

Subject card

Subject name and code	From peptides to poisons: biologically active compounds in forensic science, PG_00211855						
Field of study	Forensic Analytics						
Date of commencement of studies	October 2026		Academic year of realisation of subject		2028/2029		
Education level	Bachelor's studies		Subject group		Obligatory subject group in the field of study Optional subject group		
Mode of study	full-time studies		Mode of delivery		at the university		
Year of study	3		Language of instruction		Polish		
Semester of study	6		ECTS credits		1.0		
Learning profile	academic		Assessment form		credit		
Conducting unit	Laboratory of Bioorganic Chemistry -> Department of Molecular Biochemistry -> Faculty of Chemistry -> Rector						
Name and surname of lecturer (lecturers)	Subject supervisor		dr Natalia Ptaszyńska				
	Teachers						
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	0.0	0.0	0.0	15
	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	15		2.0		8.0	25
Subject objectives	- To familiarize students with all topics covered in the course syllabus. - To introduce students to the major groups of endogenous peptides and provide knowledge of their structure and biological functions - To familiarize students with selected groups of biologically active compounds occurring in natural and synthetic environments that may play an important role in forensic and medico-legal practice - To provide knowledge of the structure, properties, mechanisms of action, and toxicological significance of peptides, natural toxins, pharmaceuticals, psychoactive substances, and other compounds affecting living organisms. - To develop the ability to apply chemical and biochemical knowledge to the identification of biologically active substances, the interpretation of physical evidence, and the investigation of poisoning cases, crimes involving toxic substances, and the abuse of psychoactive compounds.						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[AKRL3_W05] The graduate knows and understands toxicokinetic and toxicodynamic processes and the methods of identifying toxic substances in forensic contexts.	The student demonstrates knowledge of the major groups of biologically active compounds relevant to forensic science and understands the principles underlying their identification, as well as the interpretation of chemical analysis results in cases of poisoning, psychoactive substance abuse, and crimes involving toxic agents.	[SW4] test/exam - oral or written
	[AKRL3_U01] The graduate is able to identify, analyse and solve complex research problems in chemistry and forensic science by selecting appropriate methods and information sources.	The student is able to interpret the forensic and toxicological relevance of analytical findings related to peptides, toxins, pharmaceuticals, and psychoactive substances.	[SU4] test/exam - oral or written
	[AKRL3_K01] The graduate is prepared to critically evaluate their own knowledge and its relevance to solving cognitive, practical, and societal problems, as well as to responsibly make use of expert opinions.	he student is prepared to participate in interdisciplinary teams investigating cases of poisoning, misuse of biologically active compounds, and crimes involving toxic substances, demonstrating an understanding of the roles of experts in law, medicine, biology, and chemistry.	[SK5] implementation of a problem task
	[AKRL3_K04] The graduate is ready to cooperate with representatives of other fields—law, medicine, biology—within forensic expertise.	The student is prepared to collaborate with specialists in chemistry, biology, medicine, and law in the interpretation of analytical results concerning biologically active compounds and their relevance to forensic investigations and court proceedings.	[SK5] implementation of a problem task
	[AKRL3_W03] The graduate knows and understands the structure and chemical properties of compounds relevant in forensic examinations.	The student demonstrates knowledge and understanding of the structure, properties, mechanisms of action, and toxicity of selected biologically active compounds of relevance to forensic science and forensic toxicology.	[SW4] test/exam - oral or written
Subject contents	• Peptide and protein hormones: structure, properties, and biological functions. • Plant peptides and their biological and pharmacological significance. • Antibacterial and antifungal peptides. • Anticancer and immunomodulatory peptides. • Peptide vaccines and current trends in their development. • Opioid peptides and their effects on the human body. • Peptides isolated from animal venoms and peptide toxins. • Selected natural and synthetic biologically active compounds of toxicological importance. • Applications of peptides and other biologically active compounds in medical diagnostics and therapy. • Structure–activity relationship studies of biologically active compounds. • Physicochemical methods for the identification and structural characterization of peptides and toxins, including mass spectrometry (MS), nuclear magnetic resonance (NMR), high-performance liquid chromatography (HPLC), and spectroscopic techniques. • The role of biologically active compounds in forensic science and forensic toxicology: identification of poisons, poisoning cases, psychoactive substances, and interpretation of analytical results.		
Prerequisites and co-requisites	The student possesses knowledge of organic chemistry, bioorganic chemistry, and biochemistry, including the chemical structures and mechanisms of action of the major classes of biomolecules (carbohydrates, proteins, peptides, and nucleic acids), fundamental metabolic pathways, basic methods for biomolecule analysis (liquid chromatography, gel electrophoresis, mass spectrometry, and proton nuclear magnetic resonance spectroscopy), and the fundamentals of organic spectroscopy.		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Successful completion of a written examination comprising open-ended and multiple-choice questions covering the content specified in the lecture syllabus.	51.0%	100.0%

Recommended reading	Basic literature	• Kerstin A. J. (Ed.), <i>Handbook of Biologically Active Peptides</i>, Elsevier, 2006. • M. N. Sewald, H.-D. Jakubke, <i>Peptides: Chemistry and Biology</i>, Wiley-VCH Verlag. • A. Kołodziejczyk, <i>Natural Organic Compounds</i>, PWN, Warsaw, 2006. • Selected topics will be discussed on the basis of monographs and current scientific research articles.
	Supplementary literature	• Monographic publications recommended or provided by the course instructor, including electronic resources. • Jeremy M. Berg, John L. Tymoczko, Gregory J. Gatto, Lubert Stryer, <i>Biochemistry</i>.
	eResources addresses	
Example issues/ example questions/ tasks being completed	• 1. Which of the following substances is a peptide? • a) Morphine b) Insulin c) Caffeine d) Atropine • 2. Name three groups of naturally occurring poisons. • 3. Ricin is an example of: • a) a neurotransmitter b) a therapeutic peptide c) a plant-derived toxin d) a steroid • 4. Name and briefly characterize five peptide toxins. • 5. Describe the role of mass spectrometry in the identification of biologically active substances.	
Work placement	Not applicable	

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