

Subject card

Subject name and code	Fundamentals of enzymology, PG_00082051						
Field of study	Chemistry						
Date of commencement of studies	October 2025		Academic year of realisation of subject		2027/2028		
Education level	Bachelor's studies		Subject group		Obligatory subject group in the field of study Optional subject group 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	3		Language of instruction		Polish		
Semester of study	5		ECTS credits		2.0		
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 hab. Dawid Dębowski				
	Teachers						
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	0.0	0.0	0.0	0.0	30
	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	30		5.0		15.0	50
Subject objectives	Learning and understanding of the basic laws and concepts in the enzymology.						
	Learning of the structure, role and mechanisms of action of selected classes of enzymes.						
	Learning about examples of the use of enzymes in the cosmetics, food and pharmaceutical industries.						
	Understanding the role of enzymes in the development of diseases.						
	Learning of how to determine and control enzymatic activity.						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[CHEML3_K01] Identifies the level of her/his own knowledge and skills and the need for continuous learning and personal development.	Understands the need for continuous education and updating of knowledge. Is aware of the need to critically analyze own work and external source data.	[SK4] test/exam - oral or written
	[CHEML3_K06] Raises her/his professional and personal competences by using information provided in various sources.	Understands the need for continuous education and updating of knowledge. Demonstrates cautious criticism in accepting information, especially available in the mass media	[SK4] test/exam - oral or written
	[CHEML3_U02] Performs analyses using experimental methods and draws conclusions based on them.	Designs and performs basic experiments involving selected enzymes (proteases, amylases, lipases and phosphatases), their inhibitors and fluorogenic substrates. Analyzes the results of experiments and draws correct conclusions.	[SU4] test/exam - oral or written
	[CHEML3_K02] Works individually demonstrating initiative and independence of activity and cooperates in a team fulfilling various roles in it.	Is aware and has a knowledge that enzymology is multidisciplinary science. Understands the need to be able to work in a team in accordance with one's role in it (group leader/ group member)	[SK4] test/exam - oral or written
	[CHEML3_U07] Prepares documented elaboration on a specific problem in the field of selected chemical and physical issues.	Designs experiments to evaluate the activity of selected enzymes (proteases, lipases, amylases, phosphatases). Designs experiments to evaluate the activity of protease inhibitors. Designs fluorogenic peptide substrates to assess the activity of selected proteases (trypsin, chymotrypsin and elastase).	[SU4] test/exam - oral or written
	[CHEML3_W10] Enumerates and describes the basic aspects of the construction, operation and use of measuring apparatus and equipment used in experimental works in the field of chemistry and related sciences.	Knows selected methods and devices for assessing the purity and concentration of enzymes. Knows the advantages and limitations of selected devices and laboratory techniques used to assess enzymatic activity.	[SW4] test/exam - oral or written
	[CHEML3_U09] Is able to learn independently.	Has ability to use online databases containing scientific publications about enzymes and their inhibitors (such as the PubMed database). Has ability to use online available databases (including BRENDA, MEROPS, EXPASY) to expand and update his knowledge.	[SU4] test/exam - oral or written

	Course outcome	Subject outcome	Method of verification
	[CHEML3_W01] Enumerates basic laws and theories in chemistry, physics, mathematics and biology.	Describes the structure of enzymes and their active site, lists the basic functions and properties of enzymes. Explains the term enzymatic specificity taking selected proteases and lipases as examples. Distinguishes and characterizes the basic types of enzymes. Describes the mechanism of action of selected proteolytic enzymes. Defines the concept of cofactors and provide their division. Lists and describes methods of controlling enzymatic activity in the cell. Lists examples of the use of enzymes in the food, cosmetics and pharmaceutical industries. Describes basic issues related to enzymatic kinetics. Lists examples of enzymes that are biomarkers in selected diseases. Defines the concept of ribozyme and gives an example of such a compound.	[SW4] test/exam - oral or written
Subject contents	Basic classification of enzymes. Enzymes in online databases (including BRENDA, MEROPS, EXPASY). Methods of isolation and purification of enzymes. Structure and functions of selected enzymes and coenzymes. Substrate specificity. Localization of enzymes in cells. Basic regulation ways of enzymatic activity. Inhibition mechanisms, classification of enzyme inhibitors. The concept and unit of enzymatic activity. Basics of enzymatic kinetics. Examples of enzymes evaluated in medicinal diagnostics and analytics. Examples of enzymes regarded as disease markers. Examples of enzymes used in food, pharmaceutical and cosmetic industry.		
Prerequisites and co-requisites	Basic knowledge of organic chemistry and biochemistry course. The structure of amino acids and proteins.		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Written exam	51.0%	100.0%
Recommended reading	Basic literature	J. M. Berg, J. L. Tymoczko, L. Stryer, "Biochemia", PWN, Warszawa 2009. E. Bańkowski "Biochemia", Elsevier Urban & Partner Wrocław 2004. J.R. Whitaker, A.G.J Voragen, D.W.S. Wong "Handbook of food enzymology" CRC Press 2002. R.A. Copeland "Enzymes: A Practical Introduction to Structure, Mechanism, and Data Analysis", 2nd Edition, Wiley D.E. Metzler Biochemistry: "The chemical reactions of living cells" Second edition, Academic Press	

	Supplementary literature	H. Bisswanger "Practical enzymology", Second, completely revised edition, Wiley-Blackwell J-L. Reymond "Enzyme Assays" Wiley-VCH
	eResources addresses	
Example issues/ example questions/ tasks being completed	Each of the three test tubes contains an aqueous solution of a different serine protease - trypsin, chymotrypsin and elastase. Design experiments to identify these enzymes. Provide the necessary reagents and test equipment - justify your choice. Design an experiment to check whether a given compound is an inhibitor of bovine -trypsin. Provide the necessary reagents and equipment for testing - justify the choice of reagents and equipment. What is the difference between a competitive inhibitor and a noncompetitive inhibitor? How do both of these inhibitors affect V_{max} and K_m values? Present the action of both inhibitors using a Michaelis-Menten or Lineweaver-Burk plot.	
Work placement	Not applicable	

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