- Recent Advances, Biochemical Pharmacology and History	100 Marks

**Microbiology**

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

## **M.Sc. (Medical) Part I**

### **ANATOMY (For all Branches)**

- (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, Goldman 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) Fluometry 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 administration,
- (4) Pharmacokinetics, Pharmacodynamics,
- (5) ADR, Pharmacovigilance,
- (6) New drug development,
- (7) CPCSEA, Animals used in Experimental Pharmacology

### **ANS:**

- (1) Cholinergic and Anticholinergic drugs,
- (2) Adrenergic and Antiadrenergic Drugs,
- (3) Autacoids, Serotonin, Histamine, T/t of Migraine,
- (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 Heart failure,
- (4) Antiarrhythmic drugs,
- (5) Hypolipidemic drugs

**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, Antihelminthic 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 - General Biochemistry & Metabolism**

- (1) History & scope of Biochemistry.
- (2) Cell structure & biochemical functions. Membrane - structure & functions.
- (3) Transport through biological cell membrane.
- (4) Chemistry & biological importance of carbohydrates, proteins & amino acids, lipids, nucleic acids, porphyrins, glycosaminoglycans, glycoproteins.
- (5) Chemistry of blood & haemoglobin, plasma proteins, Blood coagulation.
- (6) Enzymes & coenzymes – chemistry, nomenclature properties & mode of action of enzymes, Enzyme kinetics, factors affecting enzyme activity, enzyme inhibitions, applications of enzymes & isoenzymes.
- (7) Bioenergetics & biological oxidation – General concept of oxidation & reduction. Electron transport Chain (ETC) – functioning of ETC & inhibitors of ETC, Oxidative Phosphorylation, Uncouplers and theories of Biological oxidation & oxidative phosphorylation.
- (8) Intermediary metabolism, metabolism of Carbohydrates, Lipids, Proteins, and Amino acids, Nucleic acids, Hemoglobin, metabolic control, energy production & regulation.

**Paper II - Nutrition, Environmental & Clinical Biochemistry**

- (1) Nutrition & Environmental Biochemistry
  - (a) Digestion & absorption from gastrointestinal tract.
  - (b) Energy metabolism – Calorimetry, BMR – Its determination & factors affecting it, SDA of food.
  - (c) Macro & micro – elements & their role in health & disease, water metabolism & its regulation.
  - (d) Vitamins – Chemistry, biological importance, deficiency manifestations & recommended daily allowance.
  - (e) Principles of Nutrition – Balanced diet & its planning, Nutritive importance of various food sources, Calorific value of food, toxins & additives, Obesity, Protein Energy Malnutrition.
  - (f) Metabolic changes during starvation.
  - (g) Diet management of chronic disease viz, Diabetes mellitus, Coronary artery disease, Renal disorders, Cancer, Hypertension, Anemia Rickets & Osteomalacia.
  - (h) Diet for overweight person, pregnant woman and during lactation.
  - (i) Importance of pollution free & ecofriendly Environment, exposure to cold stress, exposure to heat, air pollution water pollution & food Pollution.
- (2) Clinical Biochemistry
  - (a) Chemistry, composition and functions of lymph, CSF, ascitic, pleural & synovial fluids.
  - (b) Urine formation, excretion & urine analysis.
  - (c) Composition, chemistry & functions of specialized tissues like muscle, bone, nerve, connective tissue & brain adipose tissue.
  - (d) Water & Electrolyte balance & imbalance.

- (e) Chemistry of respiration & acid-base balance & imbalance.
- (f) Hormones – communication amongst cells & tissues. General mechanism of action, chemistry, functions, synthesis & clinical disorders of various steroid & peptide & thyroid hormones. Hormone receptors.
- (g) Biochemistry of Diabetes mellitus, Atherosclerosis, Fatty liver & obesity.
- (h) Organ function tests for liver, kidneys, thyroid gland, adrenal gland, pancreas & gastric functions.
- (i) Radioisotopes & their clinical applications.
- (j) Lipid per oxidation, free radicals & antioxidants, Nitric oxide formation, metabolism & role in Medicine.
- (k) Biochemical changes in aging and pregnancy & lactation.
- (l) Neurochemistry in Health & Disease.
- (m) Inborn errors of metabolism.

### **Paper III: Molecular Biology, Immunology, Biostatistics & Research Methodology**

#### **Molecular Biology**

Replication, transcription, protein biosynthesis and gene regulation, Genetic code, mutations and mutants, DNA repair, Purines and pyrimidines – biosynthesis and degradation, signal transduction, receptor – structure and regulation, cloning, construction of genomic libraries, strategies for screening DNA libraries, Genes & chromosomes, Gene mapping, chromosome walking etc., Gene expression & gene amplification & gene regulation, Genetic engineering: Recombinant DNA technology & its applications. Restriction endonucleases, Plasmids, Cosmids, Gene cloning, Gene libraries. Oncogenes, biochemistry of cancer & tumor markers

#### **Immunology**

Structure functions, classifications and synthesis of immunoglobulins, antigen – antibody reaction, mechanisms and regulation of immune responses. Complement system, hypersensitivity, immune tolerance, immunity to infection, autoimmunity & autoimmune diseases, tumor immunity, genetics of immune response, major histocompatibility complex, transplantation, vaccination and immunization strategies, hybridoma technology. Apoptosis, telomeres and telomerase, cytokine network, immunodiagnostics, biochemistry of AIDS.

#### **Biostatistics and research methodology**

Types of study designs, data correlation & agreement analysis methods, risk analysis methods, calculation of adequate sample size for various study designs, students 't' test, paired 't' test, chi-square test and Fisher's exact test, Non-parametric tests of significance, Statistical aspects of diagnostic tests, Multivariate analysis methods, One way and two way analysis of variance and multiple range tests, Commonly used statistical software for the analysis of bio-medical data. Total Quality Management of Laboratories - Internal quality control, EQAS, Lab accreditation.

#### **1.2 Practical**

- (1) All practicals of undergraduate curriculum.
- (2) Estimation using semi & fully automated analyzers:
  - (a) Glucose
  - (b) Components of LFT, RFT, Lipid profile, diabetic profile etc.
  - (c) Enzymes of diagnostic importance-amylase, lipase, CPK, CPK-MB, Troponin I, LDH etc.

- (3) Estimation of hormones, vitamins, tumor markers and other biomarkers by ELISA, RIA, CLIA etc.
- (4) Biochemical analysis of fluids: CSF, ascitic & pleural fluids etc.
- (5) Analysis of arterial blood gases & electrolytes
- (6) Fractionation & Identification of, a) Amino acids b) Sugar c) Proteins d) Lipoproteins by
  - (a) Thin Layer & Paper Chromatography.
  - (b) Various diagnosis using HPLC
  - (c) Gel electrophoresis & Paper Electrophoresis.
  - (d) Capillary electrophoresis of Plasma proteins
- (7) Calculation of coefficient of variation, coefficient of correlation, plotting LJ charts.
- (8) Total Quality Management of Laboratory:
  - (a) Specimen collection, handling & storage of sample.
  - (b) Methods of standardization & calibration.
  - (c) Methods of quality control & assessment.
- (9) Interpretation and correlation of various biochemical parameters with different clinical conditions