



## Subject card

Subject name and code	Organic Chemistry, PG_00037484						
Field of study	Biotechnology						
Date of commencement of studies	October 2020	Academic year of realisation of subject	2021/2022				
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	4	ECTS credits	4.0				
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	prof. dr hab. inż. Maria Milewska					
	Teachers	prof. dr hab. inż. Maria Milewska dr hab. inż. Grzegorz Cholewiński dr inż. Jan Alfuth					
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	30.0	0.0	0.0	0.0	60
	E-learning hours included: 0.0						
	2021/22 CHEMORG BT I st. IV sem - Nowy - Moodle ID: 21013 <a href="https://enauczanie.pg.edu.pl/moodle/course/view.php?id=21013">https://enauczanie.pg.edu.pl/moodle/course/view.php?id=21013</a>						
	Additional information: The mark is <b>one</b> and only after meeting both conditions (passing the exercises, and lecture tests, and exam), the positive marks: final and partial are entered into mojaPG						
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	10.0	30.0	100		
Subject objectives	A main goal is to teach students basic problems of organic chemistry including: the structure, properties reactions and reactions mechanisms of organic compounds						
Learning outcomes	Course outcome	Subject outcome	Method of verification				
	K6_W03	The student has knowledge of organic and natural compounds with particular emphasis on the reaction mechanisms for their synthesis and biological activity of biomolecules	[SW1] Assessment of factual knowledge				
	K6_U02	Student is able to predict the potential biological properties of biomolecules and organic compounds based on knowledge of their chemical structure	[SU1] Assessment of task fulfilment				

Subject contents	<p><b>Aromatic hydrocarbons</b></p> <p>Alkadiens. Aromaticity, benzenoic and nonbenzenoic aromatic systems. Hydrogenation of benzene ring. Electrophilic substitution. Side chain reactions in substituted aromatic compounds. Aromatic hydrocarbons of condensed rings. Oil cracking, reforming, octan number</p> <p><b>Aldehydes and ketones</b></p> <p>Nomenclature, preparation and chemical properties, nucleophilic addition to the carbonyl group, oxidation and reduction, the Cannizzaro reaction, enols and enolates, the aldol condensation, halogenation, the haloform reaction.</p> <p><b>Carboxylic acids and their derivatives</b></p> <p>Nomenclature, acidity, preparation, reactions, carboxylic acid derivatives: esters and amides; nucleophilic acyl substitution, decarboxylation, dicarboxylic acids, halogeno and hydroxy acids; keto-acids - ketoacid decarboxylation reaction; carbonic acid derivatives,</p> <p><b>Synthesis and reactions of -dicarbonyl compounds</b></p> <p>the Claisen condensation, acetoacetic and malonic ester syntheses; barbiturates.</p> <p><b>Nitrogen organic compounds</b></p> <p>Amines nomenclature, basicity, preparation, reactions, diazonium salts, the Sandmeyer reaction; nitriles. Nitro compounds preparation and reactions.</p> <p><b>Phenols and aryl halides</b></p> <p>Phenols preparation, acidic properties, electrophilic substitution, oxidation, Aryl halides S<sub>N</sub>Ar reactions</p> <p><b>Heterocyclic compounds</b></p> <p>structure, aromaticity, preparation and reactions</p> <p><b>Sulphur compounds</b></p> <p>electronic structure, preparation</p> <p><b>Natural compounds</b></p> <p>carbohydrates, amino acids. peptides, proteins structure, preparation and typical reactions</p>												
Prerequisites and co-requisites	<p>Structure of elements and their compounds, especially carbon; acids, bases and salts; reaction types, geometry of molecules.</p> <p>Completed the first part of the subject Organic Chemistry.</p>												
Assessment methods and criteria	<table border="1"> <thead> <tr> <th data-bbox="456 1868 794 1899">Subject passing criteria</th> <th data-bbox="794 1868 1142 1899">Passing threshold</th> <th data-bbox="1142 1868 1479 1899">Percentage of the final grade</th> </tr> </thead> <tbody> <tr> <td data-bbox="456 1899 794 1957">Midterm colloquium; practical exercise, tests</td> <td data-bbox="794 1899 1142 1957">60.0%</td> <td data-bbox="1142 1899 1479 1957">15.0%</td> </tr> <tr> <td data-bbox="456 1957 794 1989">Written examination</td> <td data-bbox="794 1957 1142 1989">60.0%</td> <td data-bbox="1142 1957 1479 1989">60.0%</td> </tr> <tr> <td data-bbox="456 1989 794 2027">Midterm colloquium; tests</td> <td data-bbox="794 1989 1142 2027">55.0%</td> <td data-bbox="1142 1989 1479 2027">25.0%</td> </tr> </tbody> </table>	Subject passing criteria	Passing threshold	Percentage of the final grade	Midterm colloquium; practical exercise, tests	60.0%	15.0%	Written examination	60.0%	60.0%	Midterm colloquium; tests	55.0%	25.0%
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Midterm colloquium; tests	55.0%	25.0%											

Recommended reading	Basic literature	<p>1. J. D. Caserio, M. C. Roberts CHEMIA ORGANICZNA, PWN Warszawa, 1969</p> <p>2. R. T. Morrison, R. N. Boyd CHEMIA ORGANICZNA, PWN Warszawa, 1997</p> <p>3. J. McMurry CHEMIA ORGANICZNA, PWN Warszawa, 2017</p>
	Supplementary literature	<p>1. J. Gawroński, K. Gawrońska, K. Kacprzak, M. Kwit WSPÓŁCZESNA SYNTEZA ORGANICZNA, PWN Warszawa 2004</p> <p>2. J. March CHEMIA ORGANICZNA - Reakcje, mechanizmy, budowa, WNT Warszawa 1975</p> <p>3. H. O. House NOWOCZESNE REAKCJE SYNTEZY ORGANICZNEJ, PWN Warszawa 1979</p> <p>4. T. W. G. Solomons ORGANIC CHEMISTRY - 6th ed, John Wiley &amp; Sons, Inc. New York, 1996</p>
	eResources addresses	
Example issues/ example questions/ tasks being completed	<p>1. Give the product and mechanism of the reaction of benzene and <math>AlCl_3</math> with a) an acyl chloride <math>CH_3CH_2CH_2COCl</math>; b) an acid anhydride <math>(CH_3CH_2CH_2CO)_2O</math>. What is the electrophile? Show contributing resonance structures. How can we use the acylation to synthesize unbranched alkyl side chains on an aromatic ring? Illustrate by preparing n-butylbenzene.</p> <p>2. Give steps for the following conversion <math>H_2C=C(CH_3)-Ph-COOH</math> to <math>HOCH_2-CH(CH_3)-Ph-COOH</math></p>	
Work placement	Not applicable	