

**AL-FARABI KAZAKH NATIONAL UNIVERSITY**  
**Higher School of Medicine**  
**Department of Fundamental Medicine**

AFFIRM  
Dean of the Faculty

\_\_\_\_\_  
(signature)  
Kalmatayeva Z.A.  
"\_\_\_\_\_" "\_\_\_\_\_" 2021

EDUCATIONAL AND METHODOLOGICAL COMPLEX OF DISCIPLINE

**MBOH1202 Molecular Biology and Bioorganic Chemistry**

B086 General medicine"  
Educational program "6B10103 - General medicine"

Course – 1  
Semester – 2  
Number of credits – 5 (5 ECTS)

Almaty 2021

Educational and methodical complex of discipline was compiled by PhD R. Aimbetov, PhD I. Pinskiy, PhD G. Seitimova, PhD B. Kudaybergenova, master of natural sciences D. Tastanbekov, master of natural sciences A. Zhanayeva, master of natural sciences K. Tolenova

Based on the working curriculum in the specialty B086 General medicine

Considered and recommended at a meeting of the department fundamental medicine from "\_\_\_" \_\_\_\_\_202\_\_\_, protocol No. \_\_\_\_\_

Head of the department \_\_\_\_\_ Sarsenova L.K.  
(signature)

Recommended by the faculty methodical bureau "\_\_\_" \_\_\_\_\_202\_\_\_, protocol No. \_\_\_\_\_

Chairman of the method bureau of the faculty \_\_\_\_\_ Dzhumasheva R.T.  
(signature)

**Al-Farabi Kazakh National University  
Faculty of Medicine and Social Healthcare  
Higher School of Medicine  
Department of Fundamental Medicine**

**SYLLABUS**

Spring semester, academic year 2021 - 2022, English division

**Academic course information**

Discipline's code	Discipline's title	Type	No. of hours per week			Number of credits	ECTS
			Lect.	Pract.	Lab.		
<b>MBOH1202</b>	Molecular Biology and Bioorganic Chemistry	CD UC	2	3	0	5	5
<b>Lecturers</b>	Pinskiy Ilya Vladimirovich			<b>Office hours</b>	According to schedule		
<b>e-mail</b>	ilya.pinskiy@gmail.com						
<b>Phone number</b>	87472431895			<b>Auditorium</b>	Faculty of Medicine and Health Care or online with link		
	Kudaybergenova Bates Malikovna						
<b>e-mail</b>	bateskudaibergenova1@gmail.com						
<b>Phone number</b>	87014765431						
<b>Teachers of Molecular Biology</b>							
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<b>Academic presentation of the course</b>	<p><b>Course type:</b> core discipline of university component from the module “Biomedicine essentials”.</p> <p><b>Aim of discipline:</b> to form an understanding of the molecular basis of the functioning of the cell and the organism as a whole, regulation of gene expression, the chemical structure, properties and functions of biologically active compounds in living</p>
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	<p>organisms, which are necessary for further understanding of both normal processes of life activity and their disruption. Diseases, including hereditary.</p> <p><b>After completing this course students will:</b></p> <ol style="list-style-type: none"> <li>1. Explain the structure, isomerism and nomenclature of biologically active compounds</li> <li>2. Describe the physico-chemical properties, the biological role of compounds involved in the processes of vital activity</li> <li>3. Demonstrate knowledge of gene biology and mechanisms for implementing genetic information, protein biosynthesis;</li> <li>4. Apply knowledge of the causes and mechanisms of development of certain changes in the structure and functioning of nucleic acids, especially the expression of genes</li> <li>5. Understand the mechanisms of hereditary and variability and their role in the formation of human hereditary pathology and congenital malformations</li> <li>6. Understand the molecular-genetic and cellular mechanisms of the body's response to drugs and biologically active compounds.</li> <li>7. Demonstrate the ability to apply the language and knowledge of each discipline to discuss and solve fundamental scientific and clinical problems.</li> <li>8. Integrate knowledge of the structural and functional characteristics of the genome to solve clinical problems.</li> <li>9. Demonstrate the ability to identify learning gaps and create strategies to enhance one's own knowledge and skills.</li> <li>10. Effectively communicate with other students and teachers regarding medical and scientific information, articulate their opinions clearly when discussing and work effectively as a member of the team.</li> </ol>
<b>Prerequisites</b>	-
<b>Post requisites</b>	"Mechanisms of Defense and Health"
<b>Information resources</b>	<p><b>Basic literature:</b></p> <ol style="list-style-type: none"> <li>1. Alberts B. et al. Molecular biology of the cell. 6th ed. 2015. Garland Science.</li> <li>2. Lodish H. et al. Molecular cell biology. 8th ed. 2016. WH Freeman.</li> <li>3. John McMurry, et al. Fundamentals of General, Organic, and Biological Chemistry, 8th Edition. 2018. Pearson Education Limited.</li> <li>4. Soderberg T. Organic Chemistry with a Biological Emphasis. 2016. Chemistry Publications.</li> </ol> <p><b>Additional literature:</b></p> <ol style="list-style-type: none"> <li>1. Jenis, J. Study Guide and Practice Tests for Organic Chemistry (Organic Compounds of Aliphatic Series) / Al-Farabi KazNU. Almaty: Qazaq university, 2017.</li> <li>2. Russell P.J. iGenetics. A molecular approach. 3rd ed. 2009. Pearson.</li> <li>3. Karp G. Cell and molecular biology. Concepts and experiments. 7th ed. 2013. Wiley.</li> <li>4. Hartwell L. et al. Genetics. From genes to genomes. 4th ed. 2011. McGraw Hill.</li> <li>5. Zhussupova A.I. Molecular Biology (Interdisciplinary Approaches in Teaching and Research) / Al-Farabi KazNU. Almaty : Qazaq university, 2016.</li> <li>6. Zhussupova A.I. Modern issues in molecular diagnostics / Al-Farabi. Kazakh National University - Almaty : Qazaq university, 2015.</li> </ol> <p><b>Internet resources:</b></p> <ol style="list-style-type: none"> <li>1. Lecturio.com <a href="https://www.lecturio.com">https://www.lecturio.com</a></li> <li>2. "Human Genome" Project <a href="https://web.ornl.gov/sci/techresources/Human_Genome/project/info.shtml">https://web.ornl.gov/sci/techresources/Human_Genome/project/info.shtml</a></li> </ol>

	<p>3. NCBI - The National Center for Biotechnology Information, USA  <a href="https://www.ncbi.nlm.nih.gov/">https://www.ncbi.nlm.nih.gov/</a></p> <p>4. NDB - a portal for three-dimensional structural information about nucleic acids  <a href="http://ndbserver.rutgers.edu/">http://ndbserver.rutgers.edu/</a></p> <p>5. OMIM - compendium of human genes and genetic phenotypes  <a href="https://www.ncbi.nlm.nih.gov/omim?db=OMIM">https://www.ncbi.nlm.nih.gov/omim?db=OMIM</a></p> <p>6. Ensembl - Genome browser for vertebrate genomes  <a href="http://asia.ensembl.org/index.html">http://asia.ensembl.org/index.html</a></p> <p>7. EMBL-EBI - European Bioinformatics Institute  <a href="https://www.ebi.ac.uk/">https://www.ebi.ac.uk/</a></p> <p>8. Video lectures by Molecular Biology:  <a href="https://www.khanacademy.org/">https://www.khanacademy.org/</a></p>
<p><b>Academic course policy in the context of university moral and ethical values</b></p>	<p><b>Academic behavior rules.</b></p> <p><i>Attendance policy</i>  Attendance for lectures and workshops is mandatory. Attendance for an additional extracurricular research activity is highly recommended for increasing the course assessment. No less than 50% attendance is required for the lectures and workshops. Additional research activities are not required, but highly beneficial for the course better comprehension.</p> <p><i>Class participation</i>  All students are expected to participate in class activities and discussions.</p> <p><i>Classroom decorum</i>  All unrelated activities are prohibited during a lecture and workshop time. Cell phones, computer games and unrelated Internet and computer activities are strictly prohibited.</p> <p><i>Missed exams</i>  Students can retake midterm exams with an official document for the days of absence. Other excuses are not accepted and the exam will be annulled. Missing of the final exam is registered according the rules of Academic Policy of the University.</p> <p><i>Late assignments</i>  Late assignments, projects, reports and etc. are not accepted with no excuses.</p> <p><i>Appeals policy</i>  Students may appeal instructor decisions by speaking directly with him. If a solution is not found students can consult with Head of the Department.</p> <p><i>Electronic resources</i>  You are expected to regularly check your emails for updates and announcements about the course.</p> <p><i>Plagiarism and Cheating</i>  As a student, you are expected to adhere to the norms of academic integrity. Academic dishonesty includes plagiarism, cheating, fabrication, unauthorized collaboration, use of notes during exams and quizzes, and other forms. These students will be given 0 with no further retake activities.</p> <p><b>Academic values.</b></p> <p><i>Academic honesty</i>  There will be no tolerance for lapses of academic integrity. A student found to be guilty of falsifying, plagiarism and cheating or any other form of academic dishonesty will be given a failing grade.</p> <p><i>Tolerance and non-discrimination</i>  There is zero tolerance for unsafe activity in laboratory during workshops and additional research activities. There will be no discrimination per nationality, gender and anything else.</p>

<b>Evaluation and attestation policy</b>	<p><b>Criteria-based evaluation:</b> evaluation of study results in accordance with the descriptors, test of competencies (the results of study that are indicated in goal of the course) at border control and examinations.</p> <p><b>Testing</b> (open or closed questions) with situational tasks, diagrams, molecular formulas) - current / midterm / final control: learning outcomes No. 1-8</p> <p><b>Written / oral quiz</b> - current / midterm / final control: learning outcomes No. 1-8</p> <p><b>Group Problem solving (cases)</b> - current control: learning outcomes No. 1-8</p> <p><b>Direct observation</b> - current control /SIW: learning outcomes No. 9-11</p> <p><b>Summative evaluation:</b></p> <p>1. 30 lessons will be held during the course. The maximum score that can be obtained in one lesson for right answers by case-study questions equals to 7 points. Points for the classwork will constitute about 42% of the final course grade. For the Self Work of Student (SWS) students can get maximum 5 points additionally to the final course grade.</p> <p>2. Colloquium examinations will be held in test and written form on the 5th, 10th and 15th week. Score for each control examination is 25-30 points and equals about 18% of the final course grade. Exam questions will be based on the course material.</p> <p>3. Final examination will be held in test form and constitute 40% of the final course grade.</p> <p>Final course grade is calculated in accordance with Academic policy of the University by the following formula:  <math>(CC1+MT+CC2/3) \times 0,6 + (FE \times 0,4)</math>,  where CC1 is Current Control 1,  MT is MidTerm,  CC2 is Current Control 2,  FE is Final Examination.</p> <p>Students who take less than 50% of the final course grade by the results of current control <math>(CC1+MT+CC2/3)</math> will not be admitted to final examination.</p>
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**Calendar (schedule) of the implementation of the course content**  
*Coursework calendar*

Week	Topic	Hours	Max. point
1	3	4	5
	Lecture 1. Introduction to Molecular Biology. Part 1.	1	
	Practical lesson 1. Introduction to Molecular Biology. Part 1.	2	7
	Lecture 2. Introduction to Bioorganic Chemistry.	1	
	Practical lesson 2. Introduction to Bioorganic Chemistry.	1	7
2	Lecture 3. Introduction to Molecular Biology. Part 2.	1	
	Practical lesson 3. Introduction to Molecular Biology. Part 2.	2	7
	IWST: Discuss the topic, conduct a discussion and check how students are working on their own work.	1	
	Lecture 4. Safety rules in the chemical laboratory.	1	
	Practical lesson 4. Safety rules in the chemical laboratory.	1	7
	IWST: Discuss the topic, conduct a discussion and check how students are working on their own work.	1	
3	Lecture 5. Transcription of genetic information and mRNA processing.	1	

	Practical lesson 5. Transcription of genetic information and mRNA processing.	2	7
	IWST: Discuss the topic, conduct a discussion and check how students are working on their own work.	1	
	Lecture 6. Hydrocarbons. Alkane. Cycloalkane. Alkene	1	
	Practical lesson 6. Hydrocarbons. Alkane. Cycloalkane. Alkene	1	7
	IWST: Discuss the topic, conduct a discussion and check how students are working on their own work.	1	
4	Lecture 7. Translation of genetic information.	1	
	Practical lesson 7. Translation of genetic information.	2	7
	IWST: Discuss the topic, conduct a discussion and check how students are working on their own work.	1	
	Lecture 8. Hydrocarbons. Alkadiene. Alkyne.	1	
	Practical lesson 8. Hydrocarbons. Alkadiene. Alkyne.	1	7
	IWST: Discuss the topic, conduct a discussion and check how students are working on their own work.	1	
5	Lecture 9. Post-translational modification and folding of proteins.	1	
	Practical lesson 9. Post-translational modification and folding of proteins.	2	7
	IWST: Discuss the topic, conduct a discussion and check how students are working on their own work.	1	
	Lecture 10. Halogenated hydrocarbons	1	
	Practical lesson 10. Halogenated hydrocarbons	1	7
	IWST: Discuss the topic, conduct a discussion and check how students are working on their own work.	1	
	<b>Colloquium 1.</b>	<b>1</b>	<b>25</b>
	<b>ISW 1.</b> Plenary conference (Case-based discussion by Bioorganic Chemistry).	<b>2</b>	<b>5</b>
	<b>Current Control 1</b>		<b>100</b>
6	Lecture 11. Regulation of gene expression in prokaryotes and eukaryotes.	1	
	Practical lesson 11. Regulation of gene expression in prokaryotes and eukaryotes.	2	7
	IWST: Discuss the topic, conduct a discussion and check how students are working on their own work.	1	
	Lecture 12. Aromatic compounds.	1	
	Practical lesson 12. Aromatic compounds.	1	7
	IWST: Discuss the topic, conduct a discussion and check how students are working on their own work.	1	
7	Lecture 13. Mutations.	1	
	Practical lesson 13. Mutations.	2	7
	IWST: Discuss the topic, conduct a discussion and check how students are working on their own work.	1	

	Lecture 14. Alcohols, phenols and ethers. Properties of hydroxy compounds.	1	
	Practical lesson 14. Alcohols, phenols and ethers. Properties of hydroxy compounds.	1	7
	IWST: Discuss the topic, conduct a discussion and check how students are working on their own work.		
8	Lecture 15. DNA repair.	1	
	Practical lesson 15. DNA repair.	2	7
	IWST: Discuss the topic, conduct a discussion and check how students are working on their own work.	1	
	Lecture 16. Aldehydes and ketones.	1	
	Practical lesson 16. Aldehydes and ketones.	1	7
	IWST: Discuss the topic, conduct a discussion and check how students are working on their own work.	1	
9	Lecture 17. Epigenetics.	1	
	Practical lesson 17. Epigenetics.	2	7
	IWST: Discuss the topic, conduct a discussion and check how students are working on their own work.	1	
	Lecture 18. Carboxylic acids and their derivatives. Properties of carbonyl-containing compounds.	1	
	Practical lesson 18. Carboxylic acids and their derivatives. Properties of carbonyl-containing compounds.	1	7
	IWST: Discuss the topic, conduct a discussion and check how students are working on their own work.	1	
10	Lecture 19. Intracellular signaling.	1	
	Practical lesson 19. Intracellular signaling.	2	7
	IWST: Discuss the topic, conduct a discussion and check how students are working on their own work.	1	
	Lecture 20. Heterocyclic compounds.	1	
	Practical lesson 20. Heterocyclic compounds.	1	7
	IWST: Discuss the topic, conduct a discussion and check how students are working on their own work.	1	
	<b>Colloquium 2</b>	<b>1</b>	<b>30</b>
	<b>MidTerm</b>		<b>100</b>
11	Lecture 21. Cell differentiation and the development of the multicellular organism.	1	
	Practical lesson 21. Cell differentiation and the development of the multicellular organism.	2	7
	IWST: Discuss the topic, conduct a discussion and check how students are working on their own work.	1	
	Lecture 22. Amines and amino acids.	1	
	Practical lesson 22. Amines and amino acids.	1	7

	IWST: Discuss the topic, conduct a discussion and check how students are working on their own work.	1	
12	Lecture 23. Molecular and genetic basis of immunity.	1	
	Practical lesson 23. Molecular and genetic basis of immunity.	2	7
	IWST: Discuss the topic, conduct a discussion and check how students are working on their own work.	1	
	Lecture 24. Peptides and proteins.	1	
	Practical lesson 24. Peptides and proteins.	1	7
	IWST: Discuss the topic, conduct a discussion and check how students are working on their own work.	1	
13	Lecture 25. The human genome. Part 1.	1	
	Practical lesson 25. The human genome. Part 1.	2	7
	IWST: Discuss the topic, conduct a discussion and check how students are working on their own work.	1	
	Lecture 26. Carbohydrates.	1	
	Practical lesson 26. Carbohydrates.	1	7
	IWST: Discuss the topic, conduct a discussion and check how students are working on their own work.	1	
14	Lecture 27. The human genome. Part 2.	1	
	Practical lesson 27. The human genome. Part 2.	2	7
	IWST: Discuss the topic, conduct a discussion and check how students are working on their own work.		
	Lecture 28. Lipids.	1	
	Practical lesson 28. Lipids.	1	7
15	Lecture 29. Molecular biomedicine.	1	
	Practical lesson 29. Molecular biomedicine.	2	7
	Lecture 30. Recap lesson by Bioorganic chemistry.	1	
	Practical lesson 30. Recap lesson by Bioorganic chemistry.	1	7
	<b>Colloquium 3</b>	<b>1</b>	<b>25</b>
	<b>ISW 2. Plenary conference "Gene therapy: myths and reality".</b>	<b>2</b>	<b>5</b>
	<b>Current Control 2</b>		<b>100</b>
	<b>TOTAL</b>		<b>300</b>

Head of the Department \_\_\_\_\_ Sarsenova L.K.

Chair of Faculty's Methodical Bureau \_\_\_\_\_ Dzhumasheva R.T.