GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Bioorganic Chemistry and Stereochemistry, PG_00039038		
Field of study	Chemistry		
Date of commencement of studies	February 2024	Academic year of realisation of subject	2024/2025
Education level	second-cycle studies	Subject group	Optional subject group
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	assessment
Conducting unit	Department of Organic Chemistry -> Faculty of Chemistry		
Name and surname of lecturer (lecturers)	Subject supervisor	prof. dr hab. inż. Maria Milewska	
	Teachers	dr hab. Sławomir Makowiec prof. dr hab. inż. Maria Milewska dr inż. Andrzej Skwarecki	

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	10.0	20.0	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_K01	Student updates the state of knowledge about stereochemistry and biological activity of biomolecules; understands the need for education and training throughout life	[SK2] Assessment of progress of work
K7_W02	The student has broadened and deep knowledge about biologically active compounds, with particular emphasis on pharmacological aspects and the relationship between the structure and properties of chemical compounds, including biomolecules	[SW1] Assessment of factual knowledge
K7_U01	tudent is able to gain information from literature, databases and some other sources; The student is able, based on the collected source material, to prepare a speech with a multimedia presentation on the chemical and biological properties of organic compounds, their structure and importance in human life	[SU2] Assessment of ability to analyse information

Subject contents	**Biostereochemistry** 1. Conformation of carbon compounds - parameters of molecular geometry; conformations of linear compounds non-bonding interactions; conformations of cyclic compounds; anomeric effect 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 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 bound atropoisomerism; conformational equillibria in cyclic systems ring inversions 4. Selected topics of stereochemistry of biomolecules 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 5. Conformations of biopolymers - 3D structure of peptides and proteins; stereochemistry of polysaccharides; 3D structure of nucleic acids 6. Physicochemical methods of investigation of the 3D structure of biopolymers **Bioorganic chemistry** 1. The chemical origins of biology • Molecular and atom orbital theory • Intermolecular interactions • Prebiotic chemistry 2. Deoxyribonucleic acid • Chemical structure and interactions • Biosynthesis and chemical synthesis • DNA reactions 3. Amino acids and peptides • Chemical structure and interactions • Peptide synthesis on solid phase • Enzymatic cofactors 4. Saccharides • Chemical structure • Chemistry of glycosidic bond • Polisaccharides, glycoproteins, glycolipids 5. Polyketides • Chemical structure and biosynthesis • Polyketides in human body 6. Terpenes • Chemical structure and biosynthesis
Prerequisites and co-requisites	Knowledge of basic principles of organic chemistry

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<tr><td>Assessment methods and criteria</td><td colspan="2"><table>
<tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr>
<tr><td>Preparation and presentation of two reports on given subject</td><td>50.0%</td><td>30.0%</td></tr>
<tr><td>Written examination part I - Biostereochemistry</td><td>55.0%</td><td>35.0%</td></tr>
<tr><td>Written examination part II - Bioorganic Chemistry</td><td>55.0%</td><td>35.0%</td></tr>
</table></td></tr>
<tr><td rowspan="3">Recommended reading</td><td>Basic literature</td><td>1. D. van Vranken, G. Weiss, Introduction to Bioorganic Chemistry and Chemical Biology, Garland Science Taylor & Francis Group, New York and London 2013
2. E. L. Eliel, S. H. Wilen, L. N. Mander STEREOCHEMISTRY OF ORGANIC COMPOUNDS, J. Wiley&Sons, Inc., 1994
3. M. Nogradi STEREOCHEMIA. PODSTAWY I ZASTOSOWANIA, PWN Warszawa, 1988
4. I. Z. Siemion BIOSTEREOCHEMIA, PWN Warszawa, 1985</td></tr>
<tr><td>Supplementary literature</td><td>1. G. L. Patrick, An introduction to medicinal chemistry sixth edition, Oxford University Press, Oxford 2017
2. P. Kafarski, B. Lejczak, Chemia Bioorganiczna, Polskie Wydawnictwo Naukowe 1994
3. C. H. Wong, G. M. Whitesides ENZYMES IN SYNTHETIC ORGANIC CHEMISTRY, Pergamon 1995</td></tr>
<tr><td>eResources addresses</td><td>Adresy na platformie eNauczanie:</td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td colspan="2">Stereochemistry of prostagalandins.

Stereochemistry of nucleic acids.

How you can separate the racemic mixtures into enantiomers. Illustrate the answer with appropriate reaction.</td></tr>
<tr><td>Work placement</td><td colspan="2">Not applicable</td></tr>
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