



## Subject card

Subject name and code	Bioorganic Chemistry and Stereochemistry, PG_00048906						
Field of study	Biotechnology						
Date of commencement of studies	February 2022	Academic year of realisation of subject			2022/2023		
Education level	second-cycle studies	Subject group			Obligatory subject group in the field of study Subject group related to scientific research in the field of study		
Mode of study	Full-time studies	Mode of delivery			at the university		
Year of study	1	Language of instruction			Polish		
Semester of study	2	ECTS credits			3.0		
Learning profile	general academic profile	Assessment form			exam		
Conducting unit	Department of Organic Chemistry -> Faculty of Chemistry						
Name and surname of lecturer (lecturers)	Subject supervisor	prof. dr hab. inż. Maria Milewska					
	Teachers	prof. dr hab. inż. Maria Milewska dr inż. Andrzej Skwarecki dr hab. Sławomir Makowiec					
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	0.0	0.0	0.0	15.0	45
	E-learning hours included: 0.0						
Learning activity and number of study hours	Learning activity	Participation in didactic classes included in study plan	Participation in consultation hours		Self-study		SUM
	Number of study hours	45	5.0		25.0		75
Subject objectives	Broadening of knowledge on biologically active compounds, especially concerning structure-activity relationship, including the optically active molecules.						
Learning outcomes	Course outcome	Subject outcome			Method of verification		
	K7_K02	The student updates the knowledge and improves professional skills; understands the need for education and training throughout life			[SK2] Assessment of progress of work		
	K7_U04	Student is able to predict potential chemical properties of biologically active compounds, based on knowledge of their chemical structure			[SU2] Assessment of ability to analyse information		
	K7_W04	The student has broadened and deep knowledge about biologically active compounds, with particular emphasis on the relationship between the structure and properties of chemical compounds, including biomolecules			[SW1] Assessment of factual knowledge		

Subject contents	<p><b>Biostereochemistry</b></p> <p>1. Conformation of carbon compounds - parameters of molecular geometry; conformations of linear compounds – non-bonding interactions; conformations of cyclic compounds; anomeric effect</p> <p>2. Configuration and chirality of a molecule - elements of symmetry and operations of symmetry; point groups of symmetry – examples of molecules; chiral molecules with more than one stereogenic center; configurations meso, erythro/threo and syn/anti; epimers; chirality of molecules lacking stereogenic centers, axial and plane chirality, intrinsically dissymmetric molecules; separation of stereoisomers; resolution; applications of circular dichroism</p> <p>3. Dynamic stereochemistry - heterotopic and homotopic ligands and faces; heterotopicity and NMR spectroscopy, nomenclature Re/Si; conformational and configurational changes – racemisation and epimerisation processes; inversion of configuration; inhibition of free rotation around a bond – atropisomerism; conformational equilibria in cyclic systems – ring inversions</p> <p>4. Selected topics of stereochemistry of biomolecules</p> <p>configurational isomers in Nature and their properties; stereochemistry of amino acids; stereochemistry of carbohydrates; selected stereochemical aspects of lipids and prostaglandins; selected stereochemical aspects of polyprenoids and steroids</p> <p>5. Conformations of biopolymers - 3D structure of peptides and proteins; stereochemistry of polysaccharides; 3D structure of nucleic acids</p> <p>6. Physicochemical methods of investigation of the 3D structure of biopolymers</p> <p><b>Bioorganic chemistry</b></p> <p>1. The chemical origins of biology</p> <ul style="list-style-type: none"> <li>• Molecular and atom orbital theory</li> <li>• Intermolecular interactions</li> <li>• Prebiotic chemistry</li> </ul> <p>2. Deoxyribonucleic acid</p> <ul style="list-style-type: none"> <li>• Chemical structure and interactions</li> <li>• Biosynthesis and chemical synthesis</li> <li>• DNA reactions</li> </ul> <p>3. Amino acids and peptides</p> <ul style="list-style-type: none"> <li>• Chemical structure and interactions</li> <li>• Peptide synthesis on solid phase</li> <li>• Enzymatic cofactors</li> </ul> <p>4. Saccharides</p> <ul style="list-style-type: none"> <li>• Chemical structure</li> <li>• Chemistry of glycosidic bond</li> <li>• Polysaccharides, glycoproteins, glycolipids</li> </ul> <p>5. Polyketides</p> <ul style="list-style-type: none"> <li>• Chemical structure and biosynthesis</li> <li>• Polyketides in human body</li> </ul> <p>6. Terpenes</p> <ul style="list-style-type: none"> <li>• Chemical structure and biosynthesis</li> </ul>
Prerequisites and co-requisites	Knowledge of basic principles of organic chemistry

Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Written examination part II - Bioorganic Chemistry	55.0%	45.0%
	Preparation and presentation of two reports on given subject	50.0%	10.0%
	Written examination part I - Biostereochemistry	55.0%	45.0%
Recommended reading	Basic literature	<ol style="list-style-type: none"> <li>1. D. van Vranken, G. Weiss, Introduction to Bioorganic Chemistry and Chemical Biology, Garland Science Taylor &amp; Francis Group, New York and London 2013</li> <li>2. E. L. Eliel, S. H. Wilen, L. N. Mander STEREOCHEMISTRY OF ORGANIC COMPOUNDS, J. Wiley&amp;Sons, Inc., 1994</li> <li>3. M. Nogradi STEREOCHEMIA. PODSTAWY I ZASTOSOWANIA, PWN Warszawa, 1988</li> <li>4. I. Z. Siemion BIOSTEREOCHEMIA, PWN Warszawa, 1985</li> </ol>	
	Supplementary literature	<ol style="list-style-type: none"> <li>1. G. L. Patrick, An introduction to medicinal chemistry sixth edition, Oxford University Press, Oxford 2017</li> <li>2. P. Kafarski, B. Lejczak, Chemia Bioorganiczna, Polskie Wydawnictwo Naukowe 1994</li> <li>3. C. H. Wong, G. M. Whitesides ENZYMES IN SYNTHETIC ORGANIC CHEMISTRY, Pergamon 1995</li> </ol>	
	eResources addresses		
Example issues/ example questions/ tasks being completed	Determine the R / S configuration of all the stereogenic mevinoline centers		
Work placement	Not applicable		