

Hand book on the program module for bachelors of the educational program "7M05107-Biology"

This guide provides information on the modules and disciplines of the study program.

Module English (Professional)

Module designation	Master's Training Methodology Discipline -English (Professional)
Semester(s) in which the module is taught	1/2 semester
Person responsible for the module	Kurmanayeva D.K.
Language	English
Relation to curriculum	General education course
Teaching methods	Lecture (interactive method, communicative method, seminar (case study, communicative method)
Workload (incl. contact hours, self-study hours)	37 practical classes / 83 master's students' independent work
Credit points	4
Required and recommended prerequisites for joining the module	Foreign language, B2 level
Module objectives/intended learning outcomes	<p>Module English (prof) is the transference of a research knowledge system and skills to master students and the acquisition of foreign language communication skills in their professional and scientific fields.</p> <p>Knowledge: the functional and stylistic characteristics of the scientific presentation of the material in the studied foreign language; freely reading, translating the original literature in the chosen specialty, followed by analysis and evaluation of the extracted information; making a presentation of scientific research (at seminars, conferences, symposia, forums); listening and comprehension public speaking in direct and indirect communication (lectures, reports, TV and Internet programs)</p> <p>Skills: in being able to use general scientific terminology and the terminological sublanguage of the relevant specialty in a foreign language; in making a presentation of scientific research (at seminars, conferences, symposia, forums); in preparation written forms of presentation of information material in the specialty (scientific report, message, abstracts, theses, short description)</p> <p>Competencies: to form the intercultural and communicative competence of Master students of non-linguistic specialties in the process of foreign language education at the over-based standard level (C1); to master the principles of academic writing, to develop the skills of critical analysis, to prepare research review and annotations, reports and bibliographies on the subject of ongoing research.</p>
Content	<ul style="list-style-type: none"> - Introduction to the course - Developing a focus - How to write master's dissertation (introductory course) - Sourcing information for your project - Developing your project - Using evidence to support your ideas - Avoiding plagiarism - Paraphrasing and summarizing - Academic Style – some guidelines - Writing introductions - Incorporating data and illustrations. - Writing conclusions - Presentation skills. Preparing for conference presentation
Exams and assessment formats	<p>Exams and assessment formats: The first midterm control: Performing test tasks on the passed material. / Summarizing the article on scientific topics. Second midterm control: Creating a presentation on a scientific topic using graphs and diagrams. / Writing an essay on dissertation research (volume 1200-1500 words)</p> <p>Final oral exam</p>

Study and examination requirements	Requirements for successfully passing the module: the final grade in the module is composed of 60% performance on exams, 10% tests, 10% take-home assignments, 10% presentations/ essay, 10% in-class participation. Students must have a final grade of 50% or higher to pass
Reading list	<p>1) Sagimbayeva J.E. Moldakhmetova G.Z, Tazhitova G.Z, Kassymbekova N.S. English course book for Master programme students of "Governmental audit and Financial control" specialty (from extended reading to academic writing) - Eurasian National University. – Astana, 2018. -400 p.</p> <p>2) English for Academic Study. Joan McCormack and John Slaght - Extended Writing and Research Skills, University of Reading, 2012 – 152 p.</p> <p>3) Tamzen Armer. - Cambridge English for Scientists – Cambridge University Press, 2013 – 128 p.</p> <p>4) Martin Hewings – Cambridge Academic English – Upper Intermediate- Cambridge University Press, 2012 – 176 p.</p> <p>5) Dorothy E. Zemach, Lisa A. Rumisek - Academic Writing: from paragraph to essay. – London: Macmillan Education, 2016 - 130 p.</p> <p>6) Academic Writing. A Handbook for International students. Stephen Bailey. Routledge. 2011</p> <p>7) Tussupbekova M.ZH. Professional'nyy angliyskiy yazyk [Elektronnyy resurs]: elektronnoye uchebnoye posobiye dlya studentov filologicheskogo fakul'teta / M.ZH. Tusupbekova. - Nur-Sultan: YENU im. L.N. Gumileva, 2020. - 110 s. - Bibliogr.: s. 105</p> <p>E-resources:</p> <ol style="list-style-type: none"> 1. https://library.enu.kz/MegaPro/Web 2. https://scopus.com 3. https://webofscience.com 4. https://englishforacademicstudy.com 5. https://qarneteducation.com 6. http://presentationexpressions.com 7. http://wiki.ubc.ca/Presentation_Skills 8. https://global.oup.com/?cc=kz, https://www.macmillanyounglearners.com/macmillanenglish/ 9. https://www.britishcouncil.kz/kk 10. https://edpuzzle.com/

Module designation	Psychology Discipline - Psychology
Semester(s) in which the module is taught	1,2
Person responsible for the module	Mambetalina A.S. Baizhumanova B.Sh.
Language	Kazakh, Russian and English
Relation to curriculum	General education - compulsory component
Teaching methods	Lectures, practical and independent work of Master's students
Workload (incl. contact hours, self-study hours)	Workload: 60 hours, of which contact hours: lectures- 8 hours. practical -15 hours; self-study - 37 hours.
Credit points	2
Required and recommended prerequisites for joining the module	Computer-based testing
Module objectives/intended learning outcomes	<p>Objectives: The formation of socio-psychological knowledge in undergraduate students in the context of solving the problems of modernization of social consciousness, defined by the state program " Course towards the future: modernization of Kazakhstan's identity"</p> <p>Expected learning outcomes:</p> <p>Know:</p> <ul style="list-style-type: none"> - Basic psychological concepts, theories and approaches to the study of personality, society and its subsystems; - basic principles of functioning of modern society and its social institutions; - The main sources and methods of obtaining psychological information; <p>Skills:</p> <ul style="list-style-type: none"> - developing skills in describing and analyzing current psychological problems of modern society, the essence of social processes and relations: - formation of critical thinking skills and the ability to apply it in practice. - explanation and interpretation of subject knowledge (concepts, ideas, theories) in the field of psychology; -analysis of peculiarities of psychological institutions in the context of their role in modernization of Kazakhstani society; - Competencies: - Use the knowledge gained in the process of learning psychology in professional activities; - explain and interpret subject knowledge (concepts, ideas, theories) in the field of psychology; - explain socio-ethical values of the society as a product of integration processes in the systems of basic knowledge of the discipline of psychology; - analyze different situations in different spheres of communication from the position of correlation with the system of values, social, business, cultural, legal and ethical norms of Kazakhstani society; <p>to present information about different stages of development of Kazakhstani society, culture, language, social and interpersonal relations in a well-reasoned and substantiated manner;</p> <ul style="list-style-type: none"> - develop programs for solving conflict situations in society, including in professional society.
Content	<ol style="list-style-type: none"> 1. Introduction to Psychology 2. Me and my motivation 3. Emotions and emotional intelligence 4. Human Will and the Psychology of Self-Regulation 5. Individual-typological features of personality 6. Values, Interests and Norms as the Spiritual Basis of a Person 7. Psychology of the meaning of life and professional self-determination 8. Psychology of personal health. 9. Communication of personality and groups. 10. The perceptive side of communication. 11. The interactive side of communication.. 12. Communication as an exchange of information. 13.The concept and structure of socio-psychological conflict 14. Models of personal behavior in a conflict

	15. Techniques of effective communication
Exams and assessment formats	Types of control of academic achievements: Rubric 1 oral examination - 50 minutes Final 2 oral questioning - 50 minutes Final: computer-based testing
Study and examination requirements	Required: Participation in all types of control is required: current, intermediate, final, control of independent work of the master's student. A final grade is determined for the discipline, which is made up of the results of the rating control and the exam, with 60% being the rating control and 40% the result of the exam. The exam must be scored at least 50% to successfully complete the course.
Reading list	<p>Primary literature:</p> <ol style="list-style-type: none"> 1. Nazarbayev N.A. On the Threshold of the XXI Century. - Astana, 2016. 2. Nazarbayev N.A. "Course towards the future: modernization of Kazakhstan's identity". - Astana, AKORDA, 2017 / http://www.akorda.kz/ru. 3. Aronson E. Копке umtylgan zhalgyz [Mətin] = The Social Animal: əleumettik psychlogia kirispe: [оқулық] / E. Aronson ; aud. D. Duisenbekov [əən t. b.]. - 11-bas. - Astana: "Ұлттық аударма bureaucy" қорамдық kory, 2018. - 407, [2] б. - (Rukhani zhangyru) . 4. Godefroy J. What is psychology. Volume 2. - Moscow: The World, 2005. - 276 pp. 5. Daniel Goleman. Emotional Intelligence. Why it can mean more than IQ. Mann, Ivanov & Ferber Publishing House: 2018. -560 c. 6. Glukhanyuk, N.S. General psychology: Textbook / N.S. Glukhanyuk. - M.: Academy, 2017. - 272 c. 7. Glukhanyuk, N.S. General psychology / N.S. Glukhanyuk. - M.: Academia, 2016. - 608 c. 8. Enikeev, M.I. General and social psychology: Textbook / M.I. Enikeev. - M.: Norma, 2019. - 224 c. 9. Enikeev M.I. General and social psychology: Textbook / M.I. Enikeev. - M.: Norma, 2017. - 176 c. 10. Ivannikov, V.A. General psychology: Textbook for academic baccalaureate / V.A. Ivannikov. - Lyubertsy: Yurait, 2016. - 480 c. 11. Krysko V.G. General psychology in schemes and comments: Textbook / V.G. Krysko. - Moscow: Vuzovskiy textbook, 2017. - 336 c. 12. Krysko V.G. General psychology in schemes and comments: textbook / V.G. Krysko. - Moscow: Vuzovskiy textbook, 2019. - 336 c. 13. Nurkova, V.V. General psychology: Textbook / V.V. Nurkova, N.B. Berezanskaya. - Lyubertsy: Yurait, 2016. - 524 c. 14. Rezepov, I.Sh. Cheat sheets: general psychology / I.Sh. Rezepov. - Rn/D: Phoenix, 2018. - 288 c. 15. Rezepov, I.Sh. Cheat sheets: general psychology / I.Sh. Rezepov. - Rn/D: Phoenix, 2015. - 128 c. 16. Shadrikov V.D. General Psychology: Textbook for Academic Bachelor's Degree / V.D. Shadrikov, V.A. Mazilov. - Lyubertsy: Yurite, 2016. - 411 c. 17. Steinmetz A.E. General psychology: Textbook / A.E. Steinmetz. - M.: Academy, 2018. - 496 c.14 <p>Additional Literature:</p> <ol style="list-style-type: none"> 1. Makarova I.V. General Psychology: Textbook for the SPO / I.V. Makarova. - Lyubertsy: Yurait, 2016. - 182 c 2. Maklakov, A. General psychology / A. Maklakov. - St. Petersburg: Peter, 2019. - 583 c. 3. Maklakov, A.G. General psychology / A.G. Maklakov. - SPb: Peter, 2019. - 583 c. 4. Nemov, R.S. General psychology in 3 vols. i. Introduction to psychology: Textbook for bachelors / R.S. Nemov. - Lyubertsy: Yurite, 2016. - 726 c. 5. Nemov, R.S. General psychology in 3 vols. volume ii in 4 books. book 2. attention and memory: Textbook and workshop for academic bachelor's degree / R.S. Nemov. - Lyubertsy: Yurite, 2016. - 261 c. <p>Internet sources:</p> <ol style="list-style-type: none"> 1. http://www.akorda.kz 2. http://azps.ru/ 3. http://psychology.net.ru/articles 4. http://www.psychology-online.net/ 5. http://psynet.narod.ru/main.htm 6. http://psyfactor.org/

Module designation	<i>Higher School Pedagogy</i> Higher School Pedagogy	Discipline -
Semester(s) in which the module is taught	1,2	
Person responsible for the module	<i>Abibulayeva A.B.</i>	
Language	<i>English</i>	
Relation to curriculum	<i>Compulsory</i>	
Teaching methods	<i>Explanatory-illustrative, Reproductive, Research, Problem-based learning, Heuristic methods, Control tests, Work with a textbook</i>	
Workload (incl. contact hours, self-study hours)	<p><i>(Estimated) Total workload:</i></p> <p><i>Contact hours (please specify whether lecture, exercise, laboratory session, etc.): Lecture-15 hours, Practical classes – 22 hours, Masters student's independent work – 83 hours.</i></p> <p><i>Private study including examination preparation, specified in hours¹:</i></p>	
Credit points	4	
Required and recommended prerequisites for joining the module	<i>Pedagogy</i> <i>existing competences in psychology</i>	
Module objectives/intended learning outcomes	<p><i>Key question: what learning outcomes should students attain in the module? Mastering the general theoretical training of a specialist in the pedagogical foundations of the educational process at a university.</i></p> <p><i>in terms of:</i></p> <p><i>Knowledge: familiarity with information about the conceptual and terminological apparatus of Higher School pedagogy, theory and/or subject knowledge of the main approaches, directions, scientific schools and certain concepts of the educational process, characteristics of the activities of the subjects of the educational process at the university.</i></p> <p><i>Skills: cognitive and practical abilities for which knowledge is used: to analyze the historical, content characteristics and distinctive features of the Kazakhstani and foreign higher professional education, it is advisable to use teaching aids for the implementation of teaching and education methods; to make up characteristics of the types of pedagogical activity and behavior of the subjects of the educational process.</i></p> <p><i>Competences: integration of knowledge how to possess the basics skills of the analysis of educational situations, skills to be able to apply the basic principles of organizing training and education in higher education, social and methodological capacities in choosing and applying methods of teaching and upbringing that are adequate to the pedagogical situation, working or learning situations²</i></p> <p><i>Students know that/know how to/are able to use methods of diagnostics of training and education; be able to demonstrate the ability and readiness to apply the acquired knowledge in professional activities.</i></p>	

Content	<p><i>The description of the contents should clearly indicate focus areas and the level of difficulty.</i></p> <ol style="list-style-type: none"> 1. <i>General Fundamentals of Pedagogy. Higher School Pedagogy as a branch of pedagogical science.</i> 2. <i>Methodological Foundations of Higher School Pedagogy.</i> 3. <i>Particular aspects and principles of development of higher education in Kazakhstan.</i> 4. <i>Content of Education in Higher School.</i> 5. <i>Didactics in the System of Pedagogical Sciences.</i> 6. <i>Teaching Process as an Integral System.</i> 7. <i>Laws, regularities and principles of teaching in higher school.</i> 8. <i>Methods of teaching in higher school.</i> 9. <i>Lecture as a form of arrangement of teaching and learning process at higher school.</i> 10. <i>Types of forms of education at Higher school: Seminars, Practical classes, Laboratory work, Students' unassisted work.</i> 11. <i>Control in higher school.</i> 12. <i>Credit technology of education at higher education institutions of Kazakhstan</i> 13. <i>Organization of morale building activities in higher school.</i> 14. <i>Higher School Teacher.</i> 15. <i>Professional competence of a Higher School Teacher.</i>
Exams and assessment formats	<p><i>e.g. two oral Midterm assessments (20 minutes each) and one final oral exam (40 minutes), short computer-based quizzes, take-home written assignments</i></p>
Study and examination requirements	<p><i>Requirements for successfully passing the module</i></p> <p><i>e.g. the final grade in the module is composed of 60% performance on exams, 10% quizzes, 10% take-home assignments, 10% in-class participation. Students must have a final grade of 60% or higher to pass</i></p>
Reading list	<ol style="list-style-type: none"> 1. Zhogary mektep pedagogikasy / K.K. Shalgynbayeva, N.Albytova, T.S. Slambekova. – Almaty: RMEB, 2016 2. Kontseptsii sistemnoy modernizatsii vysshego pedagogicheskogo obrazovaniya. – Almaty, 2015 g. 3. Pedagogika vysshey shkoly: Uchebnik / Okolelov O.P. – M.: NITS INFRA-M, 2017. - 176 s. 4. K.R. Kalkeeva, and others. Higher School Pedagogy.- Astana, 2015/-252 p. 5. A.K. Mynbayeva. Basics of Higher School Pedagogy.- Almaty.2008 – 155 p.

Module designation	<i>Master's Training Methodology</i> Discipline- History and philosophy of science
Semester(s) in which the module is taught	<i>Autumn or spring semester of the first year of studies</i>
Person responsible for the module	<i>Kazakh – Adayeva G.A., Mamyrbekova A.K., Tursynbayeva A.O. Russian – Aubakirov Ye.N., Fazylova G.R., Sandybayeva U.M. English – Bozzhigitova M.M., Ryskulbekova D.A.</i>
Language	<i>Kazakh, Russian, English</i>
Relation to curriculum	<i>General education course</i>
Teaching methods	<i>Lecture (interactive method, communicative method, seminar (case study, communicative method)</i>
Workload (incl. contact hours, self-study hours)	<i>Lecture - 15 hours, seminars – 22 hours, MSIW – 83 hours (master's students' independent work)</i>
Credit points	<i>4</i>
Required and recommended prerequisites for joining the module	<i>Philosophy</i>
Module objectives/intended learning outcomes	<p><i>The purpose of the module: to develop an interest in fundamental knowledge among master's students, to stimulate the need for philosophical assessments of the formation and development of sciences, a critical analysis of modern scientific achievements, to develop a methodological culture of research work.</i></p> <p><i>Learning outcomes:</i></p> <ul style="list-style-type: none"> <i>- understanding the place of one's own specialty in the integral system of science, society and culture;</i> <i>- comprehension of the dynamics of the development of science, its impact on the development of the society;</i> <i>- formation of a holistic image of science, awareness of various aspects and contexts of the study of science itself;</i> <i>- expansion and deepening of the philosophical problems of certain scientific courses;</i> <i>- understanding the methodological foundations and problems of modern science, mastering the theory of the method as a special teaching about the principles, approaches, techniques, methods of scientific activity, mastering the logic and methodology of science;</i> <i>- mastering the skills of perception and analysis of texts on philosophical problems of various sciences;</i> <i>- critical reflection and comparative analysis of various concepts of the growth of scientific knowledge.</i>

Content	<p>1. The relationship between the philosophy of science and the history of science. Philosophical ideas as a heuristic of scientific research. The problem of demarcation in philosophy of science</p> <p>2. The genesis of science. Discussions about the origin of science</p> <p>3. The problem of scientific rationality. Classical science. Scientific picture of the world. Ethos of classical science.</p> <p>4. Non-classical science and post-non-classical science. Scientific picture of the world. Ethos of Science.</p> <p>5. Philosophy of science: basic meanings. Problems of the boundaries of scientific knowledge in the philosophy of I. Kant. Positivist tradition</p> <p>6. Analytical philosophy and its influence on the philosophy of science. Transition from the logic of science to the history of science.</p> <p>7. The structure of scientific knowledge. The main types of sciences. Types of cognitive procedures.</p> <p>8. Philosophy of natural sciences. The circle of problems of philosophy of natural science. Philosophical foundations for the formation of classical natural science disciplines.</p> <p>9. Philosophical problems of theoretical natural science. Mathematics and Natural Science. The ideological significance of the theory of relativity.</p> <p>10. Philosophical aspects of quantum theory, theoretical biology. The picture of the world in global evolutionism.</p> <p>11. Philosophy of technology and technical sciences. The role of technology in science. Information and computer technologies in non-classical technical sciences. Environmental aspects of the social assessment of technology.</p> <p>12. Specificity of socio-humanitarian knowledge. The problem of the formation of social theory.</p> <p>13. The topic of "death of the subject" in postmodern philosophy. Time, space, chronotope. The problem of values. Postcolonial studies</p> <p>14. Epistemological characteristics of the social sciences. Explanation. understanding, interpretation. The problem of truth. "Laboratory Life" by B. Latour.</p> <p>15. Axiological problems of modern science and the prospects of mankind. Human problem. Possible scenarios for the future development of human civilization.</p>
Exams and assessment formats	<p>Oral exam using exam cards. An examination card is a set of two or three questions to assess the knowledge of students. Cards for examinations during the intermediate session are developed in advance, teachers can give a list of sample questions to master's students in advance for preparation. However, exam cards become available only during the exam. The questions in the cards cover the material studied during the period of teaching the course and do not go beyond it, the questions are both theoretical and applied in nature (as a rule, one of the questions can be a task or an assignment to complete a drawing, diagram, function, etc.).</p>
Study and examination requirements	<p>the final grade in the module is composed of 60% performance on exams, 10% quizzes, 10% take-home assignments, 10% in-class participation. Students must have a final grade of 60% or higher to pass</p>

Reading list	<ol style="list-style-type: none"> 1. Kanke V.A. Osnovnyye filosofskiye napravleniya i kontseptsii nauki. – M., 2013 2. Kokhanovskiy V.A. Istoriya i filosofiya nauki. – M., - 2010 3. Klyagin, N. Sovremennaya nauchnaya karta mira [Elektronnyy resurs]: uchebnoye posobiye / N. Klyagin. - 1, 02 MB. – M.: Logos, 2017. – 186 s. 4. Gaydenko, P. Istoriya novoyevropeyskoy filosofii v yeye svyazi s naukoy: uchebnoye posobiye / Piama Gaydenko.- Moskva: PER SE; Sankt-Peterburg: Universitetskaya kniga, 2010. – 455, [1] s. – (Humanitas). 5. Filosofiya nauki: Obshchiye problemy poznaniya. Metodologiya yestestvennykh i gumanitarnykh nauk: khrestomatiya – M.: Progress-Traditsiya: MPSI : Flinta, 2005. – 992 s. 6. Nurmanbetova D.N. Istoriya i filosofiya nauki [Tekst] / D.N. Nurmanbetova. – Astana: YENU, 2012. 7. Koyre A. Ocherki istorii filosofskoy mysli: O vliyaniy filosofskikh kontseptsiy na razvitiye nauchnykh teoriy. 3-ye izd., ster. – M.: Yeditorial URSS, 2004. – 269 s. 8. Khoking S. Chernyye dyry i molodyye Vselennyye / S. Khoking; 11. per. s angl. M. Kononova. – Sankt-Peterburg: Amfora, 2001. – 189 s. 9. Istoriya i filosofiya nauki (Filosofiya nauki): Uchebnoye posobiye / Ye.YU.Bel'skaya, N.P. Volkova i dr.; - M.: Al'fa, M: INFRA. – M, 2011.
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A **Module** BIOL 52002 Molecular and Cell Biology

Module designation	Genetic engineering
Semester(s) in which the module is taught	1
Person responsible for the module	Asiya Dukenbaeva
Language	Russian, Kazakh
Relation to curriculum	Basic / elective
Teaching methods	Lecture (interactive method, communicative method, seminar (case study, communicative method)
Workload (incl. contact hours, self-study hours)	Total workload: 150 Contact hours: Lectures- 15, Seminars - 30 Students Individual Work :105
Credit points	5 ECTS
Required and recommended prerequisites for joining the module	Cell Biology, Molecular Biology, Genetics
Module objectives/intended learning outcomes	Objectives of the course: - theoretical foundations of genetic engineering and applied aspects of its application; As a result of mastering the discipline, the student must know the history of the emergence of genetic engineering and its place among other sciences, general provisions and approaches of genetic engineering, structural and functional features of bioengineering objects; must be able to use the knowledge gained for the selection of biological objects and their application in various technological processes; must have the skills of independent research work, methods of genetic engineering.
Content	Gen therapy. Human cloning. "Eugenics". Transformation of plant cells. Transgenic plants for practical breeding purposes. Transgenic plants for pharmacology and medicine. Genetic transformation of animal cells. Translation. Transgenic animals for practical breeding purposes. Genetic modification of human cells. Problems of gene therapy. Genetically modified organisms (GMOs) and their safety assessment.
Exams and assessment formats	two oral rating (20 minutes each) and one final oral exam (40 minutes)
Study and examination requirements	The final score, consists of the results of the rating control and the exam, with 60% being the rating control, 40% - the result of the exam. Students must have a final grade of 50% or higher to pass
Reading list	1.Zhimilov I.F.General and Molecular Genetics, Novosibirsk,2003 Textbook (in Russian) 2.Inge-Vechtomov S.G. Genetics with Fundamentals of selection,2010,Sankt-Peteersburg. Textbook (in Russian) 3. Bersimbay R.I.Genetics.Astana,2015 Textbook (in Kazakh) 4.Bersimbay R.I.Genetics,Almaty,2017 Textbook (in Kazakh) 5.Tamarin in R.H. Principles of Genetics,Drown Publishers,Fifth Edition, 1996

A **Module** Molecular and Cell Biology

Module designation	Basic molecular and genetic processes
Semester(s) in which the module is taught	1
Person responsible for the module	Rakhmetkazhy Bersimbay
Language	Russian, Kazakh
Relation to curriculum	Basic / Elective
Teaching methods	Lecture (interactive method, communicative method, seminar (case study, communicative method)
Workload (incl. contact hours, self-study hours)	Total workload: 150 Contact hours: Lectures- 15, Laboratory Classes - 30 Students Individual Work :105
Credit points	5 ECTS
Required and recommended prerequisites for joining the module	Cell Biology, Molecular Biology, Genetics
Module objectives/intended learning outcomes	As a result of studying the discipline, the student must know understand the complexity and diversity of replication, transcription, translation, and reverse transcription mechanisms; The student must be able to schematically represent the main stages of replication, transcription, translation in pro-eukaryotes, the stages of reverse transcription, the reproduction cycles of phages and retroviruses As a result of studying the discipline, the student must have the skills: the main mechanisms of mutagenesis and repair, the properties of the genetic code, the structure of ribosomes the main enzymes that carry out the processes of reproduction and implementation of genetic information;
Content	DNA as the basis of genetic information. DNA replication. Replication mechanisms. Regulation of gene expression. Regulation of gene expression in prokaryotes. Negative induction and positive repression. RNA splicing as a mechanism of gene expression. Reverse transcription. Translation. The genetic code. Features of the structure of tRNA. Isoacceptor tRNAs. The structure of the ribosome of pro-and eukaryotes. Centers on the ribosome. Formation of the incitatory complex in pro and eukaryotes.. Molecular basis of mutations. Tautomeric shifts. Repair of DNA damage: repair systems. Mechanisms of DNA repair. Photoreactive repair in prokaryotes.
Exams and assessment formats	two oral rating (20 minutes each) and one final oral exam (40 minutes)
Study and examination requirements	The final score, consists of the results of the rating control and the exam, with 60% being the rating control, 40% - the result of the exam. Students must have a final grade of 50% or higher to pass
Reading list	1. Krebs J.E., Goldstrein S., Kilpatrick S.T. Lewin's GENES X. Jones and Bartlett Publishers, 2008 (in English) 2. Clag U., Cummings M. Foundations genetics // Publishing house Technosphere, Moscow, 2007 (in Russian) 3. Genes according to Lewin /M.: Publishing house Laboratory of Knowledge. -2017. ISBN 978-5-00101-582-6 (in Russian) 4. Lewin's GENES XI Kindle Edition. -2015.- p. 2637 ISBN 978-1-4496-590 5-9 (in English) 5. Zhimulev I.F. General and molecular genetics. // Siberian University Publishing House, Novosibirsk, 2003 (in Russian)

A Module Mutational process and the environment

Module designation	Conservation of biological diversity
Semester(s) in which the module is taught	1
Person responsible for the module	Daniyar Tagayev
Language	Russian, Kazakh
Relation to curriculum	Basic / Elective
Teaching methods	Lecture (interactive method, communicative method, seminar (case study, communicative method)
Workload (incl. contact hours, self-study hours)	Total workload: 150 Contact hours: Lectures- 15, Laboratory Classes - 30 Students Individual Work :105
Credit points	5 ECTS
Required and recommended prerequisites for joining the module	Environmental Science, Evolutionary Biology
Module objectives/intended learning outcomes	As a result of studying the discipline, the student must know: the history and patterns of formation, the current state of biological diversity on Earth, as well as an understanding of the need of its conservation. As a result of studying the discipline, the student should be able to: understand various aspects of anthropogenic impact on biodiversity. As a result of studying the discipline, the student must have the skills: of using modern methods and approaches to biodiversity conservation at the species, population and ecosystem levels.
Content	Biological diversity and the need of conservation; the emergence and development of the biological diversity of the Earth; extinction of species as a natural process; the current state of the Earth's biodiversity; the geographical distribution of biodiversity; role of biodiversity in maintaining sustainable human development and stable existence of natural ecosystems; anthropogenic impact on biodiversity; biodiversity conservation concept; conservation of species, populations and communities; methods of assessment of biological diversity; the parameters of biological diversity.
Exams and assessment formats	two oral rating (20 minutes each) and one final oral exam (40 minutes)
Study and examination requirements	The final score, consists of the results of the rating control and the exam, with 60% being the rating control, 40% - the result of the exam. Students must have a final grade of 50% or higher to pass
Reading list	1. Brodsky A.K. Biodiversity: textbook. - M.: Academy, 2012 (in Russian) 2. R. Primak. Fundamentals of Biodiversity Conservation. Moscow: Publishing House of Scientific and educational and methodological center, 2002 (in Russian) 3. Kevin J. Gaston, John I. Spicer. Biodiversity: An Introduction. Blackwell Publishing company, 2004 4. Anne Maczulak. Biodiversity: Conserving Endangered Species, 2010 5. Fifth National Report of the Republic of Kazakhstan on Biological Diversity. Ministry of Environment and Water Resources of the Republic of Kazakhstan (in Russian)

A Module Biomedicine

Module designation	Medical Microbiology
Semester(s) in which the module is taught	1
Person responsible for the module	Aigul Dinmukhamedova
Language	Russian, Kazakh
Relation to curriculum	Basic / Elective
Teaching methods	Lecture (interactive method, communicative method, seminar (case study, communicative method)
Workload (incl. contact hours, self-study hours)	Total workload: 150 Contact hours: Lectures- 15, Laboratory Classes - 30 Students Individual Work :105
Credit points	5 ECTS
Required and recommended prerequisites for joining the module	Microbiology
Module objectives/intended learning outcomes	To acquaint students with the fundamental concepts of the infectious process, on the role of pathogenic microorganisms in the pathology of human diseases. As a result of studying the discipline, students should know the nature of infectious diseases, the patterns of their occurrence and development, the peculiarities of the morphology, physiology and pathogenicity of pathogens of different groups of microorganisms; must have information on modern principles of organizing anti-epidemic work, methods of prevention and control of bacterial infections
Content	The main goals and objectives of medical microbiology. The concept of epidemic process. Microflora the human body. The concept of infections. Character interactions microorganism with macroorganism. Anti-infective immunity. Principles diagnostics infectious diseases. Private medical bacteriology. Pathogens most significant infections person.
Exams and assessment formats	two oral rating (20 minutes each) and one final oral exam (40 minutes)
Study and examination requirements	The final score, consists of the results of the rating control and the exam, with 60% being the rating control, 40% - the result of the exam. Students must have a final grade of 50% or higher to pass
Reading list	1. Levinson, W. Medical Microbiology and Immunology. Moscow: BINOM. Knowledge Laboratory, 2015 - 1184 p. (in Russian) 2. WHO / Infectious Diseases - www.who.int/topics/infections_diseases/ru 3. Patrick Murray Ken Rosenthal Michael Pfaller. Medical Microbiology. 9th Edition, 2020, 872p. 4. Medical microbiology: textbook / Ramazanov V.A., Kudaibergenov K. - Almaty, 2011. - 684 p. (in Kazakh) 5. Sydykbekova RK, Mukasheva TD, Berzhanova R.Zh. Isolation and cultivation of microorganisms: a textbook. - 132 p. (in Kazakh).

A Module Biomedicine

Module designation	Psychoneuroimmunology
Semester(s) in which the module is taught	1
Person responsible for the module	Tatayeva Roza
Language	Russian, Kazakh
Relation to curriculum	Basic / Elective
Teaching methods	Lecture (interactive method, communicative method, seminar (case study, communicative method)
Workload (incl. contact hours, self-study hours)	Total workload: 150 Contact hours: Lectures- 15, Laboratory Classes - 30 Students Individual Work :105
Credit points	5 ECTS
Required and recommended prerequisites for joining the module	Neurophysiology, Endocrinology, Anatomy
Module objectives/intended learning outcomes	As a result of studying the discipline, the undergraduate must know : about the mechanisms and pathways of interaction between the nervous, immune and endocrine systems!; must be able to analyze the changes in immunological reactivity in the norm and in the experimental modeling of various types of behavior; know about the main modern research methods in the field of psychoneuroimmunology, which include physiological, pharmacological, immunological, etc. research methods.
Content	Nervous and immune systems principles organization and biological purpose. Participation of neurotransmitter systems in neuroimmunomodulation. Dependence of immunological reactivity on psycho-emotional state. Neuroimmunomodulation. The role of interleukins in neuroimmunomodulation.
Exams and assessment formats	two oral rating (20 minutes each) and one final oral exam (40 minutes)
Study and examination requirements	The final score, consists of the results of the rating control and the exam, with 60% being the rating control, 40% - the result of the exam. Students must have a final grade of 50% or higher to pass
Reading list	1.Korneva E.A. Introduction to immunophysiology: textbook. in a way. SPb .: ELBI-SPb, 2003.48 p. 2. Ketlinsky S.A., Simbirtsev A.S. Cytokines. SPb .: Fo-liant, 2008.549 p. 9 (in russian) 3. V. Abramov and other Fundamentals of euroimmunology: textbook. in a way. Novosibirsk: Publishing house of NGPU, 2004.264 p. (in russian) 4.Devoino L.V., Idova G.V., Alperina E.L. "Psychoneuroimmunomodulation: behavior and immunity. The role of the "neurotransmitter setting of the brain." Publishing house "Science", Novosibirsk. 2009.- 167(in russian). 5.Idova .V., Alperina E.L. Psychoneuroimmunomodulation. Impact of behavior on immunity. NSU, Novosibirsk (teaching aid), 2010.23s. (in russian)

A Module Biomedicine

Module designation	Physiology of sensory systems
Semester(s) in which the module is taught	1
Person responsible for the module	Zhanat Mukataeva
Language	Russian, Kazakh
Relation to curriculum	Profile / Elective
Teaching methods	Lecture (interactive method, communicative method, seminar (case study, communicative method)
Workload (incl. contact hours, self-study hours)	Total workload: 150 Contact hours: Lectures- 15, Laboratory Classes - 30 Students Individual Work :105
Credit points	5 ECTS
Required and recommended prerequisites for joining the module	Human anatomy, histology and cytology, biochemistry, genetics, cell biology, biophysics, human and animal physiology
Module objectives/intended learning outcomes	As a result of studying the discipline, the master's student must know: the basic principles of the organization and functioning of sensory systems, research methods in sensory physiology. As a result of studying the discipline, the master's student should be able to: apply knowledge of the physiology of sensory systems to understand their functioning and the laws of the higher nervous activity of a person As a result of studying the discipline, the master's student must have the skills: to conduct research on the capabilities of human sensory systems.
Content	The current state of the physiology of sensory systems. Mechanisms of sensory conversion and signal transmission Somatic sensory system Musculoskeletal or proprioceptive sensory system Lateral line sensory system Gravitational sensory system Auditory sensory system Chemoreceptor sensory systems Visual sensory system. Nociception
Exams and assessment formats	two oral rating (20 minutes each) and one final oral exam (40 minutes)
Study and examination requirements	The final score, consists of the results of the rating control and the exam, with 60% being the rating control, 40% - the result of the exam. Students must have a final grade of 50% or higher to pass
Reading list	1. Akhanov U.K. Epigraph. "Human and animal physiology" – Almaty, 2016. -235 p.(Russian) 2. Akhanov U.K. Epigraph. "Human and animal physiology" – Almaty, 2016. -178 p.(Russian) 3. Moryakina S.V., Anzarov V.A. - "Physiology of sensory systems": educational and methodological manual – Grozny, 2015. -153p.(Russian) 4. Batuev A.S. "Physiology of higher nervous activity and sensory systems: Textbook for universities" 3 rd edition, insr. and add. – St. Petersburg: Peter, 2010. – 316 p.(Russian) 5. Kogan B. M. "Anatomy, physiology and pathology of sensory systems": a textbook/B. M. Kogan, K. V. Mashilov. ASPECT PRESS, 2011, 384 p.(Russian)

A **Module** Molecular and Cell Biology

Module designation	Molecular and cell biology
Semester(s) in which the module is taught	2
Person responsible for the module	Olga Bulgakova
Language	Russian, Kazakh
Relation to curriculum	Profile / University
Teaching methods	Lecture (interactive method, communicative method, seminar (case study, communicative method)
Workload (incl. contact hours, self-study hours)	Total workload: 150 Contact hours: Lectures- 30, Seminars - 15 Students Individual Work :105
Credit points	5 ECTS
Required and recommended prerequisites for joining the module	Cytology, histology, biochemistry, molecular biology
Module objectives/intended learning outcomes	As a result of studying the discipline, the graduate student must know the functioning of cell signalling pathways; the main features of the main cell signalling pathways; principles of influence on cell signalling pathways for the treatment of diseases; must be able to apply the knowledge gained to study systems for transmitting external signals to the cell; must apply the knowledge gained to assess changes of the mechanisms of signal transduction in pathological conditions, use the knowledge gained in the field of research of intracellular and intercellular communication systems to solve professional problems; must have the skills to apply the skills of the methodological foundations of modern science in their research activities
Content	Mechanisms of intercellular and intracellular signaling. Types of receptors. Signal amplification systems in the cell. Carcinogenesis
Exams and assessment formats	two oral rating (20 minutes each) and one final oral exam (40 minutes)
Study and examination requirements	The final score, consists of the results of the rating control and the exam, with 60% being the rating control, 40% - the result of the exam. Students must have a final grade of 50% or higher to pass
Reading list	1. Signal Transduction: Principles, Pathways, and Processes 1st Edition. pp.452.- 2014 -ISBN-13: 978-16218218163 Lewin's GENES XI Kindle Edition. -2015.- p. 2637 2. Pollard T.D. et al. Cell Biology. 3rd Edition /Elsevier -2016 p. 908 Hardcover ISBN: 9780323341264 3. Proteins: Concepts in Biochemistry 1st Edition Garland Science; 1 edition, 416 p. (March 14, 2016) ISBN-13: 978-0815345022 4. The Cell, 2nd edition, A Molecular Approach, Geoffrey M Cooper (Ed), ISBN-10: 0-87893-106-6 http://www.ncbi.nlm.nih.gov/pubmed

A **Module** BIOL 52002 Molecular and Cell Biology

Module designation	Cell cycle genetics
Semester(s) in which the module is taught	2
Person responsible for the module	Olga Bulgakova
Language	Russian, Kazakh
Relation to curriculum	Profile / elective
Teaching methods	Lecture (interactive method, communicative method, seminar (case study, communicative method)
Workload (incl. contact hours, self-study hours)	Total workload: 150 Contact hours: Lectures- 30, Seminars - 15 Students Individual Work :105
Credit points	5 ECTS
Required and recommended prerequisites for joining the module	Cytology, histology, biochemistry, molecular biology
Module objectives/intended learning outcomes	As a result of studying the discipline, the graduate student must know: current data on regulators and participants of the cell cycle, about the peculiarities of cell cycles of unicellular and multicellular, embryonic, endomitotic, meiotic cycle; must be able to: work with objects traditionally used to study the cell cycle (cell cultures, oocytes, yeast cells); must have the skills: to use the molecular (proteins and nucleic acids (PCR, Sanger sequencing, NGS, ELISA, western blotting, immunoprecipitation, gene silencing methods), genetic (cytogenetic method) and cytological (cell culture, different types of microscopes, histochemistry) methods during cell cycle research.
Content	Cell cycle. Mitosis: The concept of the cell cycle. The concept of the cell cycle. Discovery of cyclin and cyclin dependent kinase. universality of cell cycle regulators. The dynamics of cell structures in the cycle, the main participants. Plant cell mitosis. Division of bacterial cells, comparative characteristics of amitosis and mitosis Meiosis: Biological significance of meiosis, Types of meiosis, Control of meiosis. Cell cycle regulation: Cell cycle control points. Cyclins. Cell death: Apoptosis. Mechanism. Genetic control of apoptosis. Mechanism of necrosis
Exams and assessment formats	two oral rating (20 minutes each) and one final oral exam (40 minutes)
Study and examination requirements	The final score, consists of the results of the rating control and the exam, with 60% being the rating control, 40% - the result of the exam. Students must have a final grade of 50% or higher to pass
Reading list	1. Cell Cycle Control. Editors: Noguchi, Eishi, Gadaleta, Mariana C. (Eds.), Springer, 2014, ISBN 978-1-4939-0888-2 2. Cell Cycle Control and Dysregulation Protocols, Editors: Giordano, Antonio, Romano, Gaetano (Eds.), 2004, ISBN 978-1-59259-822-9 3. The Eukaryotic Cell Cycle, J. A. Bryant, Dennis Francis, Taylor & Francis, 2008, , ISBN 978-0-4154-0781-6 4. Cell Cycle Oscillators, Editors: Coutts, Amanda S., Weston, Louise (Eds.), Springer, 2016, ISBN 978-1-4939-2957-3 5. http://www.ncbi.nlm.nih.gov/pubmed

A **Module** BIOL 52002 Molecular and Cell Biology

Module designation	Molecular Virology
Semester(s) in which the module is taught	2
Person responsible for the module	Tamara Ukbaeva
Language	Russian, Kazakh
Relation to curriculum	Profile / elective
Teaching methods	Lecture (interactive method, communicative method, seminar (case study, communicative method)
Workload (incl. contact hours, self-study hours)	Total workload: 150 Contact hours: Lectures- 30, Seminars - 15 Students Individual Work :105
Credit points	5 ECTS
Required and recommended prerequisites for joining the module	Microbiology
Module objectives/intended learning outcomes	The main goal of mastering the discipline is the assimilation by students of the basic provisions of virology, the principles of applying knowledge about the molecular mechanisms of viral replication for the therapy and protection of human health, the formation of the ability to apply the knowledge gained for research and in the field of extra-professional activities. As a result of mastering the discipline, the student must know the maps of the genomes of the most relevant viral families, the types of antiviral drugs, the mechanisms of the development of resistance to antiviral drugs, the principles of developing vaccine drugs, the principles of basic diagnostic methods and the main comparative characteristics of methods for diagnosing viral infections; be able to explain the mechanisms of the emergence of new viral infections, the transmission routes of viral infections, the reasons for the spread of infections.
Content	Virus Structure and Assembly. Virus Classification: The World of Viruses. Viruses of Bacteria and Archaea. Negative-Strand and Double-Stranded RNA Viruses of Eukaryotes. Small DNA Viruses of Eukaryotes. Larger DNA Viruses of Eukaryotes. Viruses That Use A Reverse Transcriptase. Host Defenses Against Virus Infection. Antiviral Vaccines. Antiviral Chemotherapy.
Exams and assessment formats	two oral rating (20 minutes each) and one final oral exam (40 minutes)
Study and examination requirements	The final score, consists of the results of the rating control and the exam, with 60% being the rating control, 40% - the result of the exam. Students must have a final grade of 50% or higher to pass
Reading list	1. Nicholas H. Acheson. Fundamentals of Molecular Virology, 2nd Edition–Wiley, 2011. – 528 p. 2. Alan Cann. Principles of Molecular Virology 6th Edition– Academic Press, 2015. – 318 p. 3. Sally Roberts (Editor). Acheson. DNA Tumour Viruses: Virology, Pathogenesis and Vaccines – Caister Academic Press, 2018. – 266 p. 4. Takashi Matsumoto and Yoshio Yamaoka. Microbiota: Current Research and Emerging Trends - Caister Academic Press, 2019 – 132 p. Reeti Khare. Guide to Clinical and Diagnostic Virology 1st Edition - ASM Press, 2019 – 311 p.

A **Module** BIOL 52002 Molecular and Cell Biology

Module designation	Molecular bases of pharmacology
Semester(s) in which the module is taught	2
Person responsible for the module	Asiya Dukenbaeva
Language	Russian, Kazakh
Relation to curriculum	Profile / elective
Teaching methods	Lecture (interactive method, communicative method, seminar (case study, communicative method)
Workload (incl. contact hours, self-study hours)	Total workload: 150 Contact hours: Lectures- 15, Seminars - 30 Students Individual Work :105
Credit points	5 ECTS
Required and recommended prerequisites for joining the module	Biochemistry, Botany, Basic molecular and genetic processes
Module objectives/intended learning outcomes	As a result of mastering the discipline, the student must know the main classes of macromolecules - targets of pharmacological agents; the main types of agonists and antagonists of pharmacological targets; the mechanisms of action of the main drugs used in the treatment of diseases caused by the pathology of various body systems, the basic concepts of pharmacokinetics and pharmacodynamics; be able to explain the mechanisms of occurrence of the main pathological processes, the mechanisms of action of the drugs studied during the course.
Content	Pharmacokinetics.Pharmacodynamics.Repeated and combined drug administration.Pharmacology of cholinergic synapses.Cholinomimetic agents.Holyoblocking agents.Pharmacology of adrenergic synapses. Adrenomimetic agents.Adrenomimetic agents.Pharmacological regulation of body functions in the field of histaminergic, dopaminergic and serotonergic structures.Drugs that affect the central nervous system Hypnotics, antiepileptic. Antiparkinsonian agents
Exams and assessment formats	two oral rating (20 minutes each) and one final oral exam (40 minutes)
Study and examination requirements	The final score, consists of the results of the rating control and the exam, with 60% being the rating control, 40% - the result of the exam. Students must have a final grade of 50% or higher to pass
Reading list	1.Shimanovsky N. L., Epinetov M. A., Melnikov M. Ya. 2.Molecular and nanopharmacology. MOSCOW: FIZMATLIT PUBL., 2010. - 624 P. ISBN 978-5-9221-1208-6. 3.D. A. Harkeevich / Pharmacology 4. Pharmacology : textbook and workshop for higher educational institutions / E. V. Konopleva. - Moscow: Yurayt publishing house, 2019. - 446 P. - (Higher Education). — ISBN 978-5-534-01500-3. 5. Kuandykov E. O. Amanzholova A. E. / fundamentals of Molecular Biology

A Module Biomedicine

Module designation	Genetics of microorganisms
Semester(s) in which the module is taught	2
Person responsible for the module	Tamara Ukbaeva
Language	Russian, Kazakh
Relation to curriculum	Profile / elective
Teaching methods	Lecture (interactive method, communicative method, seminar (case study, communicative method)
Workload (incl. contact hours, self-study hours)	Total workload: 150 Contact hours: Lectures- 30, Seminars - 15 Students Individual Work :105
Credit points	5 ECTS
Required and recommended prerequisites for joining the module	Medical Microbiology, Basic molecular and genetic processes
Module objectives/intended learning outcomes	Formation of students' ideas about the molecular basis of heredity and hereditary variability of microorganisms, about the organization of the genetic apparatus of microorganisms, about the main mechanisms of hereditary variability, about the mechanisms of DNA exchange, the role horizontal gene transfer, structure and role of migratory elements. As a result of mastering the discipline, the student must know the molecular foundations of heredity and variability of microorganisms, the principles of organizing the genetic apparatus of microorganisms; must be able to analyze, evaluate and apply the knowledge gained in the study of other disciplines and in professional activities; must master the basic methods of genetic analysis of pro- and eukaryotes.
Content	Genetics of bacteria. Molecular mechanisms of the mutation and repair process. Recombination (combinative) variability. Horizontal gene transfer in bacteria. Genetic elements. IS elements. Transposons. Conjugative transposons. Genetic engineering.
Exams and assessment formats	two oral rating (20 minutes each) and one final oral exam (40 minutes)
Study and examination requirements	The final score, consists of the results of the rating control and the exam, with 60% being the rating control, 40% - the result of the exam. Students must have a final grade of 50% or higher to pass
Reading list	1 Jeremy W. Dale, Simon F. Park. Molecular Genetics of Bacteria, 5th Edition, 2010, 400p. 2., Bryukhanov A.L., Rybak K.V., Netrusov A.I. Molecular microbiology, 2012, 480 p. (in Russian) 3. Ukbaeva TD, Asemova G.D. Genetics of microorganisms: textbook - Almaty: New book, 2021. – 130 p.(in Kazakh) 4. Joseph E Peters, Larry Snyder, Wendy Champness, Tina Henkin. Molecular Genetics of Bacteria, 2012, 5. NCBI - http://www.ncbi.nlm.nih.gov 6. pubmed - http://www.ncbi.nlm.nih.gov/pubmed 7. Ukbaeva T.D., Abitaeva G.K. Genetics of microorganisms: teaching aid for students and undergraduates of biological specialties, Ministry of Education and Science of the Republic of Kazakhstan, L.N. Gumilyov, Eurasian National University. - Astana: ENU them. L.N. Gumilyov, 2018.- 81p.

A **Module** Molecular and Cell Biology

<i>Module designation</i>	Mathematical processing of the results of molecular genetic studies
<i>Semester(s) in which the module is taught</i>	3
<i>Person responsible for the module</i>	Kulshat Akanova
<i>Language</i>	Russian, Kazakh
<i>Relation to curriculum</i>	Profile / elective
<i>Teaching methods</i>	Lecture (interactive method, communicative method, seminar (case study, communicative method)
<i>Workload (incl. contact hours, self-study hours)</i>	Total workload: 150 Contact hours: Lectures- 30, Seminars - 15 Students Individual Work :105
<i>Credit points</i>	5 ECTS
<i>Required and recommended prerequisites for joining the module</i>	Basic molecular and genetic processes
<i>Module objectives/intended learning outcomes</i>	As a result of studying the discipline, the student must master the basic concepts and terms of statistical analysis; the main ways of organizing and using data; create databases and use them in statistical analysis; understand the ways of empirical study of relationships and dependencies in statistical data; be able to use computer technology in solving applied problems; use Microsoft Excel tools to solve optimization problems; have the skills to use Statistica and Statplus packages when processing data
<i>Content</i>	Subject of mathematical processing of results molecular genetic research. Principles of biometrics. Discrete and continuous random variables. Pairwise regression analysis. Multiple Linear Regression: Least squares in a pairwise regression model. Least squares in multiple model regression. Correlation analysis. Dispersion analysis. Specification of variables. Multicollinearity. Heteroscedasticity. Dynamic series
<i>Exams and assessment formats</i>	two oral rating (20 minutes each) and one final oral exam (40 minutes)
<i>Study and examination requirements</i>	The final score, consists of the results of the rating control and the exam, with 60% being the rating control, 40% - the result of the exam. Students must have a final grade of 50% or higher to pass
<i>Reading list</i>	1. Drebuschak T.N.. Introduction to chemometrics. Analysis practice. Experimental data. Educational allowance. - / Novosib.state un-t.Novosibirsk, 2011, 88 p. 2. Ivanter, E. V.,Korosov, A.V.And 228 Elementary biometrics: textbook. - Petrozavodsk: PetrSU Publishing House, 2010, 104 p. 3. Gmurman V.E. Guide to meeting the challenges of probability theory and mathematical statistics. Educational allowance. - M.: Higher school, 1998. 4. N. Johnson, F. Lyon.Statistics and planning experiment in technology and science. - M.:World, 1980 Smirnov S.A.Computer technology in science and education. Educational allowance. - Ivanovo,2016 .-- 136 p.

A **Module** Molecular and Cell Biology

Module designation	Introduction to structural biology
Semester(s) in which the module is taught	3
Person responsible for the module	Ainash Suleimenova
Language	Russian, Kazakh
Relation to curriculum	Profile / elective
Teaching methods	Lecture (interactive method, communicative method, seminar (case study, communicative method)
Workload (incl. contact hours, self-study hours)	Total workload: 150 Contact hours: Lectures- 30, Seminars - 15 Students Individual Work :105
Credit points	5 ECTS
Required and recommended prerequisites for joining the module	Biochemistry, Molecular biology
Module objectives/intended learning outcomes	As a result of studying the discipline, the master should know: physicochemical principles underlying the methods and devices used in molecular biology, and on this basis - understanding the possibilities and applications of these methods; should be able effective independent planning of complex experiments for the analysis of biopolymers that are part of complex biological objects; must have the skills interpretation of the received results
Content	The structure of nucleic acids. Molecular bases of nucleic acid biosynthesis. Molecular basis of RNA biosynthesis. RNA types. Molecular basis of protein biosynthesis. Broadcast. Rotamers. The most favorable conformations of side groups of amino acid residues Principles of chirality. Chiral molecules by the example of alpha-amino acids. Basic principles of the structural organization of proteins. The relationship between protein structure and function. Amino acids, types of amino acid bonds. D- and L- stereoisomers of amino acids. Construction of the tertiary structure de novo. Domain structure of proteins. Membrane proteins. Modeling of protein interactions. Docking concept. Protein design. Synthetic proteins. Protein modifications. X-ray structural analysis. Protein crystallization. Cryoelectron microscopy. Nuclear Magnetic Resonance Spectroscopy (NMR). Coagulation and mobility of proteins.
Exams and assessment formats	two oral rating (20 minutes each) and one final oral exam (40 minutes)
Study and examination requirements	The final score, consists of the results of the rating control and the exam, with 60% being the rating control, 40% - the result of the exam. Students must have a final grade of 50% or higher to pass
Reading list	1. Molecular biology, Konichev, Alexander Sergeevich; Sevastyanova, Galina Andreevna, 2015 (in Russian) https://www.ozon.ru/context/detail/id/163818356/ 2. Bersimbay RI Molecular biology // Textbook, Astana. L.N. LN Gumilyov ENU, 2014, 304 p. (in Kazakh) https://www.enu.kz/gylym/gylymi-zertteu-instituti/institut-kletochnoy-biologii-biotekhnologii/ 3. Molecular biology. The structure and function of proteins, Stepanov V.M., 2015. (in Russian) https://www.twirpx.com/file/197009/ 4. Principles and Methods of Biochemistry and Molecular Biology, Aitken, E. ; Beidone, A.R. ; Fiff, J. ; Wilson, K., 2015. (in Russian) https://rucont.ru/efd/443513

A Module Biomedicine

<i>Module designation</i>	<i>Genetics of cancer and multifactorial diseases</i>
<i>Semester(s) in which the module is taught</i>	3
<i>Person responsible for the module</i>	Almira Akparova
<i>Language</i>	Russian, Kazakh
<i>Relation to curriculum</i>	Compulsory / elective
<i>Teaching methods</i>	Lecture (interactive method, communicative method, seminar (case study, communicative method)
<i>Workload (incl. contact hours, self-study hours)</i>	Total workload: 210 Contact hours: Lectures- 30, Seminars - 45 Students Individual Work :135
<i>Credit points</i>	7 ECTS
<i>Required and recommended prerequisites for joining the module</i>	Genetics, Biochemistry; Molecular biology; Human Anatomy
<i>Module objectives/intended learning outcomes</i>	As a result of studying the discipline, the student must know modern concepts of carcinogenesis, mechanisms of neoplastic transformation, molecular pathogenesis of widespread diseases, the role of gene polymorphism and environmental factors in the development of chronic obstructive pulmonary disease, diabetes mellitus, bronchial asthma, hypertension, coronary heart disease and rheumatoid arthritis; must be able to analyze information about the modern achievements of human genetics, trends in the development of its directions, relationship with other sciences; must have the skills: be able to apply molecular genetic methods, conduct statistical analysis of data.
<i>Content</i>	Classification and prevalence of multifactorial diseases. Genetic prediction of polygenic diseases. Geographic structuring of human genetic diversity. Regional clustering of populations by genome-wide SNP sets. Carcinogenesis as a multistage process of accumulation of mutations. Classification of carcinogens. Molecular mechanisms of carcinogenesis. Genetics of common diseases
<i>Exams and assessment formats</i>	two oral rating (20 minutes each) and one final oral exam (40 minutes)
<i>Study and examination requirements</i>	The final score, consists of the results of the rating control and the exam, with 60% being the rating control, 40% - the result of the exam. Students must have a final grade of 50% or higher to pass
<i>Reading list</i>	1. Haybaeck J. Mechanisms of Molecular Carcinogenesis // Springer, Cham, Switzerland, 2017, 302 pp. 2. K.I. Baumann, Z. Halata, I. Moll. The Merkel Cell. Structure-Development-Function- Cancerogenesis // Springer-Verlag Berlin Heidelberg, 2009. 3. Ruban, E. D. Human genetics with the basics of medical genetics: a textbook for students / Eleonora Dmitrievna Ruban. - Rostov-on-Don: Phoenix, 2015 .-- 319 p. 4. Chernoshei, D.A. Immunology // BSMU. – 2018. – 66 p. http://www.ncbi.nlm.nih.gov/pubmed

A **Module** Biomedicine

Module designation	Molecular bases of endocrinology
Semester(s) in which the module is taught	3
Person responsible for the module	Tamara Ukbayeva
Language	Russian, Kazakh
Relation to curriculum	Compulsory / elective
Teaching methods	Lecture (interactive method, communicative method, seminar (case study, communicative method)
Workload (incl. contact hours, self-study hours)	Total workload: 210 Contact hours: Lectures- 30, Seminars - 45 Students Individual Work :135
Credit points	7 ECTS
Required and recommended prerequisites for joining the module	Cytology and Histology; Biochemistry; Human Anatomy
Module objectives/intended learning outcomes	As a result of studying the discipline, the student must know Hormones as signaling molecules; specificity of hormone-receptor interactions; structure and function of hormone receptors; intercellular and intracellular signaling; genes encoding various classes of hormones and receptors; advances in modern molecular endocrinology and prospects for their use; should be able to: use knowledge in the field of molecular endocrinology to solve practical problems; find links between molecular endocrinology and other biological sciences; must have the skills : be able to use molecular genetic methods (PCR, DNA sequencing, DNA microarrays) to study various aspects of molecular endocrinology.
Content	Molecular mechanisms of action of hormone. Hormone-like compounds and neurotransmitters. Reception of hormones, hormonal signal transmission pathways. Chemical structure of hormones, hormone production and regulation. Structural and functional organization and functioning of genes encoding various classes of hormones and receptors. Modern molecular biological methods used to study the structure and function
Exams and assessment formats	two oral rating (20 minutes each) and one final oral exam (40 minutes)
Study and examination requirements	The final score, consists of the results of the rating control and the exam, with 60% being the rating control, 40% - the result of the exam. Students must have a final grade of 50% or higher to pass
Reading list	1. Gerald Litwack. Hormonal Signaling in Biology and Medicine: Comprehensive Modern Endocrinology // Academic Pr. – 2019. - 712 p. ISBN: 0128138149, 9780128138144 (In English) 2. Shustov S.B. Clinical endocrinology // M: Medical Information Agency. – 2012. – 632 c. ISBN 978-5-9986-0094-4 (In Russian). 3. Zaitsev V.V. Molecular endocrinology: guidelines for practical training. – 2014. – 33 c. (In Russian) 4. Franklyn F. Bolander, Jr. Molecular Endocrinology, 2004. ISBN: 978-0-12-111232-5 (In English). 5. http://www.ncbi.nlm.nih.gov/pubmed

A Module Molecular and Cellular Biology

Module designation	The latest molecular genetics and cellular technologies
Semester(s) in which the module is taught	3
Person responsible for the module	Asiya Dukenbaeva
Language	Russian, Kazakh
Relation to curriculum	Profile / elective
Teaching methods	Lecture (interactive method, communicative method, seminar (case study, communicative method)
Workload (incl. contact hours, self-study hours)	Total workload: 150 Contact hours: Lectures- 15, Seminars - 30 Students Individual Work :135
Credit points	7 ECTS
Required and recommended prerequisites for joining the module	Cell biology; Biochemistry
Module objectives/intended learning outcomes	As a result of mastering the discipline, the student must have an idea of modern molecular genetic methods, their field of application, advantages and limitations; know the principles of studying the genome, transcriptome and proteome and the main achievements in this area; navigate genome-wide databases on nucleotide sequences and their polymorphisms, as well as genome-wide databases based on the results of studying transcriptomes, DNA and chromatin modifications, distribution of regulatory protein binding sites, regulatory contacts of distant regions of the genome; have an idea of the role of modern bioinformatics methods in the primary processing of genome-wide data and their biological interpretation; be able to interpret literature data
Content	Genetic engineering of drugs. Reprogramming of human cells. Technologies for the therapeutic use of RNA. Interference Molecular cloning strategy. Types of vector molecules and their construction. Methods of genetic engineering. Genetic engineering of bacteria and yeast
Exams and assessment formats	two oral rating (20 minutes each) and one final oral exam (40 minutes)
Study and examination requirements	The final score, consists of the results of the rating control and the exam, with 60% being the rating control, 40% - the result of the exam. Students must have a final grade of 50% or higher to pass
Reading list	1.Borisova T. N., Chuvakov G. I.-MEDICAL GENETICS 2nd ed., ispr. and add. Textbook for universities-Moscow: Yurayt Publishing House-2019-159s. - ISBN: 978-5-534-07338-6-Electronic text / / EBS YURAYT-URL: https://urait.ru/book/medicinskaya-genetika-434567 2.Osipova L. A.-GENETICS IN 2 Ch. PART 1 2nd ed., ispr. and add. Textbook for universities-Moscow: Yurayt Publishing House-2019-243s. - ISBN: 978-5-534-07721-6-Electronic text / / EBS YURAYT-URL: https://urait.ru/book/genetika-v-2-ch-chast-1-434577 3.Osipova L. A.-GENETICS. IN 2 h. PART 2 2nd ed., ispr. and add. Textbook for universities-Moscow: Yurayt Publishing House-2019-251s. - ISBN: 978-5-534-07722-3-Electronic text / / EBS YURAYT-URL: https://urait.ru/book/genetika-v-2-ch-chast-2-437663 4.Ed. Alferova G. A.-GENETICS 3rd ed., ispr. and add. Textbook for academic baccalaureate-Moscow: Yurayt Publishing House-2019-200c. - ISBN: 978-5-534-07420-8-Electronic text / / EBS YURAYT-URL: https://urait.ru/book/genetika-434370 5.Subbotina, T. N. Molecular biology and genetic engineering: practicum / T. N. Subbotina, P. A. Nikolaeva, 6.A. E. Kharsekina. - Krasnoyarsk : Sib. feder. un-t, 2018. - 60 p. - ISBN 978-5-7638-3857-2. - Text: electronic. - URL: https://new.znaniy.com/catalog/product/1032111 -Text : electronic. - URL: http://znaniy.com/catalog/product/1032111

A **Module** Molecular and Cellular Biology

Module designation	Genomics and proteomics
Semester(s) in which the module is taught	3
Person responsible for the module	Olga Bulgakova
Language	Russian, Kazakh
Relation to curriculum	Profile / elective
Teaching methods	Lecture (interactive method, communicative method, seminar (case study, communicative method)
Workload (incl. contact hours, self-study hours)	Total workload: 150 Contact hours: Lectures- 15, Seminars - 30 Students Individual Work :135
Credit points	5 ECTS
Required and recommended prerequisites for joining the module	Molecular biology
Module objectives/intended learning outcomes	In the course of studying the discipline, the graduate student must know structural and functional structure of the genome and proteome, basic methods of genomic research; requirements for organizing genomic projects for systems of varying complexity, features of the organization and the main numerical characteristics of the genomes of bacteria, archaea, yeast, plants, invertebrates and vertebrates, humans, fundamental and applied aspects of structural and functional proteomics, basic scientific and methodological approaches used for proteome analysis; must be able to use methods of genome research in their research activities, carry out structural and functional analysis of proteins; must have the skills conduct independent scientific work in the field of genomics and proteomics
Content	Structure and functioning of genetic material. Epigenetic factors suppression and activation of transcription.; Non-coding DNA and its role. Satellite DNA; Non-coding DNA and its role. Mobile genetic elements; Non-coding DNA and its role. Regulatory sequences in DNA; Comparative analysis of the organization and structure of the genomes of viruses, prokaryotes and eukaryotes and organelles; Comparative analysis of the organization and structure of the genomes of viruses, prokaryotes and eukaryotes and organelles; Comparative analysis of the organization and structure of the genomes of viruses, prokaryotes and eukaryotes and organelles; Comparative analysis of the organization and structure of the genomes of viruses, prokaryotes and eukaryotes and organelles; Genomes of organelles; Molecular databases and genomic sequence annotation; Analysis of genome structure; Sequence alignment and construction of phylogenetic trees; Protein structure. Proteome and its dynamism. Formation mechanisms dynamism of the proteome. Three levels of functioning: basic functions of proteins products, physiological functions and functions at the level of the body; Protein engineering. Biotechnological foundations of proteomics; Proteomic analysis methodology (two-dimensional electrophoresis, liquid chromatography (FPLC, HPLC), mass spectrometry (fingerprinting of molecular mass peptides and tandem mass spectrometry).
Exams and assessment formats	two oral rating (20 minutes each) and one final oral exam (40 minutes)
Study and examination requirements	The final score, consists of the results of the rating control and the exam, with 60% being the rating control, 40% - the result of the exam. Students must have a final grade of 50% or higher to pass
Reading list	1. Eukaryotic Genomic Databases, Editors: Kollmar, Martin (Ed.), Springer, 2018, 577 2. Gene Expression Analysis, Editors: Raghavachari, Nalini, Garcia-Reyero, Natália (Eds., Springer, 2018, 378 3. Handbook of Statistical Genomics, 4th Edition, Editors: David J. Balding, Ida Moltke, John Marioni, 2019, 1224 4. Genomics and Proteomics: Principles, Technologies, and Applications, Edited By Devarajan Thangadurai, Jeyabalan Sangeetha, 2021, Apple Academic Press, ISBN 9781774635377 http://www.ncbi.nlm.nih.gov/pubmed

A **Module** Mutational process and the Environment

Module designation	Mutagenesis and reparation
Semester(s) in which the module is taught	3
Person responsible for the module	Almira Akparova
Language	Russian, Kazakh
Relation to curriculum	Compulsory / elective
Teaching methods	Lecture (interactive method, communicative method, seminar (case study, communicative method)
Workload (incl. contact hours, self-study hours)	Total workload: 150 Contact hours: Lectures- 30, Seminars - 15 Students Individual Work :135
Credit points	5 ECTS
Required and recommended prerequisites for joining the module	Basic molecular and genetic processes , Molecular and cell biology
Module objectives/intended learning outcomes	As a result of studying the discipline, the student must know history of the science of mutagenesis; chemical and radiation mutagenesis; mutational variability; molecular mechanisms of mutation; environmental mutagens and methods of testing; methods of detecting mutations; genetic control of mutagenesis; mechanisms of repair processes; systems of antimutagenic protection of the genome; must be able to analyze information about the modern achievements of mutagenesis, trends in the development of its directions, relationship with other sciences; must have the skills be able to apply methods for assessing the mutagenic activity of environmental factors, methods for the primary identification of mutations, conduct statistical analysis of data.
Content	A brief history of the discovery of mutagenesis. Classes of mutagenic substances. Classification of mutations. General characteristics of environmental pollution. Radiation mutagenesis. Chemical mutagenesis. Gene and chromosomal mutations. Methods for studying the mutagenicity of environmental factors. Methods for identifying mutations. Insertional mutagenesis. DNA repair. Systems of antimutagenic protection of the genome.
Exams and assessment formats	two oral rating (20 minutes each) and one final oral exam (40 minutes)
Study and examination requirements	The final score, consists of the results of the rating control and the exam, with 60% being the rating control, 40% - the result of the exam. Students must have a final grade of 50% or higher to pass
Reading list	1. Haybaeck J. Mechanisms ofMolecularCarcinogenesis // Springer, Cham, Switzerland, 2017, 302 pp. https://www.springer.com/gp/book/9783319536576 2. Abilev S.K., Glazer V.M. Mutagenesis with the basics of genotoxicology // Moscow, St. Petersburg: Nestor-History. - 2015 .—304p. 3. K.I. Baumann, Z. Halata, I. Moll. The Merkel Cell. Structure-Development-Function- Cancerogenesis // Springer-Verlag BerlinHeidelberg, 2009. https://link.springer.com/book/10.1007/978-3-662-10358-6 . 4. Ruban, E. D. Human genetics with the basics of medical genetics: a textbook for students / Eleonora Dmitrievna Ruban. - Rostov-on-Don: Phoenix, 2015 .-- 319 p. http://www.ncbi.nlm.nih.gov/pubmed

A **Module** Mutational process and the Environment

Module designation	Eukaryotic genome
Semester(s) in which the module is taught	3
Person responsible for the module	Olga Bulgakova
Language	Russian, Kazakh
Relation to curriculum	Profile / elective
Teaching methods	Lecture (interactive method, communicative method, seminar (case study, communicative method)
Workload (incl. contact hours, self-study hours)	Total workload: 150 Contact hours: Lectures- 30, Seminars - 15 Students Individual Work :135
Credit points	5 ECTS
Required and recommended prerequisites for joining the module	Basic molecular and genetic processes , Molecular and cell biology
Module objectives/intended learning outcomes	In the course of studying the discipline, the graduate student must know theoretical foundations and basic representations of the principles of the structural and functional organization of nucleic acids, structure of genomes of pro- and eukaryotes, types of regulatory sequences and features of their functioning, types of recurring sequences in genomes their role in evolution, types of functional codes of genomic DNA, advantages and disadvantages of methods of recognition of functional sites in genomic DNA; must be able to operate knowledge of the structure of genomes of pro- and eukaryotes, find information on the identified scientific problem, evaluate utility and choose information resources containing the data necessary for analysis; must have the skills views on the structure and content of the genomes of organisms, representations of epigenomics and epigenetic mechanisms, the skills of interpreting the results obtained in the context of the tasks set at the initial stages of the study, skills in the analysis and systematization of material on the scientific problem, methods of theoretical computer analysis of data on the topic of research using standard Internet-accessible programs.
Content	Genome. The structure of the human genome. The genome of mitochondria and chloroplasts. Mobile genetic elements and their role in the genome. Origin and evolution of the eukaryotic genome. Genome study methods.
Exams and assessment formats	two oral rating (20 minutes each) and one final oral exam (40 minutes)
Study and examination requirements	The final score, consists of the results of the rating control and the exam, with 60% being the rating control, 40% - the result of the exam. Students must have a final grade of 50% or higher to pass
Reading list	1. Eukaryotic Genomic Databases. Methods and Protocols. Editors: Kollmar, Martin (Ed.), 2018, Springer, ISBN 978-1-4939-7737-6 2. Viswanatha Chaitanya, Kolluru. Genome and Genomics. From Archaea to Eukaryotes, 2019, Springer, ISBN 978-981-15-0702-1 3. The Cell, 2nd edition, A Molecular Approach, Geoffrey M Cooper (Ed), ISBN-10: 0-87893-106-6 4. Topics in Current Genetics. Springer. ISSN: 1610-2096 http://www.ncbi.nlm.nih.gov/pubmed

A **Module** Molecular and Cell Biology

Module designation	Selected chapters of biotechnology
Semester(s) in which the module is taught	3
Person responsible for the module	Asiya Dukenbaeva
Language	Russian, Kazakh
Relation to curriculum	Profile / elective
Teaching methods	Lecture (interactive method, communicative method, seminar (case study, communicative method)
Workload (incl. contact hours, self-study hours)	Total workload: 150 Contact hours: Lectures- 15, Seminars - 30 Students Individual Work :135
Credit points	5 ECTS
Required and recommended prerequisites for joining the module	Genetic engineering , Molecular and cell biology
Module objectives/intended learning outcomes	The purpose of the discipline: to give the future specialist an idea of the current state and prospects for the development of biotechnology in the use of biological objects and biomolecules in industrial production, agriculture, healthcare and the environment. Objectives of the course: Stimulating the metabolism of cells to produce the intended products while suppressing other metabolic reactions. * Obtaining cells or their components that are capable of directing changes in other complex biostructures. * Creation of recombinant DNA that can encode the biosynthesis of particularly valuable compounds. * Creation of waste-free and environmentally friendly biotechnological processes. * Improving the hardware design of biotechnological processes in order to achieve maximum product yield. * Improvement of technical and economic indicators of biotechnological processes in comparison with the existing ones
Content	Subject and objectives of biotechnology. Selection of biotechnological objects. Technology of fermentation processes. Cultivation of biotechnological objects. Single-cell protein production. Separation, cleaning and modification of products. Enzyme technology. Cellular engineering
Exams and assessment formats	two oral rating (20 minutes each) and one final oral exam (40 minutes)
Study and examination requirements	The final score, consists of the results of the rating control and the exam, with 60% being the rating control, 40% - the result of the exam. Students must have a final grade of 50% or higher to pass
Reading list	1.Fundamentals of Biotechnology Authors: Almagambetov, K. H. Fundamentals of biotechnology: laboratory work on the subject of Animal Biotechnology / Zhumabaeva B.A. Reading tool - Almaty: Kazakh university, 2015. - 176 pages 2. Biryukov, V. V. Onerkasiptik biotekhnologiya negizderi / V. V. Biryukov. - M.: KolosS, 2004. - 296 b. - ISBN 5-9532-0231-8 ("KolosS"); ISBN 5-98109-008-1 ("chemistry" ANO») 3. Blinov, v. A. Zhalpy biotekhnologiya: darister kursy. 2 bolikte. 1- Bolim / V. A. Blinov. - Saratov, 2003. 4. Biotekhnologiya negizderi / N. P. Elinov. - St. Petersburg: Gylym, 1995. - ISBN 5-02-026027-4 5. Microbiology, microbiology, virology, Microbiology zhane virology-St. Petersburg: GIOR, 2009. - 368 b. - ISBN 978-5-98879-075-4

A **Module** Molecular and Cell Biology

Module designation	Structure and organization of the genome
Semester(s) in which the module is taught	3
Person responsible for the module	Olga Bulgakova
Language	Russian, Kazakh
Relation to curriculum	Profile / elective
Teaching methods	Lecture (interactive method, communicative method, seminar (case study, communicative method)
Workload (incl. contact hours, self-study hours)	Total workload: 150 Contact hours: Lectures- 15, Seminars - 30 Students Individual Work :135
Credit points	5 ECTS
Required and recommended prerequisites for joining the module	Genetic engineering , Molecular and cell biology
Module objectives/intended learning outcomes	As a result of studying the discipline, the graduate student must know: the peculiarities of the structural organization of the genomes of various organisms (pro- and eukaryotes, viruses); features of the functioning of genomes, i.e. molecular mechanisms of the main genetic processes that provide heredity and variability of organisms; modern methods of determining nucleotide sequences, methods of their analysis, methods of 3-D genomics, methods of functional genomics; should be able to use the entire methodological base for the study of genomes; independently determine goals and set research tasks; must have the skills independent development of the design of the experiment for the analysis of genomes from the different organism; independently carry out all the necessary set of experimental work, analyze the data obtained and draw conclusions, appropriate to the task
Content	Modern advances in the matter studying genes of pro- and eukaryotes. The role of viral genomes in evolution OF eukaryotes. Structure and organization of genomes of microorganisms. 3-D genomics. Spatial organization of the eukaryotic genome. Histone proteins and their role in DNA compaction. The human genome. The influence of environmental factors on the human genome. Ethnogenomics. Mobile genetic elements and their role in the genome. Mobile genetic elements (MGE) of prokaryotes, eukaryotes. Evolution of genomes. Epigenome. Genome research methods. Fundamentals of functional genomics.
Exams and assessment formats	two oral rating (20 minutes each) and one final oral exam (40 minutes)
Study and examination requirements	The final score, consists of the results of the rating control and the exam, with 60% being the rating control, 40% - the result of the exam. Students must have a final grade of 50% or higher to pass
Reading list	1. Dan Graur. Molecular and Genome Evolution . 2016 ISBN-13: 978-1605354699 2. Dhavendra Kumar, Stylianos Antonarakis. Medical and Health Genomics 1st Edition, Kindle Edition.ISBN-13: 978-0124201965 3. Christophe Lambert Darrol Baker George P. Patrinos. Human Genome Informatics: Translating Genes into Health (Translational and Applied Genomics) 1st Edition, Kindle ISBN-13: 978-0128094143 4. Lori A.S. Snyder. Bacterial Genetics and Genomics. 2020 ISBN:9780815345695 http://www.ncbi.nlm.nih.gov/pubmed

A **Module** Methodology The Master Training

Module designation	Teaching internship
Semester(s) in which the module is taught	3
Person responsible for the module	Nurmukhambetova Gaziza
Language	Russian, Kazakh
Relation to curriculum	Basic/ elective
Teaching methods	-
Workload (incl. contact hours, self-study hours)	120
Credit points	4 ECTS
Required and recommended prerequisites for joining the module	Higher School Pedagogy, Introduction to Structural Biology, Management psychology
Module objectives/intended learning outcomes	To know content of biological education, development and analysis of the curriculum, work program in the subjects of the biological cycle, methods, means and forms of theoretical and practical studies in biology; be able to conduct training sessions with students in biological disciplines, plan the educational process in biology and analyze the activities of students in the formation of professional knowledge and skills in the field of specialization; skills: methods of teaching biological disciplines in general and secondary vocational educational institutions, skills of management of educational and cognitive activities of students, assessment of the level of formation of knowledge and skills of students
Content	Formation and development of professional skills of undergraduates, mastering the foundations of pedagogical skills, abilities and experience of independent teaching and pedagogical work.
Exams and assessment formats	Defense of practice report
Study and examination requirements	fulfillment of an individual task, keeping a diary on practice, characteristics from the head of the practice base
Reading list	<ol style="list-style-type: none"> 1. Active and interactive educational technologies (forms of conducting classes) in higher school: textbook / comp. T. G. Mukhina – N. Novgorod: NNGASU, 2013. - 97 p. (in Russian) 2. Program of pedagogical and research work of masters / ost. M. L. Kochneva; Novosibirsk State Agrarian University. univ. Biologotechnol. fac. - Novosibirsk, 2011, 19 p. (in Russian) 3. Methodological recommendations for the preparation of the work program and the content of the educational and methodological complex on the academic discipline / Comp. A.V. Piskarev, E. A. Reutova, O. G. Tomilova, I. E. Tolstova, E. L. Shabalina, A. A. Shibkov; Novosibirsk State University. agrarian. univ. - Novosibirsk, 2016, 16 p. (in Russian) 4. Babaev S. B. Tulgalyk pedagogy. Fundamentals of pedagogical theory: training manual. - Almaty: Nurpress, 2013. -336 pages. (In Kazakh) 5. Biribekova F. B., Zhanatbekova N. zh. modern pedagogical technologies technologies: textbook. - Almaty: higher educational institutions of the Republic of Kazakhstan Association, 2014. -360 pages. (In Kazakh)

Module designation	Research practice
Semester(s) in which the module is taught	4
Person responsible for the module	Aigul Dinmukhamedova
Language	Russian, Kazakh
Relation to curriculum	Basic/ elective
Teaching methods	-
Workload (incl. contact hours, self-study hours)	360
Credit points	12 ECTS
Required and recommended prerequisites for joining the module	Basic molecular and genetic processes, Conservation of biological diversity, Molecular and cell biology,
Module objectives/intended learning outcomes	<p>Purpose of research practice systematization, expansion and consolidation of professional knowledge, the formation of undergraduate students' skills in conducting independent scientific work, research and experimentation.</p> <p>As a result of the internship, the undergraduate must know the basics of fundamental sciences within the framework of specialization, methods of analysis of the most important compounds of living organisms and methods of studying the processes of their vital activity, technologies of professional and scientific activities of a biologist; be able to design and carry out their scientific activities, predict their results, design their further professional development, conduct joint scientific activities; possess the skills of self-realization and self-organization, scientific project activities, expanding their knowledge based on information and educational technologies, searching for information and creative solutions.</p>
Content	<p>Safety briefing. Experimental stage. Arrangement of laboratory and field experiments, observations. Processing of research results. Statistical analysis and presentation of the obtained results of experimental studies. Writing a practical section of a master's thesis. Completion of the thesis. Drawing up a report on practice. Preparation of presentation, report and practice report.</p>
Exams and assessment formats	Defense of practice report
Study and examination requirements	fulfillment of an individual task, keeping a diary on practice, characteristics from the head of the practice base
Reading list	<ol style="list-style-type: none"> 1. Andreev G.I. Fundamentals of scientific work and registration of the results of scientific activity / G.I. Andreev, S. A. Smirnov, V. A. Tikhomirov. - M.: Finance and statistics, 2003, 272 p. (in Russian) 2. Karnaukhova V.K., Sotserdotova G.V. Scientific research methods. - Irkutsk: RIO ISU. 2002 (in Russian) 3. http://www.kazneb.kz/ - Scientific Electronic Library of Kazakhstan 4. http://www.ncbi.nlm.nih.gov/pubmed 5. https://www.scopus.com/search/form.uri?display=basic#basic