

Subject card

Subject name and code	Physico-chemical analytical methods, PG_00082038						
Field of study	Chemistry						
Date of commencement of studies	October 2024	Academic year of realisation of subject				2026/2027	
Education level	Bachelor's studies	Subject group				Obligatory subject group 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_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
	[CHEML3_U02] Performs analyses using experimental methods and draws conclusions based on them.	Student can plan the experiments in the laboratory, analyze and solve problems using the known laws and methods and correctly draw conclusions from the results of the measurements.	[SU1] oral statement/conversation/discussion [SU4] test/exam - oral or written
	[CHEML3_U03] Selects the appropriate equipment and laboratory apparatus for conducting uncomplicated chemical experiments.	Student is able to plan experimental research using the physicochemical analytical methods.	[SU1] oral statement/conversation/discussion [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.	The student is able to describe the construction and principles of operation of chemical equipment necessary for physicochemical measurements.	[SW1] oral statement/conversation/discussion
	[CHEML3_U07] Prepares documented elaboration on a specific problem in the field of selected chemical and physical issues.	Student can analyze and solve problems using the known laws and methods, correctly draw conclusions from the results of the measurements and prove their correctness on the basis of the available literature.	[SU1] oral statement/conversation/discussion [SU4] test/exam - oral or written
	[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_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_K05] Observes established procedures in laboratory work and is responsible for the safety of her/his and others' work.	Student can work independently and cooperate and interact in the group adopting various roles..	[SK1] oral statement/conversation/discussion	
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	<ol style="list-style-type: none"> 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	<ol style="list-style-type: none">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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