

Subject card

Subject name and code	Unlocking the Secrets of Life: Spectroscopy in Bioinorganic Chemistry, PG_00171097						
Field of study	Chemical Business, Chemistry, Environmental Protection						
Date of commencement of studies	February 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		English		
Semester of study	2		ECTS credits		4.0		
Learning profile	academic		Assessment form		credit		
Conducting unit	Laboratory of Intermolecular Interactions -> Department of Bioinorganic Chemistry -> Faculty of Chemistry -> Rector						
Name and surname of lecturer (lecturers)	Subject supervisor		dr hab. Agnieszka Chylewska				
	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		10.0		60.0	100
Subject objectives	<p>The aim of the course is:</p> <p>- to familiarize students with fundamental methods of chemical and physicochemical analysis used in spectroscopic studies of bioinorganic chemical systems.</p> <p>- to give the students an idea of the importance and significance of chemistry in our lives and body;</p> <p>- to develop specific interests, habits, and abilities encompassing all sciences;</p> <p>- to help the student discover whether he/she has an aptitude for further work in pure or applied sciences and to induce such people to continue science studies</p> <p>Students will learn laboratory procedures, including safety rules, calibration techniques, acid-base equilibrium analysis, and methods for determining stoichiometry and kinetic parameters involving coordination compounds. They will also gain skills in applying potentiometry to determine the composition of coordination compounds based on the presence of chloride ions in the studied substance's formula.</p>						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[CHEMMU2_W01] Uses knowledge of spectroscopic methods of chemical compound analysis.	The student applies in-depth knowledge of spectroscopic methods for the analysis of chemical compounds, understands their principles, applications, and limitations, and can use appropriate spectroscopic techniques to analyze various types of chemical compounds.	[SW3] text preparation/written work
	[CHEMMU2_W03] Demonstrates extended knowledge in the field of modern measuring techniques used in chemical analysis.	The student demonstrates an in-depth knowledge of modern measurement techniques used in chemical analysis, understands their principles, applications, and limitations, and is able to critically evaluate the results obtained using these techniques.	[SW3] text preparation/written work
	[CHEMMU2_K06] Undertakes research tasks consciously and responsibly, understanding the social aspects of the practical application of the acquired knowledge and skills and the responsibility related to it.	The student consciously and responsibly undertakes research tasks, considering the social aspects of the practical application of acquired knowledge and skills, and understands the associated responsibility for the impact of their actions on society and the environment.	[SK3] text preparation/written work
	[CHEMMU2_W09] Classifies specialist IT tools used in statistical evaluation of experiment results.	The student is able to classify specialized software tools used in the statistical analysis of experimental results, understands their functions, and selects the appropriate software for analyzing experimental data based on the nature of the study.	[SW3] text preparation/written work
	[CHEMMU2_U05] Presents the results of research in the form of an independently written paper containing a description and justification of the purpose of the work, adopted methodology, results and their significance in comparison to other similar research.	The student presents research results in the form of an independently written paper, which includes a clear description and justification of the research aim, the adopted methodology, results, and their interpretation in the context of existing studies, demonstrating the ability to critically analyze literature and formulate conclusions.	[SU4] test/exam - oral or written
	[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 recognizes the limitations of their knowledge, demonstrates a willingness to deepen it, and independently acquires new skills. They understand the importance of lifelong learning and can inspire others to develop their competencies in chemical analysis.	[SK4] test/exam - oral or written
	[CHEMMU2_U03] Finds necessary information in specialist literature, databases and other sources, lists basic scientific journals in chemistry.	The student is able to search for necessary information in professional literature, databases, and other sources, and is familiar with and can list the key scientific journals in the field of chemistry, using them to deepen their knowledge and complete scientific tasks.	[SU3] text preparation/written work
	[CHEMMU2_U01] Plans and implements chemical experiments of medium complexity.	The student is able to plan and conduct chemical experiments of increased complexity, selecting appropriate analytical methods and research techniques, and interpreting the obtained results in the context of chemical theories.	[SU3] text preparation/written work

Subject contents	Introduction, materials and safety rules in the laboratory, spectroscopic methodology, procedures and duties explanation.		
	Calibration curves role in research the case of studies.		
	Acid-base equilibria of (bio)inorganic and organic ligands (determination of pKa values).		
	Jobs plots to establish stoichiometry of metal complexes with bioligands.		
	Kinetic parameters and activation energy determination of processes involving coordination compounds.		
	Potentiometric determination of coordination compound formula based on the presence of chloride ions.		
Prerequisites and co-requisites			
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	60% Pre-Lab test	60.0%	60.0%
	10% Lab Technique	10.0%	10.0%
	30% Post-Lab reports	30.0%	30.0%
Recommended reading	Basic literature	1. I. Bertini, D. Garner, S.J. Lippard, J. Reedijk, A.X. Trautwein, M.J. Clarke, E. Kimura, K.N. Raymond, P.J. Sadler, R. Weiss, <i>Topics in Biological Inorganic Chemistry</i> Volume 1, Springer, 1-200, 1999. 2. R. S. Mikkelsen, E. Corton, <i>Bioanalytical Chemistry</i> Wiley-Interscience, 1-375, 2004. 3. G. A. Lawrance, <i>Introduction to Coordination Chemistry</i> , University of Newcastle, Callaghan, NSW, Australia A John Wiley, 1-307, 2010. 4. G.E. Rodgers, <i>Descriptive Inorganic, Coordination, and Solid-State Chemistry, Third Edition</i> Belmont, Brooks Cole, USA, 1-668, 2012.	
	Supplementary literature	K. Nakamoto, <i>Infrared and Raman Spectra of Inorganic and Coordination Compounds: Part A: Theory and Applications in Inorganic Chemistry Part A and B</i> (DOI:10.1002/9780470405840); 2008.	
	eResources addresses	Supplementary https://onlinelibrary.wiley.com/doi/book/10.1002/9780470405840 - K. Nakamoto, <i>Infrared and Raman Spectra of Inorganic and Coordination Compounds: Part A: Theory and Applications in Inorganic Chemistry Part A</i> https://chem.libretexts.org/Bookshelves/Inorganic_Chemistry/Supplemental_Modules_and_Websites_(Inorganic_Chemistry)/Coordination_Chemistry/Structure_and_Nomenclature_of_Coordination_Compounds/Introduction_to_Coordination_Chemistry - Introduction to Coordination Chemistry	
Example issues/ example questions/ tasks being completed	Werner complexes; the significance of coordination compounds with transition metal ions; spectroscopic methods (UV-Vis, ATR) in studies involving coordination compounds (determining formulas; interactions with biomolecules); chemistry of d-block metal complexes; stability of coordination bonds; the role of metal complexes in medicine.		
Work placement	Not applicable		

Document generated electronically. Does not require a seal or signature.