



Subject card

Subject name and code	Organic Chemistry, PG_00037451						
Field of study	Chemistry						
Date of commencement of studies	October 2021	Academic year of realisation of subject			2023/2024		
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	3	Language of instruction			Polish		
Semester of study	5	ECTS credits			8.0		
Learning profile	general academic profile	Assessment form			assessment		
Conducting unit	Department of Organic Chemistry -> Faculty of Chemistry						
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Teresa Olszewska					
	Teachers	dr hab. inż. Teresa Olszewska dr inż. Jan Alfuth					
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	45.0	30.0	0.0	0.0	0.0	75
	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	75	10.0		115.0	200	
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_W09] has knowledge on chemical management and the concept of sustainable development necessary to conduct the management of chemicals (including dangerous substances) in the industrial plant, knows health and safety issues and ergonomics.	A student knows the toxicity and danger associated with the use of specific substances from the class of organic compounds in question. He knows typical substitutes for harmful chemical solvents for less toxic to the environment.			[SW1] Assessment of factual knowledge		
	[K6_U01] knows how to get information from literature, databases and other sources, can integrate the information obtained, interpret and critically evaluate it, and draw conclusions, and to formulate and justify the opinions	A student is able to propose a method of synthesizing a given organic compound starting from an appropriate substrate. In addition, he can distinguish the main classes of organic compounds using simple chemical tests.			[SU1] Assessment of task fulfilment [SU3] Assessment of ability to use knowledge gained from the subject		
	K6_W02	A student has knowledge of the structure and properties of organic compounds discussed during the lectures and knows the basic reactions they undergo. He has a good understanding of the mechanisms of chemical reactions characteristic of particular groups of organic compounds.			[SW1] Assessment of factual knowledge		

Subject contents	<p>Arenes and aromaticity benzene: structure and bonding, aromaticity, Hückels rule, nomenclature of arenes and their derivatives, benzyl cation and radical, aromatic electrophilic substitution reaction mechanism, substituent effects in aromatic substitution.</p> <p>Alcohols and ethers the synthesis with use of organometallic compounds, chemical properties, preparation of ethers, chemical reactions, epoxides, crown ethers.</p> <p>Phenols preparation, acidic properties, electrophilic substitution, oxidation, S_NAr reactions mechanisms.</p> <p>Organometallic compounds preparation, the applications of organometallic compounds in organic syntheses, reactions with carbonyl compounds.</p> <p>Aldehydes and ketones 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, ,-unsubstituted carbonyl compounds.</p> <p>Nitro compounds preparation and typical reactions.</p> <p>Amines nomenclature, basicity, preparation, reactions, diazonium salts, The Sandmeyer reaction, the azo dyes.</p> <p>Carboxylic acids nomenclature, acidity, preparation, reactions, carboxylic acid derivatives: esters and amides, nucleophilic acyl substitution, decarboxylation, dicarboxylic acids, halogeno and hydroxy acids, the Claisen condensation, acetoacetic and malonic ester syntheses, carbonic acid derivatives, nitriles.</p> <p>Heterocyclic compounds structure, aromaticity, preparation and reactions.</p> <p>Sulphur and organophosphorus compounds electronic structure, preparation, the Wittig reaction.</p>		
Prerequisites and co-requisites	<p>A student has a basic knowledge of the structure of elements and their compounds, especially carbon; the concept of acids, bases and salts; reaction types; geometry of molecules.</p> <p>Completion of part I of the course.</p>		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	lecture - three tests based on lecture material	60.0%	50.0%
	tutorials - tests on the material carried out during the classes	60.0%	50.0%

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, 2002</p> <p>4. T. W. G. Solomons ORGANIC CHEMISTRY - 6th ed, John Wiley & Sons, Inc. New York, 1996</p> <p>5. T. W. G. Solomons, C. B. Fryhle, S. A. Snyder SOLOMONS' ORGANIC CHEMISTRY, 12th Edition, Global Edition, John Wiley & Sons, Inc. 2017.</p> <p>6. F. A. Carey ORGANIC CHEMISTRY 4th ed, Mc Graw Hill Companies, Inc. USA, 2000</p> <p>7. J. Clayden, N. Greeves, S. Warren ORGANIC CHEMISTRY, 2nd edition, New York, Oxford University Press 2012</p>
	Supplementary literature	<p>1. J. Gawroński, K. Gawrońska, K. Kacprzak, M. Kwit WSPÓŁCZESNA SYNTEZA ORGANICZNA, WN 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>
	eResources addresses	<p>Adresy na platformie eNauczenie:</p> <p>Chemia Organiczna, kierunek Chemia, semestr V, 2023/24 - Moodle ID: 35005</p> <p>https://enauczanie.pg.edu.pl/moodle/course/view.php?id=35005</p>

<p>Example issues/ example questions/ tasks being completed</p>	<p>1) Starting with benzene, outline a synthesis of each of the following:</p> <p>a) isopropylbenzene</p> <p>b) <i>tert</i>-butylbenzene</p> <p>c) <i>p</i>-bromonitrobenzene</p> <p>d) <i>m</i>-nitrobenzenesulfonic acid</p> <p>2) Outline syntheses that would yield each of the following product.</p> <p>a) $C_6H_5CH=CHCOC(CH_3)_3$ starting with $CH_3COC(CH_3)_3$</p> <p>b) $C_6H_5CH=CHCHO$ starting with C_6H_5CHO</p> <p>c) $p\text{-}CH_3O(C_6H_4)CH=CHCN$ starting with CH_3CN</p> <p>3) What products would you expect to obtain when ethyl propanoate reacts with each of the following?</p> <p>a) 1-petanol, HCl</p> <p>b) $LiAlH_4$, then H_2O</p> <p>c) C_6H_5MgBr, then H_2O</p> <p>d) CH_3NH_2</p> <p>4) Write equations for simple chemical tests that would distinguish between triethylamine and diethylamine.</p> <p>5) Outline two methods for preparing isopropyl methyl ether by a Williamson synthesis. One method gives a much better yield of the ether than the other. Explain which is the better method and why.</p>
<p>Work placement</p>	<p>Not applicable</p>

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