

Subject card

Subject name and code	Physico-chemical analytical methods, PG_00082038						
Field of study	Chemistry						
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 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		1.0		
Learning profile	academic		Assessment form		credit		
Conducting unit	Faculty of Chemistry -> Rector						
Name and surname of lecturer (lecturers)	Subject supervisor		dr hab. Karol Krzywiński				
	Teachers						
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	0.0	15.0	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	Familiarize students with theoretical (general knowledge, calculations) contained in the contents of the course. Understanding physicochemical processes with the emphasis on natural environment and everyday life. Inspiring students to select and evaluate the acquired information by themselves in order to develop skills of selfeducation by acquiring and analysing information derived from various sources.						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	[CHEML3_W02] Describes the properties of elements and the most important chemical compounds, enumerates the methods of their preparation and methods of analysis.		Student knows the basics and is able to plan the analysis of chemical compounds using physicochemical methods (spectroscopic, thermochemical, chromatographic, refractometric).		[SW4] test/exam - oral or written [SW1] oral statement/ conversation/discussion		
	[CHEML3_W04] Characterises the basic methods of chemical compound analysis.		Student knows the basics and is able to select appropriate methods for analyzing chemical compounds. Student is able to perform the necessary calculations related to the planned analyzes of chemical compounds.		[SW4] test/exam - oral or written [SW1] oral statement/ conversation/discussion		
	[CHEML3_U05] Uses basic statistical methods and IT techniques to describe chemical processes and analyse experimental data.		Student can solve calculation problems using appropriate theories, formulas and statistical methods.		[SU1] oral statement/conversation/ discussion [SU4] test/exam - oral or written		
Subject contents	calculations related to the cryoscopic and ebullioscopic effect and other colligative properties; osmosis: determining osmotic pressure, determining molar mass and isotonic coefficient by osmotic measurement; thermodynamic calculations of the crystal lattice enthalpy using the Born-Haber cycle; spectroscopy: rotational and vibrational spectra: calculation of the frequency and width of rotational and oscillatory transitions, calculation of molecular moments of inertia, lengths and force constants of bonds; calculations of molar absorption coefficients, wave numbers of electronic transitions, calculation of the half-life of the phosphorescent state						

Prerequisites and co-requisites	Completion of courses at the bachelor level: mathematics, physics, general chemistry, physical chemistry.		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	activity	0.0%	5.0%
	test	51.0%	95.0%
Recommended reading	Basic literature	Electronic materials provided by the lecturers.	
	Supplementary literature	1. P.W. Atkins, Chemia fizyczna, Wydawnictwo naukowe PWN, Warszawa 2003. 2. J. Demichowicz-Pigoniowa, Obliczenia fizykochemiczne, PWN Warszawa, 1984.	
	eResources addresses		
Example issues/ example questions/ tasks being completed	1. Express the energy of radiation with a wavelength of 600 nm in frequency units and wave numbers. 2. Calculate the moment of inertia of sulfur hexafluoride about the axis of rotation perpendicular to the axis of the molecule and passing through the sulfur atom. The SF bond length is 0.1564 nm. The masses of the nuclides are: S - 32,066 and F - 18,998. 3. List and briefly describe the effects affecting the spectral line width.		
Work placement	Not applicable		

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