Course Title: Cellular and Molecular Biochemistry

Level: Medical Students
Duration: 16 Weeks (2 hours/week)
Main Reference: Karthikeyan Biochemistry
Additional References: Lehninger Principles of Biochemistry, Stryer's Biochemistry
Assessment: Final exam (50–60 MCQs)

Course Objectives

By the end of this course, students will be able to:

- Describe the structure and function of biomolecules (amino acids, proteins, carbohydrates, lipids, nucleic acids)
- Explain enzyme mechanisms, kinetics, and regulation
- Understand biochemical underpinnings of molecular function in health and disease
- Connect macromolecular structure to physiological roles

Lesson Plan Overview

Week	Topic	Content Focus	Teaching Strategies	References
1	**Introduction + Amino Acids**	Amino acid structure, classification, properties, zwitterions, pKa	Lecture, structural diagrams, Q&A	The primary reference for this course is Karthikeyan's Biochemistry, with Lehninger and Stryer used as supplementary texts for additional explanation and clarity.
2	**Peptides & Protein Structure I**	Peptide bond, primary & secondary structure, hydrogen bonding	Visuals, 3D models, group discussion	
3	**Protein Structure II**	Tertiary & quaternary structure, folding, motifs, domains	Case studies (e.g., misfolding), PDB demos	
4	**Structure-Function Relationships**	Examples: Collagen, keratin, globular vs. fibrous proteins	Comparative tables, clinical connections	
5	**Enzymes I: Basics**	Classification, active site, mechanism of action	Enzyme models, classification flowcharts	
6	**Enzymes II: Kinetics**	Michaelis-Menten, Km, Vmax, Lineweaver-Burk	Problem-solving, graphs, concept mapping	

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7	**Enzymes III: Regulation**	Allostery, covalent modification, zymogens, feedback inhibition	Diagram analysis, pathway examples	
8	**Hemoglobin & Myoglobin**	Structure, oxygen binding, cooperativity, Bohr effect	Clinical correlation (anemia, sickle cell), O2 dissociation curves	
9	**Carbohydrates I**	Monosaccharides, isomerism, stereochemistry, anomers	Molecule kits, exercises	
10	**Carbohydrates II**	Glycosidic bonds, disaccharides, polysaccharides	Chart comparisons, structural drawing	
11	**Lipids I**	Fatty acids, structure, saturation, triglycerides	Lipid models, case studies	
12	**Lipids II**	Phospholipids, sphingolipids, glycolipids, biological membranes	Membrane diagrams, role in signaling	
13	**Membranes**	Lipid bilayer, fluid mosaic model, membrane proteins	Interactive apps/models, group activity	
14	**Nucleotides**	Structure, purines/pyrimidines, base properties, tautomerism	Puzzle models, functional roles	
15	**Nucleic Acids**	DNA/RNA structure, base pairing, double helix, types of RNA	DNA models, Watson-Crick model, clinical insights	
16	**Revision + Practice MCQs**	Summary of key concepts + 30–40 practice MCQs	Group quiz, Q&A, mock test	

Additional Notes

- **Assignments:** Optional short weekly quizzes for reinforcement
- **Interactive Elements:** Use molecular models, diagrams, and clinical cases to link biochemistry with medicine
- **MCQ Focus:** Structure-based, function-based, regulatory pathways, clinical correlations