University of Gdańsk

Subject card

Subject name and code	Symmetry in crystals, PG_00179527						
Field of study	Chemistry						
Date of commencement of studies	October 2026		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	1		Language of instruction	Polish			
Semester of study	2		ECTS credits	1.0			
Learning profile	academic		Assessment form	credit			
Conducting unit	Laboratory of Crystallochemistry -> Department of Physical Chemistry -> Faculty of Chemistry -> Rector						
Name and surname of lecturer (lecturers)	Subject supervisor		dr Artur Mirocki				
	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		13.0	30
Subject objectives	Familiarization of students with point symmetry of finite objects, symmetry of infinite structures, experimental crystallography, and the physical properties of crystals in relation to their symmetry						

Learning outcomes

Course outcome	Subject outcome	Method of verification
[CHEMMU2_W08] Demonstrates knowledge of theoretical computational and IT methods used to solve problems in chemistry.	The student is familiar with diffraction methods, the Laue and Bragg diffraction conditions, the construction of the Ewald sphere, and the concept of the reciprocal lattice	[SW1] oral statement/ conversation/discussion [SW5] implementation of a problem task
[CHEMMU2_W02] Has extended and in-depth knowledge in the field of basic chemistry.	The student performs coordinate system transformations, identifies symmetry operations and elements, and assesses the compatibility of symmetry with translational lattices. They recognize symmetry operations, are familiar with symmetry groups, and are capable of assigning point groups to objects. The student understands the stereographic projection of symmetry groups, symmetry operations in infinite translational lattices, and can describe the relationship between crystal symmetry and the symmetry of physical properties	[SW1] oral statement/ conversation/discussion [SW5] implementation of a problem task
[CHEMMU2_K01] Knows the limitations of her/his own knowledge; understands the need for further education and can inspire other people to do so.	The student understands the need for lifelong learning and continuous improvement of professional, personal, and social competencies; demonstrates a critical attitude towards information obtained from the internet and other sources; adheres to the principles of professional ethics, including regulations concerning copyright and the protection of intellectual property	[SK1] oral statement/conversation/ discussion [SK5] implementation of a problem task [SK8] observation of student's independent or team work
[CHEMMU2_W11] Demonstrates general knowledge about the current trends in the development of chemistry as a science and the latest discoveries in this field.	The student possesses foundational knowledge of experimental crystallography, including the latest diffraction techniques, current procedures of structural analysis, methods of electron and neutron diffraction, as well as techniques for investigating polycrystalline materials	[SW1] oral statement/ conversation/discussion [SW5] implementation of a problem task

Subject contents

Coordinate system transformations; compatibility of symmetry with translational lattices; the isometry condition in an orthonormal coordinate system; symmetry operations and symmetry elements in three-dimensional and higher-dimensional spaces; invariants of symmetry operations; determination of the positions of symmetry elements; coexistence of symmetry axes and of mirror planes with symmetry axes; assignment of point groups to objects; stereographic projection of symmetry groups; diffraction methods; the relationship between crystal symmetry and the symmetry of physical properties

Prerequisites and co-requisites

General Chemistry

Crystallography

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
test	51.0%	100.0%

Recommended reading

Basic literature	1. Bojarski Z., Gigla M., Stróż K., Surowiec M., Krystalografia, PWN, 2008. 2. Trzaska Durski Z., Trzaska Durska H., Podstawy krystalografii strukturalnej i rentgenografii, Oficyna Wydawnicza. Politechniki Warszawskiej, 2003.
Supplementary literature	1. Penkala, T., Zarys Krystalografii, PWN, 1983.
eResources addresses	

Example issues/ example questions/ tasks being completed

Work placement

Not applicable

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