# TABLE OF SPECIFICATION

**M. Phil Biochemistry (Major)**

**Paper I: General, Metabolic and Hormone Biochemistry**  
**Total Marks: 150**

<table>
<thead>
<tr>
<th>Title of Topics</th>
<th>No. of lectures</th>
<th>M.C.Q's</th>
<th>S.E.Q's</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic Biochemistry; Chemistry of Carbohydrates, Proteins, lipids and Cell Signaling</td>
<td>15</td>
<td>10</td>
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<tr>
<td>Physiochemical Principles &amp; acid base balance. Acid-base Physiology and Pathology</td>
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<td>7</td>
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<tr>
<td>Bioenergetics &amp; energy metabolism</td>
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<td>8</td>
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<td>Carbohydrate metabolism</td>
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<td>Protein metabolism</td>
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<td>Lipid metabolism</td>
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<td><strong>105</strong></td>
<td><strong>80</strong></td>
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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**

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<td>Liver Function tests</td>
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<td>Hemoglobin and Heme Metabolism</td>
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<td>Xenobiotics and drug metabolism</td>
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<td>Renal Function Tests</td>
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<td>Tumor Markers</td>
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<td>Biochemical And Molecular Techniques</td>
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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 Homopolysacharrides
   1.1.3.2 Heterpolysacharrides
1.2. Structure
   1.2.1. Anomers
   1.2.2. Epimers
   1.2.3. Enatiomers
   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
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
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
   Metabolic pathways of carbohydrates & their regulation.
   7.1.1 Glycolysis

   5 Lectures

   10 Lectures

   20 Lectures
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 Porphyrias

14.0 XENOBIONTICS 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
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 ENZYMEOLOGY

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

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
24.10. Composition & Caloric value in commercially available commodities.

12.0 BIOCHEMICAL AND MOLECULAR TECHNIQUES

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