

Subject card

Subject name and code	Monographic lecture - Selected issues of carbohydrate chemistry, PG_00139953						
Field of study	Chemical Business						
Date of commencement of studies	February 2026		Academic year of realisation of subject			2026/2027	
Education level	Master's studies		Subject group			Obligatory subject group in the field of study Optional subject group	
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			3.0	
Learning profile	academic		Assessment form			credit	
Conducting unit	Laboratory of Glycochemistry -> Department of Organic Chemistry -> Faculty of Chemistry -> Rector						
Name and surname of lecturer (lecturers)	Subject supervisor		prof. dr hab. Beata Liberek				
	Teachers						
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	0.0	0.0	0.0	0.0	30
	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	30		5.0		40.0	75
Subject objectives	To familiarize students with the basic issues of modern sugar chemistry and glycobiology.						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[BCHMU2_K04] Is willing to properly assess the acquired knowledge, respect and disseminate it in order to solve specific cognitive and practical issues.	Recognizes and appreciates the need to harmonize and complement each other elements of different sciences; Shows creativity in solving problems; Maintains criticism formulating conclusions; Understand the need for deliberate and group action.	[SK1] oral statement/conversation/discussion [SK4] test/exam - oral or written
	[BCHMU2_W01] Knows and understands complex physicochemical processes and is able to analyse their course in connection with other fields of science.	Explains the behavior of sugars in an aqueous environment; Describes the conformation of the monosaccharide ring, explains the factors affecting its stability; Explains the use of NMR to determine the structure of a monosaccharide; Describes the conformations of oligosaccharides and glycans;	[SW4] test/exam - oral or written [SW1] oral statement/conversation/discussion
	[BCHMU2_U01] Is able to, on the basis of her/his knowledge, propose a solution to problems in chemistry, taking into account the economic aspect by using advanced measurement techniques.	Classifies carbohydrates; Indicates possible methods of protection and deprotection of functional groups in sugars, taking into account economic calculations; Designs a glycoside synthesis strategy; Proposes a method of saccharide analysis.	[SU1] oral statement/conversation/discussion [SU4] test/exam - oral or written
	[BCHMU2_W05] Knows and understands the main trends in the development of chemistry combined with economics as two interpenetrating scientific disciplines.	Characterizes the division of carbohydrates; Explains the methods of protection and deprotection of functional groups in sugars; Describes strategies for glycoside synthesis; Lists the glycosyl donors used and recognizes their economic effectiveness; Characterizes glycosides used in medicine and defines the benefits of glycosylation; Recognizes glycoconjugates, characterizes their division and functions; Defines proteoglycans and lists glycosaminoglycans; Characterized by peptidoglycan; Describes the biosynthesis of N-glycans; Characterizes mucins; Identifies blood group substances; Explains the role of mannose 6-phosphate in the cell.	[SW4] test/exam - oral or written [SW1] oral statement/conversation/discussion
	[BCHMU2_U02] Is able to define her/his interests, develop them within the chosen direction and in connection with the subject of her/his master's thesis by implementing the process of self-education and planning her/his professional career.	Recognizes glycosides used in medicine; Analyzes the conformations of the monosaccharide ring; Deduces about monosaccharide structure based on NMR; Predicts the conformations of oligosaccharides and glycans; Classifies glycoconjugates and assigns them functions. Organizes proteoglycans and glycosaminoglycans; Recognizes peptidoglycan; Discusses the biosynthesis of N-glycans; Recognizes mucins; Verifies blood group substances; Discusses the role of mannose 6-phosphate in the cell.	[SU1] oral statement/conversation/discussion [SU4] test/exam - oral or written
Subject contents	Carbohydrate functions; Structural diversity of aldoses and ketoses; Optical rotation of saccharides; Sugar equilibriums in aqueous solution; Reductive and non-reductive carbohydrates; L series of monosaccharides: L-fucose and L-idouronic acid; Protecting groups in carbohydrate chemistry: ether, silyl, ester, acetal, introduction and deprotection; Strategies of glycosidic bond synthesis; Commonly used glycosyl donors; Bonding of sugar with amino acid; Glycosides in medicine: antibiotics, vitamins, alkaloids, steroids, terpenes, flavonoids; Pyranose ring conformations: factors influencing conformer stability, anomeric effect, conformational analysis, application of NMR for conformational studies; Furanose ring conformations; Oligosaccharide conformations; Glycan conformation: Carbohydrate biosynthesis; Glycoconjugates: division and functions; Proteoglycans, glycosaminoglycans, peptidoglycans; Glycoproteins: division and biosynthesis; N-glycosylation of peptide chain; O-Glycans; Blood groups determinants; Mannose-6-phosphate as a tag.		
Prerequisites and co-requisites	Basic knowledge of organic chemistry.		

Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Positive result from the multiple choice test, which consists of 50 questions.	51.0%	100.0%
Recommended reading	Basic literature	H. M. I. Osborn Carbohydrates	
		J. F. Stoddart Stereochemistry of Carbohydrates	
		A. Varki, R. D. Cummings, J. D. Esko... Essentials of Glycobiology	
	Supplementary literature	M. Miljkovic, Carbohydrates, Synthesis, Mechanisms, and Stereoelectronic Effects	
S. Hanessian, Preparative carbohydrate chemistry			
	eResources addresses		
Example issues/ example questions/ tasks being completed			
Work placement	Not applicable		

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