

MEDICAL CHEMISTRY

Academic year 2026/2027

[Wednesdays, 8:00-9:30 h/ Fridays 8:00-9:30 h (odd weeks) Lecture Hall B]

WEEK	DATE	THE TOPIC OF THE LECTURE
1.	16.9.2026	ELEMENTS, CHEMICAL BONDS, AND NON-COVALENT INTERACTIONS Biologically important elements and their compounds. Oxygen and other radicals – chemical properties and reactions. Chemical bonds, non-covalent interactions.
2.	23.9.2026	CHEMICAL EQUILIBRIUM AND ENERGETICS OF CHEMICAL REACTIONS Chemical equilibrium. The first law of thermodynamics, Enthalpy. Entropy and the second law of thermodynamics. Thermodynamics and living systems. Gibbs free energy and coupled reactions in living systems.
	25.9.2026	THE RATE OF CHEMICAL REACTIONS Rate of reactions. Opposing, consecutive, and branched reactions, their significance in metabolic pathways. Catalysis. Enzyme kinetics and inhibition.
3.	30.9.2026	ENZYMES Classification of enzymes. Mechanism of enzyme catalysis, enzyme specificity, isoenzymes. Regulation of enzyme activity – short-term and long-term control.
4.	7.10.2026	AQUEOUS SOLUTIONS AND THEIR REACTIONS I. Properties of aqueous solutions, concentration of solutions, diffusion, osmosis. Chemical reactions in aqueous solutions: Acid-base reactions, pH of solutions. Buffer systems and living organisms.
	9.10.2026	AQUEOUS SOLUTIONS AND THEIR REACTIONS II. Oxidation-reduction reactions, redox potential. Precipitation reactions – formation of insoluble substances. Formation of coordination substances. Colloids, hydrophilic and hydrophobic colloids, and biopolymers as colloids.
5.	14.10.2026	AMINO ACIDS AND PEPTIDES Chemical properties and biological importance of amino acids and peptides. Nomenclature of amino acids and peptides. Amphiprotic properties.
6.	21.10.2026	PROTEINS Chemical properties and biomedical importance of proteins. Protein conformation – primary, secondary, tertiary, and quaternary structure of proteins. Protein denaturation. Globular and fibrillar proteins. Chemical properties of myoglobin, hemoglobin, and collagen. Transcription factors, immunoglobulins, receptors.

	23.10.2026	SACCHARIDES Chemical properties and biological importance of mono-, di-, polysaccharides. Derivatives of saccharides. Glycosaminoglycans, glycoconjugates.
7.	28.10.2026	LIPIDS Classification of lipids. Chemical properties and biological significance of triacylglycerols, phospholipids, sphingolipids and steroids.
8.	4.11.2026	STRUCTURE OF BIOLOGICAL MEMBRANES Lipid and protein components of membranes. Synthetic membranes. Membrane fluidity, movement of lipids and proteins. Structural changes of membranes under pathological conditions.
	6.11.2026	MEMBRANE TRANSPORT Passive and active transport - facilitated diffusion, channels, ATP-dependent transport. Transport of polar and non-polar substances, gases, and drugs. Transepithelial transport, exocytosis, endocytosis. Transport of amino acids.
9.	11.11.2026	NUCLEOTIDES Chemical and biological properties of purine and pyrimidine nucleotides. Nucleotide-derived coenzymes and other coenzymes. Second messengers.
10.	18.11.2026	NUCLEIC ACIDS Primary, secondary, and tertiary structure of DNA. Genetic information. Structure and organization of the eukaryotic genome, organization of DNA with proteins in chromatin, chromosomes.
	20.11.2026	DNA replication Mechanism of DNA replication. Enzymes and other factors required for DNA replication. Mechanisms of DNA repair.
11.	25.11.2026	RNA synthesis Major classes of RNA (mRNA, tRNA, rRNA). Mechanism of RNA synthesis – transcription, post-transcriptional RNA processing, splicing. RNA as an enzyme.
12.	2.12.2026	CREDIT TEST
	4.12.2026	PROTEOSYNTHESIS Characteristics of genetic code, mutations. Mechanism of proteosynthesis, post-translational modifications of proteins. Inhibitors, antimetabolites, antibiotics.
13.	9.12.2026	REGULATION OF GENE EXPRESSION Regulation of gene expression in eukaryotes. Six steps of regulation. Clinical examples of deregulation of gene expression.

