

TABLE OF SPECIFICATION**M. Phil Biochemistry (Major)****Paper I: General, Metabolic and Hormone Biochemistry****Total Marks: 150**

Title of Topics	No. of lectures	M.C.Q's	S.E.Q's
Basic Biochemistry; Chemistry of Carbohydrates, Proteins, lipids and Cell Signaling	15	10	1
Physiochemical Principles & acid base balance. Acid-base Physiology and Pathology	5	7	0.5
Bioenergetics & energy metabolism	10	8	0.5
Carbohydrate metabolism	20	15	1.5
Protein metabolism	20	15	1.5
Lipid metabolism	20	15	1
Endocrinology	15	10	1
Total	105	80	7

Each MCQ will be of 1 mark while each SEQ will be of 10 marks.

Paper II: Medical Genetics, Advance, Clinical and Enzyme Biochemistry**Total Marks: 150**

Title of Topics	No. of lectures	M.C.Q's	S.E.Q's
Liver Function tests Hemoglobin and Heme Metabolism Xenobiotics and drug metabolism	16	15	1
Renal Function Tests Cardiac Markers Tumor Markers	10	8	1
Vitamins Minerals	15	12	0.5
Nucleic acids, Nucleic acid metabolism Medical Genetics & Biotechnology	25	15	1.5
Nutrition	12	10	1
Enzymology	12	10	1
Biochemical And Molecular Techniques	15	10	1
Total	105	80	7

Each MCQ will be of 1 mark while each SEQ will be of 10 marks.

DETAILED SYLLABUS M. PHIL BIOCHEMISTRY (MAJOR)

PAPER I: GENERAL, METABOLIC AND HORMONE BIOCHEMISTRY

TOPICS

BASIC BIOCHEMISTRY

15 Lectures

1.0 CHEMISTRY OF CARBOHYDRATES

1.1. Classification & Biological Role

- 1.1.1. Monosaccharides
- 1.1.2. Oligosaccharides
 - 1.1.2.1 Disaccharides
- 1.1.3. Polysaccharides
 - 1.1.3.1 Homopolysaccharides
 - 1.1.3.2 Heteropolysaccharides

1.2. Structure

- 1.2.1. Anomers
- 1.2.2. Epimers
- 1.2.3. Enantiomers
- 1.2.4. Reducing & Non Reducing Sugars
- 1.2.5. Derived Carbohydrates
- 1.2.6. D & L and Optical Isomers (d & l)
Ring Structure (Pyran & Furan)

2.0 CHEMISTRY OF PROTEINS AND AMINO ACIDS

2.1. Classification & Biological Role

2.1.1 Based on Solubility

2.1.2 Based on Shape

2.1.3. Based on Functions

- 2.1.3.1 Immuglobin
- 2.1.3.2 Regulatory
- 2.1.3.3 Contractile
- 2.1.3.4 Nutrition
- 2.1.3.5 Plasma Proteins

2.1.4. Based on 3 D Structure

2.2. Structure

2.2.1. Levels of Organization

- 2.2.1.1 Primary
- 2.2.1.2 Secondary
- 2.2.1.3 Tertiary
- 2.2.1.4 Quaternary

2.3. Amino Acids

2.3.1. Classification based on

- 2.3.1.1 Nutrition
- 2.3.1.2 R Group

- 2.3.1.3 Biochemical importance (Glycogenic, Ketogenic)
- 2.3.1.4 Functional GP
- 2.3.1.5 Properties

3.0 CHEMISTRY OF LIPIDS AND FATTY ACIDS

3.1 Classification & Biological Role

- 3.1.1 Primary
- 3.1.2 Secondary
- 3.1.3 Derived

3.2. Structure – Fatty Acids

- 3.2.1 Essential – Non Essential
- 3.2.2 Structured – Un Structured

3.3. Properties of Fatty Acids

- 3.3.1 Rancidity
- 3.3.2 Peroxidation

ROS (Reactive Oxygen Species)

4.0 ACID BASE BALANCE

5 Lectures

- 4.1 Physiochemical Principles & acid base balance.
- 4.2 Acid-base Physiology and Pathology

5.0 CELL SIGNALING

- 5.1 Composition & Chemistry of membranes of the Cells & Organelles
- 5.2 Receptors & transport channels
- 5.3 Second messenger system
- 5.4 Ca, IP3 mechanism
- 5.5 Role of the G Proteins
- 5.6 Protein Kinases/Tyrosine Kinases
- 5.7 Nitric Oxide synthase

METABOLIC BIOCHEMISTRY

6.0 BIOENERGETICS & ENERGY METABOLISM

10 Lectures

6.1 Concept of Metabolism

6.2 Digestion, Absorption, Transport & Incorporation of Biomolecules.

- 6.2.1. Carbohydrates
- 6.2.2. Proteins
- 6.2.3. Lipids
- 6.2.4. Nucleoproteins

6.3 Bioenergetics

- 6.3.1 Oxidative Phosphorylation including Electron Transport Chain.
- 6.3.2 Photophosphorylation
- 6.3.3 Inhibitors & Uncouplers

7.0 CARBOHYDRATE METABOLISM

20 Lectures

Metabolic pathways of carbohydrates & their regulation.

- 7.1.1 Glycolysis

- 7.1.2 TCA
- 7.1.3 Gluconeogenesis
- 7.1.4 HMP shunt
- 7.1.5 Glycogenesis & Glycogenolysis
- 7.1.6 Glycogenic Cycle
- 7.1.7 Glycogen Storage Diseases

8.0 PROTEIN AND AMINO ACID METABOLISM

20 Lectures

Metabolic pathways of proteins & their regulation.

- 8.1 Nitrogen Economy & their regulations
- 8.2 Anabolism & Catabolism of Aromatic and aliphatic A.A.
- 8.3 Anabolism & Catabolism of Sulfur containing A.A.
- 8.4 Anabolism & Catabolism of Branched Chain A.A.
- 8.5 Anabolism & Catabolism of hydroxyl GP containing A.A.
- 8.6 Anabolism & Catabolism of Acidic & Basic A.A.
- 8.7 Detoxification of Ammonia in Birds Reptiles & Mammals (Urea Cycle).
- 8.7 Inborn error of Metabolism
- 8.8 Functions of Plasma Proteins.

9.0 LIPIDS AND FATTY ACIDS METABOLISM

20 Lectures

Metabolic pathways of lipids & their regulation.

- 9.1 Synthesis of Fatty Acids
- 9.2 Oxidation of Fatty Acids
- 9.3 Phospholipids
- 9.4 Cholesterol Synthesis (Steroids & prostaglandins)
- 9.5 Lipid Storage Diseases

11.0 ENDOCRINOLOGY

15 Lectures

- 11.1 Chemistry, Synthesis, degradation, hyper & hypo states of the following hormones:
 - i. Insulin
 - ii. Glucagon
 - iii. Thyroid
 - iv. Adrenal Cortical H
 - v. Adrenal medullary H
 - vi. Parathyroid H
 - vii. FSH & LH
 - viii. ACTH, TSH, Oxytocin
 - ix. ADH

PAPER II: MEDICAL GENETICS, ADVANCE, CLINICAL AND ENZYME BIOCHEMISTRY

TOPICS

- 12.0 LIVER FUNCTION TEST** **5 Lectures**
12.1 Biochemical Functions of Liver
12.2 Pathophysiology and Clinical Presentation of Liver diseases
12.3 Lab Diagnosis and interpretation of Liver function tests
- 13.0 HEME AND HEMOGLOBIN METABOLISM** **7 Lectures**
13.1 Biochemistry of Heme and Hemoglobin
13.2 Metabolism of heme and hemoglobin (Synthesis of degradation of Hemoglobin)
13.3 Porphyrrias
- 14.0 XENOBIOTICS AND DRUG METABOLISM** **4 Lectures**
14.1 Phases and reactions of detoxification
- 15.0 RENAL FUNCTION TESTS** **3 Lectures**
15.1 Diagnosis and screening of renal diseases
15.2 Types of Renal Failure, the uremic syndrome and Nephrotic syndrome
15.3 Renal Function Tests
- 16.0 ACID-BASE PHYSIOLOGY AND PATHOLOGY** **3 Lectures**
16.1 Buffer systems in acid-base balance
16.2 Mechanism of Acid-base balance
16.3 Disorders of acid-base balance; acidosis, alkalosis, their types and compensation
- 17.0 CARDIAC MARKERS** **4 Lectures**
17.1 Basic Biochemistry and Tissue distribution
17.2 Clinical utility of cardiac markers
17.3 Lab diagnosis of Myocardial Infarction
- 18.0 TUMOR MARKERS** **2 Lectures**
18.1 Introduction to Tumor markers
18.2 Clinical Application of Tumor markers
18.3 Specific Tumor markers
- 19.0 VITAMINS** **8 Lectures**
19.1 Basic concepts and Classification of Vitamins
19.2 Sources, Absorption and Excretion of Vitamins
19.3 Water Soluble Vitamins
19.3.1 Biochemical Functions and deficiencies of Water soluble vitamins
19.4 Fat Soluble Vitamins
19.4.1 Biochemical Functions and deficiencies of Fat soluble vitamins
- 20.0 MINERALS AND TRACE ELEMENTS** **7 Lectures**
20.1 Biochemistry and Function of Essential Trace Elements

20.2 Clinical Application of deficiencies and toxicity of Trace elements

21.0 MEDICAL GENETICS & BIOTECHNOLOGY **25 Lectures**

21.1 CHEMISTRY OF NUCLEIC ACIDS (DNA & RNA)

21.1.1. Nitrogenous Bases

21.1.2. Nucleosides

21.1.3. Nucleotides

21.1.4. Nucleic Acids

21.1.5. Nucleoproteins

21.2 Nucleic acids Metabolism

Metabolic pathways of nucleic acid & their regulation.

21.2.1 Biosynthesis and degradation of purines & Pyrimidines

21.2.2 Disorders of Nitrogen metabolism.

21.3. Genes, Chromosomes, Central Dogma

21.4. Cell Cycle

21.5 Replication & proof reading

21.6. Transcription

21.7 Post transcriptional modifications

21.8 Translation

21.9 Post translational modifications

21.10 Operon

21.11 DNA damage

21.11.1 Extracellular agents causing DNA damage

21.11.2 Endogenous mechanisms causing DNA damage

21.12 DNA Repair

21.13 Human genome project

21.14 Genetic disorder with Mendelian and Complex inheritance

21.15. Mutations and their types

21.16. Identifying Human gene diseases

21.16.1. Position-independent strategies

21.16.2. Identifying a disease gene through knowing the protein product

21.16.3. Identifying a disease gene through animal model

21.17. Genetic Engineering

21.17.1. Plasmid, vector, Translocation,

21.17.2. Cloning

21.17.3. Recombinant DNA Technology

21.17.4. Nucleic Acid Sequencing

21.18 Genetic Polymorphism and Sequence variation

21.19 Molecular Pathology

21.19.1. Effects of mutation of phenotype

21.19.1.1 Loss of function mutations

21.19.1.2 Gain of function mutations

21.19.2. Molecular Pathology: From gene to disease

21.19.3. Molecular Pathology: From disease to gene

21.19.4 Molecular Pathology chromosomal disorders

21.20 Cancer Genetics

21.21 Genetic testing, Gene tracking, Population Screening, Ethical issues

11.0 ENZYMOLOGY

12 Lectures

- 11.1. Nomenclature, Units, Coenzymes, Cofactors
- 11.2. Classification
- 11.3. Factor affecting enzyme activity
- 11.4. Regulatory Enzymes
 - 11.4.1 Allosteric Activity
 - 11.4.2 Covalent Modification
 - 11.4.3 Iso-enzymes
 - 11.4.4 Inhibition of Enzymes
 - 11.4.5 Others
- 11.5. RNA as an Enzyme
- 11.6. Clinical importance of Enzymes
- 11.7. Kinetics of Enzymes
 - Michaelis/Menton Equation
 - Linweaver Burk Equation

24.0 NUTRITIONAL BIOCHEMISTRY

12 Lectures

- 24.1. Food in Health**
- 24.2. Balanced Diet & its Composition**
- 24.3. Diet for**
 - 24.3.1. New Born (0-6 Months)
 - 24.3.2. Infants (7 – 1 Year)
 - 24.3.3. Children (1.1 – 12 years)
 - 24.3.4. Teenagers (13-19 Years)
 - 24.3.5. Adults (20-45 years)
 - 24.3.6. Old Age (46-70 Years)
- 24.4. Diet for Pregnant & Lactating Women**
- 24.6. Diet for Ailments (hypertensive, Cardiac & Renal Patients)**
- 24.7. Diet for obese & Patients with malnutrition (Marasmus, Kwashiorkor)**
- 24.8. Diet for Diabetic Patients**
- 24.9. Diet for Diarrohea Patients**
- 24.9. BMR, PM, Caloric Value**
- 24.10. Composition & Caloric value in commercially available commodities.**

12.0 BIOCHEMICAL AND MOLECULAR TECHNIQUES

15 Lectures

- 12.1 Solution & buffer system
- 12.2 Amino Acid Analyzer
- 12.3 Chromatography including HPLC
- 12.4 Electrophoresis
- 12.5 PCR
- 12.6 Restriction Fragment Length Polymorphism
- 12.7 Western Blotting
- 12.8 Southern Blotting
- 12.9 Eastern Blotting
- 12.10 Northern Blotting
- 12.11 Fluorescence labeled techniques
- 12.12 Radioactive labeled techniques

12.13 Mass Spectroscopy

12.14 ELISA

12.15 Spectrophotometry

12.16 Atomic Absorption spectrometry

12.16 Flame photometry