University of Gdańsk

Subject card

Subject name and code	Biochemical basis of gene expression, PG_00048681		
Field of study	Biology		
Date of commencement of studies	October 2023	Academic year of realisation of subject	2025/2026
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	dr hab. Monika Słomińska-Wojewódzka	

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	0.0	0.0	15

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_K01] the graduate is ready to evaluate his/her own knowledge and understands the need for continuous learning and development and is open to new ideas	Knows the limitations of his own knowledge, understands the need for continuous learning and development, and is open to new ideas.	[SK1] oral statement/conversation/ discussion [SK4] test/exam - oral or written
[BIOLL3_W10] the graduate is familiar with the development and current state of knowledge and the latest trends in biology, as well as their relationship with other natural disciplines	Explains the theoretical basis of experimental methods and the key techniques used to study the various stages of the translation process.	[SW4] test/exam - oral or written [SW1] oral statement/ conversation/discussion
[BIOLL3_U10] the graduate is able to prepare oral presentations in Polish and in a foreign language on specific topics in the field of biology	not applicable	[SU4] test/exam - oral or written
[BIOLL3_K08] the graduate is ready to be honest, reliable and apply the principles of savoir-vivre in his/her academic and professional work	Understands the need for scientific integrity and honesty.	[SK1] oral statement/conversation/ discussion [SK4] test/exam - oral or written
[BIOLL3_U08] the graduate is able to learn independently, in a focused manner	The graduate demonstrates focused, independent learning.	[SU1] oral statement/conversation/ discussion [SU4] test/exam - oral or written
[BIOLL3_U07] the graduate is able to independently search and use available sources of biological information, including electronic sources	Independently searches and uses available biological information sources, including electronic ones, especially when preparing presentations.	[SU1] oral statement/conversation/ discussion [SU4] test/exam - oral or written
[BIOLL3_U06] the graduate can read with comprehension simple scientific biological texts in Polish and simple texts in English	Reads and understands scientific biological texts in Polish and English.	[SU1] oral statement/conversation/ discussion [SU4] test/exam - oral or written
[BIOLL3_W14] the graduate knows the theoretical basis of experimental methods and the most important techniques of the biological sciences	The graduate is familiar with basic methods and techniques used in the study of protein synthesis.	[SW4] test/exam - oral or written [SW1] oral statement/ conversation/discussion

Subject contents

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
test - includes the degree of mastery of the material covered in the lectures in written form	51.0%	100.0%

Recommended reading

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, Kłyszejko-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-Gołacka 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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