

# PACIFIC MEDICAL UNIVERSITY, UDAIPUR

## Ph.D. Entrance Syllabus – Medical Biochemistry

### 1. General & Physical Biochemistry

- Atomic structure and chemical bonding
- pH, buffers, Henderson–Hasselbalch equation
- Water and electrolytes
- Bioenergetics and thermodynamics
- Acid–base balance (metabolic & respiratory disorders)

### 2. Carbohydrate Chemistry & Metabolism

- Structure and classification of carbohydrates
- Glycolysis
- Gluconeogenesis
- Glycogenesis & glycogenolysis
- Pentose phosphate pathway
- Regulation of blood glucose
- Diabetes mellitus (biochemical basis)
- Inborn errors of carbohydrate metabolism

### 3. Lipid Chemistry & Metabolism

- Structure and classification of lipids
- Fatty acid synthesis and  $\beta$ -oxidation
- Ketone body metabolism
- Cholesterol metabolism
- Lipoproteins (HDL, LDL, VLDL)
- Hyperlipidemias and atherosclerosis

#### **4. Amino Acids & Protein Metabolism**

- Amino acid structure and classification
- Protein structure (primary to quaternary)
- Protein digestion and absorption
- Transamination, deamination
- Urea cycle
- Plasma proteins
- Inborn errors (PKU, MSUD, homocystinuria)

#### **5. Enzymology**

- Enzyme classification and mechanisms
- Enzyme kinetics ( $K_m$ ,  $V_{max}$ , Lineweaver–Burk plot)
- Enzyme inhibition
- Isoenzymes
- Clinical significance of enzymes

#### **6. Molecular Biology & Genetics**

- DNA structure and replication
- RNA transcription and translation
- Genetic code
- Gene regulation (operon concept)
- Recombinant DNA technology
- PCR and blotting techniques
- Mutations and DNA repair
- Epigenetics (basic concepts)

#### **7. Hormones & Signal Transduction**

- Classification of hormones
- Mechanism of hormone action
- Second messengers (cAMP, IP<sub>3</sub>, DAG)
- Endocrine disorders (diabetes, thyroid, adrenal disorders)

## **8. Vitamins & Minerals**

- Fat-soluble vitamins (A, D, E, K)
- Water-soluble vitamins (B-complex, C)
- Deficiency and toxicity
- Mineral and trace elements (iron, calcium, iodine, zinc)

## **9. Nutrition & Applied Biochemistry**

- Macronutrients and micronutrients
- Balanced diet
- Protein-energy malnutrition
- Obesity and metabolic syndrome
- Free radicals and antioxidants
- Detoxification and xenobiotics

## **10. Clinical Biochemistry**

- Liver function tests
- Renal function tests
- Thyroid function tests
- Cardiac markers
- Tumor markers
- Electrolytes and blood gas analysis
- CSF, urine, and body fluid analysis

## **11. Immunochemistry (Basic)**

- Immunoglobulins structure
- Antigen–antibody reactions
- Complement system
- Hypersensitivity reactions
- Autoimmune disorders (basic concepts)

## **12. Research Methodology & Biostatistics**

- Study designs
- Literature review
- Research ethics (ICMR guidelines)
- Hypothesis and protocol writing
- Statistical tests (basic)

## **13. Laboratory Techniques & Instrumentation**

- Spectrophotometry
- Chromatography
- Electrophoresis
- ELISA, RIA
- Quality control and assurance
- Automation in clinical biochemistry