University of Gdańsk

Subject card

Subject name and code	Properties vs structure of chemical compounds, PG_00081926		
Field of study	Chemistry		
Date of commencement of studies	October 2024	Academic year of realisation of subject	2025/2026
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	2	Language of instruction	Polish Polish
Semester of study	4	ECTS credits	2.0
Learning profile	academic	Assessment form	credit
Conducting unit	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	0.0	0.0	30.0	0.0	0.0	30

E-learning hours included: 0.0

Additional information:

The student performs and develops 6 laboratory exercises on organic physicochemistry with a focus on practical issues. Finally, he prepares an initial test verifying the overall knowledge acquired during the implementation of subsequent tasks.

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	5.0	15.0	50

Subject objectives

- Arousing interest in organic physicochemistry and acquiring basic experimental skills in this field;- Familiarization with the phenomenon of luminescence of organic compounds (fluorescence, chemiluminescence) and its applications;- Understanding the laws of absorption of electromagnetic radiation and their applications.- Familiarization with the operation of a UV-Vis spectrophotometer and the practical use of UV-Vis absorption spectroscopy.- Familiarization with the theory and methods of studying the kinetics of chemical processes.

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[CHEML3_W03] Explains the relationship between the structure of matter and its observed properties.	- Student gives examples of fluorescence (FL) and chemiluminescence (CL) of organic compounds; - Knows their physicochemical basis for FL and CL processes; - Knows and explains "light" and "dark" processes using the Jabłoński diagram; - Lists the influence of environmental factors on FL and CL processes - Knows the basic laws and concepts regarding photophysical processes (FL and CL); - Knows the concept of a chemical reaction rate constant and knows how to determine it experimentally; - Knows and understands the concepts of refractive index and molar refraction; - Understands why chromatographic division processes occur - knows the methods of calculating retention coefficients based on the TLC chromatogram.	[SW4] test/exam - oral or written [SW3] text preparation/written work
	[CHEML3_U02] Performs analyses using experimental methods and draws conclusions based on them.	- The student deepens experimental skills in the field of general chemistry: preparing solutions of specific concentrations, automatic pipetting, analytical weighing, titration, carrying out reactions in solutions; - Acquires skills in the field of organic physicochemistry: density measurement liquid, refractive index; preparation of the layout and development of plate chromatograms; - Acquires skills in operating a modern UV-Vis spectrophotometer; - Ability to record and analyze UV-Vis absorption spectra; - Knowledge of methods for determining physical constants basing on spectroscopic measurements.	[SU1] oral statement/conversation/ discussion [SU4] test/exam - oral or written [SU5] implementation of a problem task
	[CHEML3_U01] Identifies, analyses and solves problems in the field of broadly understood chemistry on the basis of the acquired knowledge.	- The student acquires the ability to determine the composition of mixtures based on physicochemical tests (refractometry, chromatography, UV-Vis spectroscopy); - Calculates various types of chromatographic retention coefficients; - Ability to prepare, develop and process plate chromatograms; - Separates mixtures by TLC and PLC chromatography. - Acquires the ability to generate organic luminescence (FL, CL) in various conditions; - Correctly formulates observations and conclusions based on experiments and understands the differences between them.	[SU3] text preparation/written work [SU4] test/exam - oral or written [SU5] implementation of a problem task
Subject contents	The phenomenon of fluorescence and chemiluminescence - physicochemical basics, examples; Jabłoński's diagram; Fluorophores and chemiluminophores; Theoretical principles of electron absorption spectroscopy; Laws of absorption of electromagnetic radiation and their applications; Dissociation constant and their calculations; Chemical kinetics; Chemical reaction rate constant; Proper and molar refraction; Refractive index; Theoretical foundations of plate chromatography; Description and parameters of chromatographic bands.		

Prerequisites and co-requisites	- Passed subject General chemistry (theoretical and practical aspects) in line with the requirements for the first year of chemical studies (bachelor's degree);- Physics, mathematics (knowledge, skills and competences) - in accordance with education standards).

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Theoretical preparation and performance during lab course	51.0%	10.0%
Exit test	51.0%	40.0%
Lab exercise reports	51.0%	50.0%

Recommended reading

Basic literature	S. Paszyc, Basics of photochemistry, PWN, Warsaw 1992.P.W. Atkins, Fundamentals of physical chemistry, PWN, Warsaw 1998.Z. Witkiewicz, Basics of chromatography, PWN, Warsaw 1992.
Supplementary literature	N.S. Issacs, Physical Organic Chemistry. Exercises, PWN, Warsaw 1974.T. Pluciński, Chemical experiments, Adamantan Publishing House, Warsaw 1997.K. Bauer, L. Gros, W. Sauer, Thin Layer Chromatography. An Introduction, Merck Publishing, 1991.
eResources addresses	

Example issues/ example questions/ tasks being completed	An incorrect statement regarding the Lambert-Beer law is:Para-nitrophenol is colorless and its anion is yellow. What does it mean?Chromatography of dyes coming from leaves was carried out on a PLC plate covered with silica gel. Four signals were obtained, which can be interpreted as follows: ...The phenomenon of tonic fluorescence in aqueous solution was observed. This phenomenon is responsible for: ...
Work placement	Not applicable

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