



## Subject card

Subject name and code	Organic Chemistry, PG_00061904						
Field of study	Materials Engineering						
Date of commencement of studies	October 2023	Academic year of realisation of subject			2024/2025		
Education level	first-cycle studies	Subject group			Obligatory subject group in the field of study 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	2	Language of instruction			Polish		
Semester of study	3	ECTS credits			5.0		
Learning profile	general academic profile	Assessment form			exam		
Conducting unit	Department of Organic Chemistry -> Faculty of Chemistry						
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Grzegorz Cholewiński					
	Teachers	dr hab. inż. Grzegorz Cholewiński					
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	0.0	30.0	0.0	0.0	60
	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	60		5.0		60.0	125
Subject objectives	Getting familiar with the structure, physicochemical properties, and reactivity of basic groups of organic compounds						
Learning outcomes	Course outcome	Subject outcome			Method of verification		
	[K6_K01] Understands the need to improve professional and personal competencies; is conscious of own limitations and knows when to turn to experts, properly establishes priorities helping to accomplish tasks defined by oneself or others.	Due to the interdisciplinary nature of materials engineering, the diversity of factors determining the properties of materials, including organic compounds, the student understands the need to improve professional and personal competences; is aware of his/her own limitations and knows when to turn to experts, and is able to appropriately define priorities for the implementation of tasks defined by himself/herself or others.			[SK2] Assessment of progress of work		
	[K6_U01] Can properly use selected analytical, simulation and experimental methods, as well as devices for measuring the fundamental properties of materials and technological processes.	Measurement of parameters during a chemical reaction (temperature, pressure, mass, volume), identification or verification of the purity of a substance (boiling point, melting point, refractive index).			[SU1] Assessment of task fulfilment		
	[K6_W02] has knowledge of physics and chemistry, useful for formulating and solving simple problems within the scope of materials science	Knows the structure of basic groups of chemical compounds and its influence on the reactivity and physicochemical properties of substances that are components of materials.			[SW1] Assessment of factual knowledge		
[K6_U05] can learn independently	Understanding the influence of structural elements of a chemical compound on its reactivity and physicochemical properties.			[SU2] Assessment of ability to analyse information			

Subject contents	<p>1. Structure of organic compounds: Chemical bonds: covalent, polar, ionic. Lewis structures, formal charge, resonance. Hybridized orbitals <math>sp^3</math>, <math>sp^2</math>, <math>sp</math> in the structures of organic molecules. Acids and bases in organic chemistry. Polarity of molecules. Intermolecular interactions.</p> <p>2. Alkanes and cycloalkanes: Homologous series of organic compounds. IUPAC nomenclature. Conformation of molecules. Constitutional and geometric isomerism. Free radical substitution.</p> <p>3. Halogenated derivatives of aliphatic hydrocarbons: Optical isomerism, chiral molecules, enantiomers. Rules of priority in determining configuration (R, S). Nucleophilic substitution and elimination reactions.</p> <p>4. Unsaturated hydrocarbons: Alkenes and alkynes structure, preparation, properties. Addition reactions to double and triple bonds. The concept of tautomerism. Properties of conjugated unsaturated systems: dienes and polyenes. Diels-Alder reaction.</p> <p>5. Aromatic hydrocarbons: benzene - structure and basic properties. Electrophilic substitution reactions, reaction mechanism, directing influence of substituents. Aromatic hydrocarbons with fused rings.</p> <p>6. Alcohols and phenols: Structure, properties, basic reactions of alcohols and phenols. Synthesis of alcohols based on organomagnesium compounds.</p> <p>7. Ethers, epoxides: Structure, properties and methods of synthesis of ethers. Acid cleavage of ethers. Epoxide ring opening reactions. Crown ethers.</p> <p>8. Aldehydes and ketones: Nomenclature, synthesis and chemical properties. Nucleophilic addition to the carbonyl group. Oxidation and reduction, Cannizzaro reaction, enolate ions, aldol condensation.</p> <p>9. Carboxylic acids and their derivatives: Structure and nomenclature of carboxylic acids. Carboxylic acid derivatives: esters, acid halides, anhydrides, nitriles and amides. Nucleophilic substitution in the acyl group.</p> <p>10. Amines: Nomenclature, structure, basicity and preparation of amines. Basic reactions, diazonium salts, azo dyes.</p>														
Prerequisites and co-requisites															
Assessment methods and criteria	<table border="1"> <thead> <tr> <th data-bbox="453 1225 794 1261">Subject passing criteria</th> <th data-bbox="794 1225 1139 1261">Passing threshold</th> <th data-bbox="1139 1225 1484 1261">Percentage of the final grade</th> </tr> </thead> <tbody> <tr> <td data-bbox="453 1261 794 1296">laboratory basics</td> <td data-bbox="794 1261 1139 1296">50.0%</td> <td data-bbox="1139 1261 1484 1296">25.0%</td> </tr> <tr> <td data-bbox="453 1296 794 1332">tests</td> <td data-bbox="794 1296 1139 1332">50.0%</td> <td data-bbox="1139 1296 1484 1332">25.0%</td> </tr> <tr> <td data-bbox="453 1332 794 1361">exam</td> <td data-bbox="794 1332 1139 1361">60.0%</td> <td data-bbox="1139 1332 1484 1361">50.0%</td> </tr> </tbody> </table>			Subject passing criteria	Passing threshold	Percentage of the final grade	laboratory basics	50.0%	25.0%	tests	50.0%	25.0%	exam	60.0%	50.0%
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	eResources addresses	Adresy na platformie eNauczanie:
Example issues/ example questions/ tasks being completed	<p>1. Pentaerythritol (formally: 2,2-bis(hydroxymethyl)-propane-1,3-diol) is a tetrahydric alcohol widely used as an intermediate in chemistry and technology, e.g. a substrate for the synthesis of stabilizers for polymer materials. It is formed in the reaction of formaldehyde with an excess of ethanal under basic conditions. Present the chemical reactions that proceed in sequence.</p> <p>2. Acetic anhydride is an important acylating reagent used in organic synthesis on both a laboratory and industrial scale. For example, in the reaction with 4-aminophenol, paracetamol is formed - the active substance of analgesics and antipyretics. Present the mechanism of this <i>N</i>-acylation.</p> <p>3. Diethyl ether can be used as a solvent to extract aniline from an aqueous suspension. Which of the following is true for this solvent: a) perfectly soluble in water, b) density greater than water, c) flammable.</p>	
Work placement	Not applicable	

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