

Subject card

Subject name and code	Biochemical basis of gene expression, PG_00207431						
Field of study	Biology						
Date of commencement of studies	October 2026		Academic year of realisation of subject		2028/2029		
Education level	Bachelor's studies		Subject group		Obligatory subject group in the field of study Optional subject group 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		1.0		
Learning profile	academic		Assessment form		credit		
Conducting unit	Laboratory of Intracellular Signalling -> Department of Medical Biology and Genetics -> Faculty of Biology -> Rector						
Name and surname of lecturer (lecturers)	Subject supervisor		dr hab. Monika Słomińska-Wojewódzka				
	Teachers						
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	0.0	0.0	0.0	15
	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	15		1.0		9.0	25
Subject objectives	1. Familiarization with the structure of mRNA and tRNA molecules, as well as the function of aminoacyl-tRNA synthetases and ribosomes. 2. To learn in detail the mechanisms of protein synthesis in prokaryotic and eukaryotic cells, and to discuss how this process is regulated at different stages. 3. To learn about the general issues of protein folding and degradation. 4. To be able to use available sources of biological information in preparing scientific presentations.						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[BIOLL3_W07] knows the development of biology as a science, its connections with other disciplines and the principles of using biological knowledge in the economy and social life, including ways that are entrepreneurial		
	[BIOLL3_W05] has advanced knowledge of experimental methods, laboratory and field techniques, and the principles of planning and conducting biological research		
	[BIOLL3_U09] is able to learn independently and plan her/his own development in an organized and controlled manner		
	[BIOLL3_U03] is able to search for, select and critically analyze information from various sources, including scientific literature and electronic databases, as well as read and understand scientific texts in Polish and English		
	[BIOLL3_K04] is ready to apply the principles of bioethics, scientific integrity and honesty, including the proper handling of biological material and respect for intellectual property		
Subject contents	[BIOLL3_K01] is ready to critically evaluate her/his biological knowledge and continuously update and develop it, taking into account scientific advances and the needs of practice		
	mRNA: differences in structure of prokaryotic and eukaryotic mRNA, structure of 5' and 3' ends of mRNA, stability and degradation of mRNA. tRNA: structure, modifications of bases in tRNA, maturation of tRNA, isoacceptor tRNA. Genetic code: historical outline, properties, principle of code vacillation, deviations from code universality. Aminoacyl-tRNA synthetases: structure, classification, mechanism of action. Ribosomes: structure of prokaryotic and eukaryotic ribosomes, arrangement of active sites, characteristics of rRNA. Regulation of gene expression at the level of the translational process. Translation initiation in prokaryotic and eukaryotic cells: stages of translation initiation process, role of initiation factors (IFs), structure and role of initiator tRNAs. Elongation of translation: role of elongation factors (EFs), stages of elongation process, effect of antibiotics that inhibit elongation, mechanism of peptide bond formation. Termination of translation: mechanism of termination, role of termination factors (RF). Mechanism of selenocysteine coding. Systems of mRNA quality control. Suppressor mutations: mechanism of suppression of missense nonsense and insertion mutations. Programmable shift of the mRNA reading frame. General principles of protein folding. Selected post-translational modifications of proteins. General issues of protein degradation.		
	Prerequisites and co-requisites		
	Basic knowledge of cell biology, molecular biology, biochemistry. Good knowledge of English.		
	Assessment methods and criteria		
	Subject passing criteria	Passing threshold	Percentage of the final grade
Recommended reading	test - includes the degree of mastery of the material covered in the lectures in written form	51.0%	100.0%
	Basic literature		
	1. Molecular Cell Biology, Lodish H., Berk A., Zipursky S.L., Matsudaira P., Baltimore D., Darnell J.E.; W.H. Freeman and Company, 2016		
	2. Molecular Biology of the Cell, Alberts B., Johnson A., Lewis J., Raff M., Roberts K., Walter P.; 2022		
	3. Genes VIII, Lewin B., Benjamin Cummings, 2014		

	Supplementary literature	1. Biochemistry, Berg J.M., Stryer L., Tymoczko J.L., Polish edition, PWN, 2019 2. Cytobiochemistry, Klyszejko-Stefanowicz L., PWN 2022 3. Słomińska-Wojewódzka M, Sandvig, K. The Role of Lectin-Carbohydrate Interactions in the Regulation of ER-Associated Protein Degradation. Molecules, 2015, 20: 9816-9846. 4. Nowakowska-Gońska J, Sominka H, Sowa-Rogozińska N, Słomińska-Wojewódzka M. Toxins Utilize the Endoplasmic Reticulum-Associated Protein Degradation Pathway in Their Intoxication Process. 2019, Int J Mol Sci, 20 (6).
	eResources addresses	
Example issues/ example questions/ tasks being completed	Differences in the course of translation between prokaryotic and eukaryotic cells. Mechanisms of regulation of translation initiation.	
Work placement	Not applicable	

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