University of Gdańsk

Subject card

Subject name and code	The use of enzymes in the analysis of food products, PG_00179657						
Field of study	Environmental Protection						
Date of commencement of studies	October 2025		Academic year of realisation of subject	2026/2027			
Education level	Master's studies		Subject group	Optional subject group			
Mode of study	full-time studies		Mode of delivery	at the university			
Year of study	2		Language of instruction	Polish			
Semester of study	4		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 Natalia Ptaszyńska					
	Teachers						
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	0.0	0.0	30.0	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	1. **To familiarize students with the role of enzymes in food analysis**, with particular emphasis on their catalytic properties and substrate specificity. 2. **To develop practical skills in the application of enzymes** for qualitative and quantitative analysis of food components. 3. **To enhance competencies in planning and conducting enzymatic experiments**, using modern analytical techniques. 4. **To build the ability to interpret enzymatic analysis results** and assess their relevance in the context of food quality control. 5. **To improve teamwork skills in a laboratory environment**, while adhering to safety regulations and good laboratory practices. 6. **To foster critical thinking and research independence** in the use of enzymes for food analysis.						

Learning outcomes

Course outcome	Subject outcome	Method of verification
[OŚMU2_W09] Applies safety and hygiene principles when working independently on a test or measurement stand in a laboratory or in the field.	Knows and applies the principles of occupational health and safety while independently performing research and measurement tasks, both in laboratory and field conditions. Demonstrates responsibility for their own safety as well as that of their colleagues	[SW5] implementation of a problem task
[OŚMU2_K06] Recognises the importance of knowledge in solving encountered cognitive and practical problems and consults experts in the event of difficulties in solving a problem on her/his own.	Critically evaluates their own knowledge and the work of teams in which they participate, identifies gaps, and takes action to address them	[SK1] oral statement/conversation/ discussion
[OŚMU2_K02] Recognises threats, creates safe work conditions and is responsible for the safety of own and other people's work.	Collaborates within an interdisciplinary team, demonstrating responsibility, initiative, and the ability to solve research-related problems	[SK8] observation of student's independent or team work
[OŚMU2_U04] Critically analyses experimental data on environmental protection by statistical methods and modelling using IT techniques and tools.	he student prepares a thoroughly documented and analytically grounded study addressing a specific problem within selected topics in chemistry and physics. This task involves identifying a relevant scientific issue, conducting a literature review, applying appropriate theoretical frameworks, and presenting findings in a structured and coherent written format.	[SU3] text preparation/written work
[OŚMU2_U03] Plans and performs research tasks in the field or laboratory and interprets research results on environmental issues (working individually or in a team assuming various roles, including managerial functions).	Has knowledge of advanced research methods used in biochemistry and physicochemistry, including experimental and analytical techniques. Collaborates within an interdisciplinary team, demonstrating responsibility, initiative, and the ability to solve research-related problems.	[SU5] implementation of a problem task [SU8] observation of student's independent or team work
[OŚMU2_K07] Is willing to undertake individual and team activity; to professionally plan and organise its course and set priorities for their actions.	Collaborates effectively within an interdisciplinary team, demonstrating responsibility, initiative, and the ability to solve research-related problems	[SK8] observation of student's independent or team work
[OŚMU2_W04] Chooses methods, techniques and research tools used in environmental protection.	Is able to independently design and conduct biochemical experiments using available instructions and laboratory procedures	[SW2] presentation/project/paper/ report [SW5] implementation of a problem task
[OŚMU2_W05] Describes development directions and the latest discoveries in the field of scientific disciplines related to environmental protection.	Has in-depth specialist knowledge in selected areas of chemistry and physics, including the properties of enzymes and methods for their analysis. Performs critical analysis and synthesis of scientific information, including primary literature and experimental data.	[SW4] test/exam - oral or written [SW1] oral statement/ conversation/discussion
[OŚMU2_K05] Critically assesses her/his own knowledge and the knowledge of the teams in which s/ he works, can critically assess the content received.	Critically evaluates their own knowledge and the work of teams in which they participate, identifies deficiencies, and takes action to address them.	[SK1] oral statement/conversation/ discussion
[OŚMU2_U02] Uses advanced measurement and analytical techniques used in environmental protection.	Has knowledge of advanced research methods used in biochemistry and physicochemistry, including experimental and analytical techniques. Communicates effectively in a scientific environment by preparing research documentation and presenting results both orally and in writing	[SU6] demonstration of practical skills [SU8] observation of student's independent or team work

<table>
<tr><td>Subject contents</td><td>• Familiarization with the chemical structure, physicochemical properties, and biological functions of selected enzymes from the hydrolase group.
• Completion of four laboratory experiments covering the following topics:
1. Determination of glucose concentration in food products using both chemical and enzymatic methods.
2. Application of tyrosinase in the production of L-DPA.
3. Determination of acid phosphatase activity in a potato homogenate.
4. Hydrolysis of milk lipids using pancreatic lipase</td></tr>
<tr><td>Prerequisites and co-requisites</td><td>Basic knowledge of organic chemistry and biochemistry; ability to work in a chemical laboratory; familiarity with basic laboratory glassware; understanding of the principles of working in a biochemical laboratory</td></tr>
<tr><td>Assessment methods and criteria</td><td>
<table>
<tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr>
<tr><td>Completion of four planned laboratory exercises (the assessment will include: the quality of laboratory work, the approach to conducting experiments, and the ability to collaborate within a group).</td><td>51.0%</td><td>50.0%</td></tr>
<tr><td>Analysis of the obtained results in the form of a written report for each completed exercise.</td><td>51.0%</td><td>50.0%</td></tr>
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<tr><td>Recommended reading</td><td>
<table>
<tr><td>Basic literature</td><td>1. Berg, J.M., Tymoczko, M.J., Stryer, L. Biochemistry, 5th Edition, PWN Scientific Publishers, Warsaw, 2019.
2. Whitehurst, R.J., Van Oort, M. Enzymes in Food Technology, PWN Scientific Publishers, Warsaw, 2016.
3. Bańkowski, E. Biochemistry: A Textbook for Medical Students, 3rd Edition, Edra Urban & Partner, Wrocław, 2016.
4. Szutowicz, A., Raszeja-Specht, A. Laboratory Diagnostics, Volume I, Medical University of Gdańsk, Gdańsk, 2009.</td></tr>
<tr><td>Supplementary literature</td><td>1. McMurry, J. Organic Chemistry, Volume 5, PWN Scientific Publishers, Warsaw, 2022.
2. Adamczak, M. Enzymatic modification of natural triacylglycerols, Biotechnology, 1(68), 131151, 2005.
3. Alberts, B., Hopkin, K., Johnson, D.A., Morgan, D., Raff, M., Roberts, K., Walter, P. Essential Cell Biology, 3rd Edition, PWN Scientific Publishers, Warsaw, 2019.</td></tr>
<tr><td>eResources addresses</td><td></td></tr>
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<tr><td>Example issues/ example questions/ tasks being completed</td><td>Structure and Function of Enzymes:

• Structure of simple and complex enzymes (apoenzyme, cofactor, holoenzyme)
• Types and classification of cofactors
• Structure and role of the enzyme active site
• Classification and nomenclature of enzymes according to the International Union of Biochemistry and Molecular Biology (IUBMB)
• Functions of phosphatases
• Units of enzymatic activity (standard unit U, katal)
• Chemical formulas of p-nitrophenyl phosphate and its hydrolysis products
• Models describing enzyme-substrate interaction the lock and key model and the induced fit model
• Substrate-, regio-, and acyl-specificity of lipases
• Stereospecificity of enzymes
• Lipase-catalyzed reactions under anhydrous conditions
• Methods of enzyme immobilization</td></tr>
<tr><td>Work placement</td><td>Not applicable</td></tr>
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