University of Gdańsk

Subject card

Subject name and code	Physicochemistry and life, PG_00180309						
Field of study	Chemical Business, Chemistry						
Date of commencement of studies	October 2024		Academic year of realisation of subject	2026/2027			
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	3		Language of instruction	English			
Semester of study	6		ECTS credits	2.0			
Learning profile	academic		Assessment form	credit			
Conducting unit	Laboratory of Luminescence Research -> Department of Physical Chemistry -> Faculty of Chemistry -> Rector						
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. Karol Krzymiński					
	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		1.0	14.0	30	
Subject objectives	**Aims of education:** Aims: Familiarizing students with the main issues of physical chemistry and its practical aspects in everyday life; - Familiarizing students with the basic principles of thermodynamics and chemical kinetics; - Presenting the basics of physicochemical chemical changes occurring in nature; - Familiarizing students with physicochemical methods of analysis of selected issues of physical chemistry and their application to describe natural processes. - Familiarizing students with the basics of modern physicochemical methods, with a focus on spectroscopic methods (e.g. UV-Vis, FL, NMR, MS, basics of chromarography.						

Learning outcomes

Course outcome	Subject outcome	Method of verification
[CHEML3_K06] Raises her/his professional and personal competences by using information provided in various sources.	K06: Searches various sources and uses physicochemical data, supported by digital tools.	[SK2] presentation/project/paper/ report
[CHEML3_U08] Presents in an understandable way the basic facts about chemistry using a scientific language typical of chemical sciences.	U08: Prepares their work, written in a scientific but accessible manner, concerning a selected problematic issue covering the area of practical physical chemistry.	[SU3] text preparation/written work
[CHEML3_U01] Identifies, analyses and solves problems in the field of broadly understood chemistry on the basis of the acquired knowledge.	U01: Solves physical and chemical problems related to the natural environment using data and formulas presented in lectures.	[SU4] test/exam - oral or written
[CHEML3_W04] Characterises the basic methods of chemical compound analysis.	W04: Can use phase transition diagrams with understanding. Knows the theoretical foundations of modern spectroscopic methods. Can propose physicochemical research methods that are optimal for a given problem. Knows what error calculus is and knows the basics of statistics in the processing of physicochemical data.	[SW4] test/exam - oral or written [SW1] oral statement/ conversation/discussion
[CHEML3_K07] Appreciates the need for understandable presentation of selected chemical issues to the public.	K07: Prepares their work in a clear and illustrative manner, addressing a problematic issue in the area of practical physical chemistry.	[SK2] presentation/project/paper/ report
[CHEML3_U09] Is able to learn independently.	U09: Prepares their work independently and then prepares for the exam, using various sources, both analogue and digital.	[SU5] implementation of a problem task
[CHEML3_W03] Explains the relationship between the structure of matter and its observed properties.	W03: Student can describe the states of matter and the causes of phase transitions. Understands the behaviour of physicochemical systems resulting from the laws of nature. Understands the principles of physicochemical phenomena and their use in practice.	[SW4] test/exam - oral or written [SW3] text preparation/written work

Subject contents

States of matter; Phase diagrams and systems, Raoult's law; Zeotropic and azeotropic mixtures; Fractional distillation; Colligative properties of solutions; Reaction enthalpy; Thermochemistry; Hess's law, Born-Haber cycle; Factors influencing the reaction rate; Chemical kinetics; Chromatographic methods; Spectroscopic methods (MS and and NMR); Fundamentals of electron spectroscopy - absorption and emission (UV-Vis and FL). Emission processes (FL, CL) and their modern applications. Physical chemistry of natural systems.

Prerequisites and co-requisites

Introductory requirements completed course in general chemistry (Bachelor level)

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Student's own work	51.0%	50.0%
Written exam (test)	51.0%	50.0%

Recommended reading

Basic literature	• Peter Atkins and Julio de Paula, Elements of Physical Chemistry, 7-th Ed., Oxford University Press, 2016, ISBN: 9780198727873. • Peter Atkins, Julio de Paula, "Physical Chemistry for the Life Sciences", Second Edition, Oxford University Press. ISBN: 9780199564286.
Supplementary literature	• Eldra P. Solomon, Linda R. Berg, and Diana W. Martin, "Biology", Ninth Edition, Brooks/Cole, ISBN 9780538741255. • Peter Bolgar, Haydn Lloyd, Aimee North, Vladimiaras Oleinikovas, Stephane Smith, James Keeler, Student Solutions Manual to Accompany Atkins Physical Chemistry, 11-th Ed., Oxford University Press 2018, UK, ISBN: 978-0-198807773. • Electronic materials provided by the lecturer.

	eResources addresses	
Example issues/ example questions/ tasks being completed	- Describe the processes of luminescence and their practical uses - Calculate the feasibility of given process occurring in nature taking into account thermochemical data provided. - Determine the molecular mass of an organic compound in the gaseous state using the Clapeyron equation, knowing its mass and volume at a given temperature and pressure. - In a certain experiment, a reaction such as: A2 + B2 2 AB reached equilibrium. The initial concentrations of substrates were the same. 75% of substance A has reacted. The equilibrium constant in this experiment is: ...- Calculate the quantum yield of a fluorescent dye given spectroscopic data on the absorbance and integral emission values under given conditions for it and the standard.	
Work placement	Not applicable	

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