

## **Semester IV Medical Biochemistry**

*Preamble: The Medical Biochemistry course has been formulated to impart medically relevant information on clinical biochemistry. Students would learn the principle and applications of the diagnostic enzymology, interplay of hormones in the metabolism and details of various biomolecules of diagnostic significance. These topics are included to educate students on the clinical significance of biochemistry. This course will also focus on the contemporary methods and practical approaches that are used in the clinical laboratories for the investigation of the diseased state.*

### **THEORY**

**Total Lectures = 48**

**Unit 1: Basic Concepts and Scope (02 Lectures)**  
**(Chapter 1: Harper)**

**Unit 2: Enzymes: Distribution and diagnostic significance (10 Lectures)**  
**(Chapter 1: Harper)**

Properties of enzymes used in diagnosis of metabolic disorders, clinical significance of diagnostically important enzymes: creatine kinase, lactate dehydrogenase, alanine- and aspartate aminotransferases, with a detailed account of the biochemical reactions catalysed by these enzymes and of their clinical assays; kinetic assay and end point assay for the enzymes. A detailed account on: isoenzymes, their tissue distribution and clinical significance.

**Unit 3: Hormones (08 Lectures)**  
**(Chapter 23: Nelson and Cox; Chapters 41 and 42: Harper)**

Classification (with reference to their biochemical nature, mechanism of action (one example from each class of hormones) with special reference to epinephrine and thyroid hormones (T3 and T4); functions.

**Unit 4: Structural complexities and diseases associated with carbohydrates and lipids (10 Lectures)**  
**(Chapters 7, 10 and 21: Nelson and Cox; Chapters, 15 and 26: Harper)**

Carbohydrates: Sugars as information molecules; detailed account on Lectins: their role in physiological functions and their potential as drug targets in various infectious diseases. Dietary fibers.

Lipids: Lipoproteins- types (chylomicron, VLDL, LDL, HDL); disorders associated with lipoprotein metabolism (hypercholesterolemia, Atherosclerosis). Metabolism of ketone bodies in diabetic patients. Prostaglandins- classification, biosynthesis, role of COX-1, COX-2, NSAIDS in synthesis; functions Steroids-Cholesterol- biosynthesis and regulation, inhibitors of cholesterol biosynthesis (Statins-structure and mechanism of action).

**Unit 5: Vitamins**  
**(Chapter 27: Tietz; Chapter 12: Chatterjea and Shinde)**

**(06 Lectures)**

Definition, classification, requirement and recommended allowances, and dietary precursors; diseases due to deficiency of water-soluble and fat-soluble vitamins: the symptoms and the clinical significance.

**Unit 6: An overview of integrative metabolism**  
**(Chapter 19, 23: Nelson and Cox)**

**(12 Lectures)**

Local and global regulation in tissue specific metabolism, interplay of insulin and glucagon integration of various metabolic pathways of proteins, lipids, carbohydrates and nucleic acids, obesity and regulation of body mass, electron transport chain and inhibitors, oxidative phosphorylation: chemiosmotic theory, role of uncouplers and ionophores.

**PRACTICALS**

1. Preparation of serum and plasma from whole blood.
2. Quantitative determination of the following in the whole blood/plasma/serum:
  - a). **LFT:**
    - i) SGPT and SGOT
    - ii) Creatine kinase
    - iii) Albumin/total protein
  - b) **KFT:**
    - i) Urea
    - ii) Uric acid
  - c). **Metabolites:**
    - i) HDL/LDL and triglycerides
    - ii) Serum protein A: G ratio.
    - iii) Serum glucose.
3. Five case studies based on above quantitative studies performed.

**ESSENTIAL BOOKS**

1. Tietz Fundamentals of Clinical Chemistry, 6<sup>th</sup> edition (2007), Carl A. Burtis, Edward R. Ashwood, and David E. Bruns; WB Saunders Co.
2. Harpers Illustrated Biochemistry, 29<sup>th</sup> edition (2012), Robert Murray, David Bender, Kathleen M. Botham Peter J. Kennelly, Victor Rodwell, P. Anthony Weil; McGraw-Hill Medical.

3. Lehninger's Principles of Biochemistry, David L. Nelson and Michael M. Cox, 5<sup>th</sup> edition (2008).
4. Textbook of Medical Biochemistry, 7<sup>th</sup> edition (2007), Chatterjea & Shinde, Jaypee Publications.

### **SUGGESTED BOOKS**

1. Biochemistry, J. M. Berg, J. L. Tymoczko and L. Stryer, 6<sup>th</sup> edition (2006), W. H. Freeman and Co.
2. Fundamentals of Biochemistry: Life at the Molecular Level, 4<sup>th</sup> edition (2012), Donald Voet, Judith G. Voet, Charlotte W. Pratt; Wiley.