

Course: STRUCTURAL BIOCHEMISTRY I
(2 CFU; 22 hr lesson)

Learning objectives: The student knows the basic carbon chemistry, the functional groups and the chemical-physical properties of the main classes of biologically relevant organic compounds. In turn these properties confer to biomolecules the suitable structural and functional features for their specific biological role. The student is able to identify the functional groups in the biomolecules, and to link the chemical structure to the role of biologically active organic compounds in the constitution and transformation of living matter. Moreover she/he is able to understand the molecular susceptibility to structural and conformational changes, ruled by the cellular microenvironment, and the guidelines of the biosynthetic and metabolic reactions in animals. The student acquires information on the structure and role of glucides, nucleotides and vitamins in animals, as basic tool for the future veterinarian activities and skills.

Acquired skills and domains	Topics	Contents	hrs
Opening lesson		Course introduction, programme and how students will be evaluated	1
<p>1. CARBON CHEMISTRY (FOR A TOTAL OF 11 HRS)</p> <p><i>Students are endowed with:</i></p> <p>a) the basic carbon chemistry and the tools to identify the main organic compounds</p> <p>b) the ability to recognize the functional groups in biomolecules</p> <p>c) the understanding of the chemical reactivity of organic compounds</p>	Basic carbon chemistry	Macro- e microconstituents of living matter. The most abundant heteroatoms in biomolecules. Chemical features of carbon. Graphical representation of organic compounds. Carbon oxidation state in biologically relevant organic compounds	1
	Overview of organic compounds	Functional groups, definition, the main functional groups and their basal features. Mono- and polyfunctional organic compounds, isomers, chirality	1
	Aliphatic hydrocarbons	Classification, nomenclature and chemical-physical features of alkanes, alkenes, alkynes. Linear, branched and cyclic chains. Alkyl groups.	1
	Aromatic compounds	Benzene and aromatic hydrocarbons. Resonance stabilization. Aryl groups. Phenols. Aromatic features.	2
	Heteroatom-containing - compounds	Alcohols, thiols, ethers, thioethers, esters, thioesters. Amines, classification, chemical-physical properties.	1
		Carbonylic compounds, aldehydes, ketones and derivatives: hemiacetals and acetals. Carboxylic acids and derivatives: esters, amides, anhydrides. Chemical-physical properties.	2

	Reactivity	The main organic reactions of biochemical relevance: addition, elimination, substitution group transfer, redox reactions. Ionic and radical reactions. Reaction intermediates: radicals and ions. Nucleophilic and electrophilic species.	2
<p>2. SELECTED BIOLOGICALLY ACTIVE ORGANIC COMPOUNDS: CARBOHYDRATES, NUCLEOTIDES, VITAMINS (FOR A TOTAL OF 10 HRS)</p> <p><i>Students are endowed with:</i></p> <p><i>the ability to recognize the carbohydrates, nucleotides and vitamins as polyfunctional organic compounds and to link their features to the molecular structure</i></p>	Glucides or carbohydrates	Definition and classification of carbohydrates. Monosaccharides: classification, nomenclature, stereochemistry. Structure representations, monosaccharide cyclization and mutarotation.	3
		Monosaccharide derivatives. Glycosidic bonds. Reducing and non-reducing ends. Oligosaccharides, structural and storage polysaccharides.	2
	Nucleotides	Nucleotide and nucleoside structure. Nucleotides as coenzymes: NAD, NADP, FAD. The nucleotide triphosphate ATP. Nucleotides as nucleic acid constituents: DNA and RNA structures and biochemical role.	2
	Vitamins	Hydrosoluble vitamins. Group B vitamins: structure and role as coenzyme precursors. Notions on antivitamins. Vitamin C and its antioxidative role. Food sources, biological role, carential symptoms.	2
		Structure and function of liposoluble vitamins: A, D, E, K. Food sources, biological role, carential symptoms.	2