University of Gdańsk

Subject card

Subject name and code	Secrets hidden in protein crystal, PG_00040422						
Field of study	Chemistry						
Date of commencement of studies	October 2024		Academic year of realisation of subject	2025/2026			
Education level	Bachelor'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	3		ECTS credits	2.0			
Learning profile	academic		Assessment form	credit			
Conducting unit							
Name and surname of lecturer (lecturers)	Subject supervisor		dr Marta Orlikowska				
	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	To acquaint students with the basics of protein crystallography. The study of methods for obtaining crystals, registration of a diffraction image, obtaining electron density maps and solving protein structures. To acquaint students with the parameters characterizing the correctness and quality of the structure. Preparing students for independent use of information about structures deposited in the PDB. To acquaint students with the possibilities of presenting protein structures in a graphics program. To acquaint students with examples of the use of protein spatial structures in drug design.						

Learning outcomes

Course outcome	Subject outcome	Method of verification
[CHEML3_K02] Works individually demonstrating initiative and independence of activity and cooperates in a team fulfilling various roles in it.	student works showing creativity and independence as well as the ability to cooperate while working in a group; student knows how to discuss and convince people to be right with factual arguments	[SK2] presentation/project/paper/ report [SK5] implementation of a problem task [SK8] observation of student's independent or team work
[CHEML3_U04] Plans and performs simple chemical experiments and analyses the results obtained.	student is able to plan and conduct experiments leading to receiving protein crystals; student can verify the correctness of the model structures.	[SU2] presentation/project/paper/ report [SU8] observation of student's independent or team work
[CHEML3_K03] Establishes priorities in the right way for the implementation of tasks specified by herself/himself and/or by others.	student works showing creativity and independence as well as the ability to cooperate while working in a group	[SK2] presentation/project/paper/ report [SK5] implementation of a problem task [SK8] observation of student's independent or team work
[CHEML3_W09] Describes the practical applications of IT tools (computer programmes) for chemical calculations and data analysis.	student can verify correctness of the structure model.	[SW2] presentation/project/paper/ report [SW5] implementation of a problem task
[CHEML3_U06] Uses basic application software packages to solve problems from the field of science.	student can visualize protein structure or fragment thereof graphics program; student can verify correctness of the structure model	[SU2] presentation/project/paper/ report [SU5] implementation of a problem task [SU8] observation of student's independent or team work
[CHEML3_U12] Reads with understanding scientific and popular science chemical texts in English.	student knows the basics of protein crystallization: factors affecting the solubility of proteins, crystallization techniques, crystal nucleation.	[SU6] demonstration of practical skills
[CHEML3_K05] Observes established procedures in laboratory work and is responsible for the safety of her/his and others' work.	student is able to plan and conduct experiments leading to receiving protein crystals;	[SK5] implementation of a problem task [SK8] observation of student's independent or team work
[CHEML3_W03] Explains the relationship between the structure of matter and its observed properties.	student is able to reason about protein properties on based on its structure	[SW2] presentation/project/paper/ report
[CHEML3_K08] Formulates opinions in the field of science with caution and criticism in their expression.	student knows the basics of protein crystallization: factors affecting the solubility of proteins, crystallization techniques, crystal nucleation; student learns the methods of solving structures:	[SK2] presentation/project/paper/ report [SK6] demonstration of practical skills

Subject contents

- Obtaining protein crystals (crystallization by vapor diffusion method, crucial factors for crystallization, observation of the crystals under a microscope, harvesting of crystals from drop)
- Obtaining a diffraction pattern for protein crystals
- Analysis of model compatibility with electron density maps
- Interpretation of protein structures deposited in Protein Data Bank (structure quality assessment)
- Preparation of representations of two- and three-dimensional protein structures in a graphics program

Prerequisites and co-requisites

- completed courses: "General chemistry", "Physics", "Information technology"

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
points for raports from laboratory exercises	51.0%	100.0%

Recommended reading

Basic literature	• monographic materials prepared by the lecturers • Proteomics and metabolomics, collective work, University of Warsaw Publishing House
Supplementary literature	Biomolecular Crystallography: Principles, Practice, and Application to Structural Biology, Bernhard Rupp
eResources addresses	

Example issues/ example questions/ tasks being completed	• Protein crystallization by vapor diffusion method • Evaluation of set crystallization trials • Familiarization with the UniProt database tools - Align and Blast • Protein structure - analysis of the model's compliance with experimental data and assessment of the quality of the structure • Using the PyMOL program to graphically present the structures of biomolecules
Work placement	Not applicable

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