

# NPJSC«L.N. GUMILYOV EURASIAN NATIONAL UNIVERSITY»

Module Handbook Educational program 7M05107Biology (MA)

> Nur-Sultan 2022

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Module 1	
Moduledesignation	PHIL 52001–History and philosophy of science
Semester(s) in which themodule is taught	Autumn or spring semester of the first year of studies
Person responsible for the	Kazakh–
module	AdayevaG.A., MamyrbekovaA.K., TursynbayevaA.O.Russian – Aubakirov Ye.N., Fazylova G.R., Sandybayeva U.M.English– BozzhigitovaM.M., RyskulbekovaD.A.
Language	Kazakh,Russian,English
Relationtocurriculum	Generaleducationcourse
Teachingmethods	Lecture (interactive method, communicative method.seminar(casestudy.communicativemethod)
Workload(incl.contacthours.self	Lecture-15hours, seminars-22hours, MSIW-
-studyhours)	83hours(master'sstudents'independentwork)
Creditpoints	4
Required and	Philosophy
recommendedprerequisitesforj	
oiningthe	
Module	
Module objectives/intendedlearningou tcomes	The purpose of the module: to develop an interest in fundamentalknowledge among master's students, to stimulate the need forphilosophical assessments of the formation and development ofsciences, a critical analysis of modern scientific achievements, todevelopamethodologicalcultureofresearchwork. Learningoutcomes: - understanding the place of one's own specialty in the integralsystemofscience, societyandculture; - comprehension of the dynamics of the development of science, its impact on the development of the development of science, its impact on the development of the science, awareness of various aspects and contexts of the science its eff; - expansion and deepening of the philosophical problems of certainscie ntific courses; - understanding the methodological foundations and problems of modern science, mastering the theory of the method as a special teaching about the principles, approaches, techniques, method sofscientific activity, mastering the logic and methodology of science; - mastering the skills of percention and analysis of text son philosophic
	- criticalreflectionandcomparativeanalysisofvariousconceptsofthe growthofscientific knowledge.

	T
Content	<ol> <li>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</li> <li>The genesis of science. Discussions about the origin of science. Scientific picture of the world. Ethos of classical science.</li> <li>Non-classical science and post-non-classical science. Scientific picture of the world. Ethos of Science.</li> <li>Philosophy of science: basic meanings. Problems of the boundaries of scientific knowledge in the philosophy of science.</li> <li>Philosophy of science: basic meanings. Problems of the boundaries of scientific knowledge in the philosophy of science.</li> <li>Tha structure of scientific knowledge. The main types of science.</li> <li>The structure of scientific knowledge. The main types of sciences. Types of cognitive procedures.</li> <li>Philosophy of natural science. The circle of problems of philosophy of natural science. The ideological significance of the theory of relativity.</li> <li>Philosophical problems of theoretical natural science. Mathematics and Natural Science. The ideological significance of the theory of relativity.</li> <li>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.</li> <li>Specificity of socio-humanitarian knowledge. The problem of the formation of social theory.</li> <li>The topic of "death of the subject" in postmodern philosophy. Time, space, chronotope. The problem of values. Postcolonial studies</li> <li>Explanation. Understanding, interpretation. The problem of truth. "Laboratory Life" by B.Latura.</li> <li>Axiological problems of modern science and the prospects of mankind. Human problem. Possible scenarios for the future developing.</li> </ol>
Examp and appagement	Oral examusing exam cards. An examination card is a set of two
formats	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 inadvance forpreparation.However,examcardsbecomeavailableonlyduringthe exam.Thequestionsinthecardscoverthematerialstudiedduringthep eriodofteachingthecourseand do not go beyond it, the questions are both theoretical
	andappliedinnature(asarule, one of the question scan be at a skor
Study and	Anassignmenttocompletea drawing, diagram, function, etc.).
Sludy and	performanceonexams. 10% guizzes. 10% take-home
nts	assignments, 10% in-
	classparticipation. Studentsmusthaveafinalgradeof60% or higher top
	ass

Reading list	1. Kanke V.A. Osnovnyye filosofskiye
· · · · · · · · · · · · · · · · · · ·	napravleniva ikontseptsii nauki. –M. 2013
	2. KokhanovskiyV.A.Istoriya i filosofiya nauki. – M., -2010
	3. Klyagin, N. Sovremennaya nauchnaya karta mira
	[Elektronnvv resurs]: uchebnove posobive/N.Klvagin1.02MB. –
	M.:Logos.2017.–186s.
	4. Gavdenko. P. Istoriva novovevropevskov filosofii v veve
	svvazi s naukov:uchebnove posobive/PiamaGavdenko
	Moskva:PERSE:Sankt-Peterburg:Universitetskavakniga.2010.
	-455.[1]s(Humanitas).
	5. Filosofiva nauki: Obshchive problemv poznaniva.
	Metodologiva vestestvennvkh i gumanitarnvkh
	nauk:khrestomativa – M.: Progress-Traditsiva: MPSI : Flinta.
	2005. –992s.
	6. Nurmanbetova D.N. Istoriva i filosofiva nauki ITekstl/ D.N.
	Nurmanbetova. – Astana:YENU.2012.
	7. Kovre A.Ocherki istorii filosofskov mvsli: O vlivanii
	filosofskikh kontseptsiv na razvitive nauchnykh teoriv. 3-ve
	izd.,ster.–M.;Yeditorial URSS,2004.–269s.
	8. Khoking S. Chernvve dvrv i molodvve Vselennvve / S.
	Khoking:11.per.sang I.M.Kononova.–Sankt-Peterburg:
	Amfora,2001.–189s.
	9. Istoriya i filosofiya nauki (Filosofiva nauki):
	Uchebnoveposobiye / Ye.YU.Bel'skaya, N.P. Volkova i dr.: - M.:
	Al'fa, M:INFRAM,2011.

Moduledesignation	ENGL 52002
8	Foreign
	language(professional)
Semester(s)inwhichthemoduleis taught	<sup>1</sup> / <sub>2</sub> semester
Personresponsibleforthemodule	KurmanayevaD.K.
Language	English
Relationto curriculum	Generaleducationcourse
Teachingmethods	Lecture(interactivemethod, communicativemethod, seminar(casestudy, communicativemethod)
Workload(incl.contacthours,self- Studyhours)	37practicalclasses/83master'sstudents'independentwork
Creditpoints	4
Required and	Foreignlanguage,B2level
recommendedprerequisitesforjoi ning themodule	

Module2

Module	ModuleEnglish(prof)isthetransferenceof
objectives/intendedlearn	aresearchknowledgesystemand skills to master students and the
ingoutcomes	acquisition of foreign languagecommunicationskills in their
0	professional and scientific fields.
	Knowledge: the functional and stylistic characteristics of the
	scientific presentation of the material in the studied for eignlanguage; fre
	elyreading, translating the original literature in the chosen
	specialty, followed
	by analysis and evaluation of the extracted information; making a present the second structure of th
	tation of scientific research (at seminars, conferences,
	symposia, forums); listening and comprehension public speaking indire
	ctandindirectcommunication(lectures, reports, 1V and Internet
	programs)
	Skills: in being able to use general scientific terminology and the terminol
	ogicalsublanguageoftherelevantspecialtyinaforeignlanguage; in
	making a presentation of scientific research (at seminars,
	conferences, symposia, forums); inpreparation written forms of present
	$ation of information material in the special ty (scientific report, message, \label{eq:science} and \label{eq:science} at the special ty (scientific report, message, \label{eq:science} at the special ty (science) t$
	abstracts, theses, short description)
	Competencies: to form the intercultural and communicative
	competence of Master students of non-linguistic specialties in the
	process of foreignlanguage education at the over-based standard
	level (C1); to master theprinciples of academic writing, to develop
	the skills of critical analysis, toprepareresearch review and
	annotations, reports and bibliographies
	onthesubjectofongoingresearch.
Content	-Introductiontothecourse
	- Developingajocus - Howtowritemaster's dissertation (introductory course)
	- Sourcinginformationforyourproject
	- Developingyourproject
	- Usingevidenceto supportyourideas - Avoidingnlagiarism
	- Paraphrasingandsummarizing
	- AcademicStyle–someguidelines
	- Writingintroductions
	- Incorporatingaataanattustrations. - Writingconclusions
	- Presentationskills. Preparingforconferencepresentation
Examsandassessmentformats	Examsandassessmentformats: Thefirstmidtermcontrol: Performingt
	esttasksonthepassedmaterial./Summarizingthearticleonscientifictop
	ics.Secondmidtermcontrol:Creatingapresentationonascientifictopic
	usinggraphsanddiagrams./Writinganessayondissertationresearch(v
	olume1200-1500woras) Finaloral exam

Studyandexaminationr	Requirementsforsuccessfully passingthemodule:
equirements	Thefinalgradeinthemoduleiscomposedof60%performanceonexams, 10%
•	tests, 10% take-home assignments, 10% presentations/ essay, 10%in-
	classparticipation Studentsmusthaveafinalgradeof50% or higher
	Topass
Reading list	<ul> <li>tests, 10% take-nome assignments, 10% presentations/ essay, 10% infectassparticipation.Studentsmusthaveafinalgradeof50% or higher Topass</li> <li>1)SagimbayevaJ.E.MoldakhmetovaG.Z,TazhitovaG.Z,Kassymbekova N.S.English coursebook for Master's programme students of "Governmental audit and Financial Control" specialist (from extended reading to academic writing)- Eurasian National University. – Astana,2018400p.</li> <li>2) English for Academic Study. Joan McCormack and John Slaght - Extended Writing and Research Skills, University of Reading, 2012 – 152p.</li> <li>3) TamzenArmerCambridgeEnglishforScientists– CambridgeUniversityPress, 2013 –128p.</li> <li>4) Martin Hewings – Cambridge Academic English – Upper Intermediate-CambridgeUniversityPress, 2012 –176p.</li> <li>5) Dorothy E. Zemach, Lisa A. Rumisek- Academic Writing: from paragraph to essayLondon:MacmillanEducation,2016-130p.</li> <li>6) Academic Writing. A Handbook for International students. StephenBailey.Routledge.2011</li> <li>7) Tussupbekova M.ZH. Professional'nyy angliyskiy yazyk [Elektronnyyresurs]:elektronnoyeuchebnoyeposobiyedlyastudentovfilolog icheskogofakul'teta / M.ZH.TusupbekovaNur-Sultan:YENU im. L.N.Gumileva,2020110sBibliogr.:s.105</li> </ul>
	E-resources:
	1. <u>https://library.enu.kz/MegaPro/Web</u>
	2. <u>https://webofscience.com</u>
	4. https://weboiscience.com
	5. https://garneteducation.com
	6. http://presentationexpressions.com
	7. http://wiki.ubc.ca/Presentation_Skills
	8. <u>https://global.oup.com/?cc=kz,https://www.macmillanyou</u>
	nglearners.com/macmillanenglish/
	9. <u>https://www.plftisncouncil.KZ/KK</u> 10. https://edpuzzle.com/
	TO. IIIIps.//eupuzzie.com/

Moduledesignation	BIOL 52002 Genetic engineering
Semester(s)inwhichthemoduleistau ght	1
Person responsible for themodule	AsiyaDukenbaeva
Language	Russian,Kazakh
Relationtocurriculum	Basic/elective
Teachingmethods	Lecture(interactivemethod, communicativemethod, seminar(casestudy, com municativemethod)
Workload(incl. contact hours,self- studyhours)	Totalworkload:150 Contacthours:Lectures-15,Seminars- 30StudentsIndividualWork:105
Creditpoints	SECTS
Requiredandrecommended Prerequisitesforjoiningthemo dule	CellBiology,MolecularBiology,Genetics
Moduleobjectives/intendedlea rningoutcomes	Objectivesofthecourse:- theoreticalfoundationsofgeneticengineeringandappliedaspectsofitsappli cation; As a result of mastering the module, the student <b>must know</b> the history of the emergence of genetic engineering and its placeamongothersciences, general provisions and approaches of geneticeng ineering, structural and functional features of bio engineering objects; <b>mustb</b> eabletouse the knowledge gained for these lection of biological objects and the application Invarious technological processes; <b>musthave the skills</b> of independent research work. methods of geneticengineering.
Content	Gen therapy. Human cloning. "Eugenics". Transformation of plantcells. Transgenicplantsforpracticalbreedingpurposes. Transgenicpla ntsforpharmacologyandmedicine. Genetictransformation of animal cells. Translation. Transgenic animals forpractical breeding purposes. Genetic modification of human cells. Problemsofgenetherapy. Geneticallymodifiedorganisms (GMOs) and theirsafetyassessment.
Examsandassessmentformats	Two oral rating (20 minutes each) and one final oral exam (40 minutes)
Studyandexaminationreq uirements	Thefinalscore, 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
Technical, multimedia	https://edu.enu.kz/, https://www.microsoft.com/,
tools and software	https://www.labster.com/, https://fen.enu.kz/subpage/material-no- tehnicheskaya-baza-kaf-obg
Readinglist	<ol> <li>ZhimilovI.F.GeneralandMolecularGenetics,Novosibirsk,2003Textbook( inRussian)</li> <li>Inge-Vechtomov S.G. Genetics with Fundamentals ofselection,2010,Sankt-Peteersburg.Textbook(inRussian)</li> <li>Bersimbay R.I.Genetics.Astana,2015 Textbook(in Kazakh)</li> <li>Bersimbay R.I.Genetics,Almaty,2017 Textbook(in Kazakh)</li> <li>TamarininR.H.PrinciplesofGenetics,DrownPublishers,FifthEdition,19</li> <li><u>https://onlinelibrary.wiley.com/</u></li> <li><u>https://link.springer.com/</u></li> <li><u>https://link.springer.com/</u></li> <li><u>https://access.clarivate.com/</u></li> </ol>

Moduledesignation	BIOL 52002Basic molecular and genetic processes
Semester(s)inwhichthemoduleist	1
aught	
Person responsible for	RakhmetkazhyBersimbay
themodule	
Language	Russian,Kazakh
Relationtocurriculum	Basic/Elective
Teachingmethods	Lecture(interactivemethod, communicativemethod, seminar(casestu
_	dy,communicativemethod)
Workload(incl.contacthours,self	Totalworkload:150
-studyhours)	Contact hours: Lectures- 15, Laboratory Classes –
	30StudentsIndividualWork:105
Creditpoints	SECTS
Requiredandrecommendedp rerequisitesforjoiningthe module	CellBiology,MolecularBiology,Genetics
Moduleobjectives/intendedl earningoutcomes	Asaresultofstudyingthe module,thestudent <b>mustknow</b> understand the complexity and diversity of
	replication, transcription, translation, and reverse
	transcription mechanisms; The student <b>mustbe</b>
	abletoschematically represent the
	mainstagesofreplication, transcription, translation in pro-
	eukaryotes, the stages of reverse transcription, the reproduction cycles
	ofphagesanareiroviruses
	theskills themainmechanisms of mutagenesis and renair the properti
	esofthegeneticcode thestructureofribosomesthemainenzymesthatc
	arryouttheprocesses of reproduction and implementation of geneticin
	formation;
Content	DNA as the basis of genetic information. DNA replication. Replication
	mechanisms.Regulationofgeneexpression.Regulationofgene
	expression inprokaryotes.Negative induction and positive
	repression. RNA splicing as
	amechanismofgeneexpression.Reversetranscription.Translation.
	The genetic code. Features of the structure of
	tRNA.IsoacceptortRNAs.Thestructureoftheribosomeofpro-
	andeukaryotes. Centers on the ribosome. Formation of the
	Incluatory complex in pro and eukaryoles. Molecular basis of mutations Tautomovies hifts Ponging DNA damage unpairs stores
	mutations. Lautomericsnijis. Repairoj DNAaamage. repairsystems. Mechanismsof DNA repair Photoreactiverepairin prokarvotes
Examsandassessmentformats	Twooralrating(20minuteseach)andonefinaloralexam(40minutes)
Studyandexaminationr	Thefinalscore, consists of the results of the rating control and the exam,
equirements	with 60% being the rating control, 40% - the result of theexam.Studentsmusthaveafinalgradeof 50% or highertopass
Technical, multimedia	https://edu.enu.kz/, https://www.microsoft.com/,
tools and software	https://www.labster.com/, https://fen.enu.kz/subpage/material-no- tehnicheskaya-baza-kaf-obg
Readinglist	1. KrebsJ.E., GoldstreinS., KilpatrickS.T.Lewin's GENESX. Jonesa
	ndBartlettPublishers,2008(inEnglish)
	2. Clag U., Cummings M. Foundations genetics //
	PublishinghouseTechnosphere,Moscow,2007(inRussian)
	3. GenesaccordingtoLewin/M.:PublishinghouseLaboratoryofKno
	wledge2017.ISBN978-5-00101-582-6(inRussian)
	4. Lewin's GENES XI Kindle Edition2015 p.
	205/ISBN9/8-1-4490-3903-9(INENglish) 5. Thimulay I.F. Canada and malaguilar a section //
	5. Znimulev 1.F. General and molecular genetics. //

SiberianUniversityPublishingHouse,Novosibirsk,2003 (inRussian)

Module designation	BIOL 63004Conservation of biological diversity
Semester(s) in which the	1
module is taught	
Person responsible for	i Daniyar Tagayev
Language	Russian,Kazakh
Relation to curriculum	Basic/Elective
Teaching methods	<i>Lecture (interactive method, communicative method, seminar(case study, communicative method)</i>
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
Requiredandrecommended prerequisitesforjoiningthe module	Environmental Science, Evolutionary Biology
Module objectives/intended learning outcomes	As a result of studying the module, <b>the student must know</b> : the history and patterns of formation, the current state of biologicaldiversityonEarth, aswellasanunderstandingoftheneedofitsconservat ion. As a result of studying the module, <b>the student should be able to</b> : understand various aspects of anthropogenic impact on biodiversity. As a result of studying the module, <b>the student must have the skills</b> : 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.
Examsandassessmentformats	Two oral rating (20 minutes each)and one final oral exam (40 minutes)
Studyandexaminatio nrequirements	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
Technical, multimedia tools and software	https://edu.enu.kz/, https://www.microsoft.com/, https://fen.enu.kz/subpage/material-no-tehnicheskaya-baza-kaf-obg

Readinglist	1. Brodsky A.K. Biodiversity: textbook M .: Academy, 2012 (inRussian)
	2. R.Primak.FundamentalsofBiodiversityConservation.Moscow:Publishing
	House of Scientific and educational and methodological center, 2002(inRussian)
	3. KevinJ.Gaston, JohnI.Spicer. Biodiversity: An Introduction. Blackwell
	Publishing Company, 2004
	4. Anne Maczulak. Biodiversity: Conserving Endangered Species, 2010
	5. FifthNationalReportoftheRepublicofKazakhstanonBiologicalDiversity.
	Ministry of Environment and Water Resources of
	theRepublicofKazakhstan(inRussian)
	6. https://www.scopus.com/home.uri
	7. https://link.springer.com/

Module designation	BIOL 53003Medical Microbiology
Semester(s)in which the module is	1
taught	
Person responsible for the	Aigul Dinmukhamedova
module	
Language	Russian,Kazakh
Relation to curriculum	
Teaching methods	<i>Lecture (interactive method, communicative method), seminar (casestudy, communicative method)</i>
Workload (incl. contact hours, self-	Total workload: 150
study hours)	Contact hours: Lectures- 15, Laboratory Classes – 30
Con literation	Students Individual Work: 105
Creati points	
Required and recommended prerequisites for joining the module	Microbiology
Module objectives/in tended	To acquaint students with the fundamental concepts of the in fectious
learning outcomes	process, on the role of pathogenic microorganisms in the pathology of
	human diseases. As a result of studying the module, students should
	know the nature of infectious diseases, the patterns of the it occurrence
	and development, the peculiarities of the morphology, physiology and
	pathogenicity of pathogens of alfferent groups of microorganisms; must
	work matheds of Provention and control of hacterial infections
	work, methods of 1 revention 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 for mats	Two oral rating (20 minutes each) and one final oral exam (40 minutes)
Study and examination	The final score consists of the results of the rating control and the
requirements	exam with 60% being the rating control 40% - the result of the exam
requirements	Students must have a final grade of 50% or higher to pass
Technical, multimedia	https://edu.enu.kz/. https://www.microsoft.com/.
tools and software	https://www.labster.com/, https://moodle.enu.kz/,
U U	https://learn.chm.msu.edu/vibl/, https://fen.enu.kz/subpage/material-no-
	<u>tehnicheskaya-baza-kaf-obg</u>
Reading list	1. Levinson, W. Medical Microbiology and Immunology.
	Moscow: BINOM.KnowledgeLaboratory, 2015 - 1184p. (inRussian)
	2. WHO / Infectious Diseases - <u>www.who.int/topics/infections_diseases/ru</u>
	3. PatrickMurrayKenRosenthalMichaelPfaller.MedicalMicrobiology.9"E
	allion,2020,8/2p. A Madiaal miguahiology: taythook / Pamazanoya V.A. Kudaiharaanoy
	Almaty 2011 -684 n (inKazakh)
	5. SvdvkbekovaRK.MukashevaTD. BerzhanovaR Zh Isolationand
	cultivation of microorganisms: a textbook 132 p. (inKazakh).
	6. <u>https://onlinelibrary.wiley.com/</u>
	7. <u>https://www.scopus.com/home.uri</u>
	8. <u>https://link.springer.com/</u>
	9. <u>https://pubmed.ncbi.nlm.nih.gov/</u>
	10. <u>https://access.clarivate.com/</u>

Module designation	BIOL 53003 Psychoneuroimmunology
Semester(s) in which the module is	1
taught	
Person responsible for the	Dinara Isakova
Module Language	Pussian Kazakh
Relation to curriculum	Russian, Kuzukh
Teaching wethods	Lasture (interactive method communicative method seminar(case study)
reaching methods	communicative method)
Workload (incl contact hours self-	Total workload: 150
study hours)	Contact hours: Lectures- 15. Laboratory Classes – 30
	Students Individual Work: 105
Credit points	5 ECTS
Required and recommended	Neurophysiology, Endocrinology, Anatomy
prerequisites for joining the module	
Module objectives/in tended	As a result of studying the module, the under graduate <b>must know</b> : about
learning outcomes	the mechanisms and pathways of interaction between the nervous,
	immune and endocrine systems; <b>must be able to analyze</b> the changes in
	immunological reactivity in the norm and in the experimental modeling of
	various types of behavior; <b>know</b> about the main modern research
	meinoas in the field of psychoneuroimmunology, which include
	physiological, pharmacological, immunological, etc.research methods.
Content	Nervous and immune systems principles organization and hiological
	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 for mats	<i>Two oral rating (20 minutes each) and one final oral exam (40 minutes)</i>
Study and examination	The final score, consists of the results of the rating control and the
requirements	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
Technical, multimedia	https://edu.enu.kz/, https://www.microsoft.com/,
tools and software	https://fen.enu.kz/subpage/material-no-tehnicheskaya-baza-kaf-obg
Reading list	1. Korneva E.A. Introduction to immunophysiology: textbook. in
	away.SPb.: ELBI-SPb,2003.48p.
	2. KetlinskyS.A., SimbirtsevA.S.Cytokines.SPb.:Fo-
	liant,2008.549p.9(inrussian)
	3. V. Abramov and other Fundamentals of
	neurommunology:textbook. in a way. Novosibirsk: Publishing
	nouse of NGPU,2004.204p.(inrussian)
	4. DevoinoL. V., 100vaG. V., AlperinaE.L. Psychoneuroimmunomodulation
	brain "Publishing house" Science" Novosibirsk 2000 - 167/in Russian)
	5. Idova V. Alperina E. I. Psychoneuroimmunomodulation Impactof
	behavior on immunity NSU.Novosibirsk/teaching aid).2010 23s (in
	Russian)

Module 7

Module 8		
Module designation	BIOL 53003 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-	Total workload:150	
study hours)	Contact hours: Lectures- 15, Laboratory Classes – 30	
	Students Individual Work: 105	
Credit points	3 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 module, <b>the master's student must know:</b> the basic principles of the organization and functioning of sensory systems, research methods in sensory physiology. As a result of studying the module, <b>the master's student should be able to:</b> 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 module, <b>the master's student must have the skills</b> : to conduct research on the capabilities of human sensory systems.	
Content Exam sand assassment for mate	The current state of the physiology of sensory systems. MechanismsofsensoryconversionandsignaltransmissionSomaticsensory system. Musculoskeletal or proprioceptive sensory system Lateral line sensory system Gravitational sensory system Auditory sensory system Chemoreceptor sensory systems Visual sensory system. Nociception Two oral rating (20 minutes each) and one final oral exam (40 minutes)	
Exam sana assessment for mais	Two or at running (20 minutes each) and one final or at exam (10 minutes)	
Study and examination	The final score, consists of the results of the rating control and the	
requirements	exam, with 60% being the rating control, 40% - the result of the exam. Students much have a final grade of 50% or higher to pass	
Tachnical multimadia	https://adu.anu.kz/	
tools and software	https://fen.enu.kz/subpage/material-no-tehnicheskaya-baza-kaf-obg	
Reading list	<ol> <li>Akhanov U.K. Epigraph. "Human and animal physiology"- Almaty, 2016235p. (Russian)</li> <li>Akhanov U.K. Epigraph. "Human and animal physiology"- Almaty, 2016178p. (Russian)</li> <li>MoryakinaS.V., AnzarovV.A "Physiology Of Sensory Systems":educational and methodological manual -Groznyi, 2015 153p. (Russian)</li> <li>Batuev A.S. "Physiology of higher nervous activity and sensory systems: Textbook for universities" 3<sup>rd</sup> edition, insr. and add St.Petersburg:Peter, 2010316p. (Russian)</li> <li>Kogan B. M. "Anatomy, physiology and pathology of sensory systems": a textbook/B. M. Kogan, K. V. Mashilov.ASPECTPRESS, 2011, 384p. (Russian)</li> </ol>	

	Module9
Module designation	EDUC 52003 Higher School Pedagogy
Semester(s)in which the module is taught	1,2
Person responsible for the module	Abibulayeva A.B.
Language	English
Relation to curriculum	Compulsory
Teaching methods	Explanatory-illustrative, Reproductive, Research, Problem-based learning, Heuristic methods, Control tests, Work with a text book
Workload (incl. contact hours,	(Estimated)Total workload:
self-study hours)	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>Private study including examination preparation, specified in hours</i> <sup>1</sup> :
Credit points	4
Required and recommended	Pedagogy
prerequisites for joining the module	Existing competences in psychology
Module objectives/intended learning outcomes	Key question: what learning outcomes should students attain in the module? Mastering the general theoretical training of a specialist in the pedagogical foundations oftheeducationalprocessatauniversity. In terms of:
	Knowledge: familiarity within formation about the conceptual and terminological apparatus of Higher School pedagogy, the or y and/or subject knowledge of the main approaches, directions, scientific school sand certain concepts of the educational process, characteristics of the activities of the subjects of the educational process at the university.
	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.
	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 situations <sup>2</sup> .
	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.

Content	<i>The description of the contents should clearly indicate focus are a sand the level of difficulty.</i>
	<ol> <li>General Fundamentals of Pedagogy. Higher School Pedagogy as a branch of pedagogical science.</li> <li>Methodological Foundations of Higher School Pedagogy.</li> <li>Particular aspects and principles of development of higher education in Kazakhstan.</li> <li>Content of Education in HigherSchool.</li> <li>Didactics in the System of Pedagogical Sciences.</li> <li>Teaching Process as an Integral System.</li> <li>Laws, regularities and principles of teaching in higher school.</li> <li>Methods of teaching in higher school.</li> <li>Lecture as a form of arrangement of teaching and learning process at higher school.</li> <li>Types of forms of education at Higher school: Seminars, Practical classes, Laboratory work, Students' unassisted work.</li> <li>Control in higher school.</li> <li>Credit technology of education at higher education institutions of Kazakhstan.</li> <li>Organization of morale building activities in higher school.</li> <li>Higher School Teacher.</li> <li>Professional competence of a Higher School Teacher.</li> </ol>
Exam sand assessment for mats	e.g. two oral Midterm assessments (20 minutes each) and one final oral. Exam (40 minutes), short computer-based quizzes, take-home written assignments
	written ussignments
Study and examination	Requirements for successfully passing the module e.g. the final grade in the module is composed of 60%
requirements	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.
Reading list	<ol> <li>Zhogary mektep pedagogikasy / K.K. Shalgynbayeva, N.Albytova, T.S.Slambekova. –Almaty: RMEB,2016</li> <li>Kontseptsii sistemnoy modernazatsii vysshegopedagogicheskogoobrazovaniya. – Almaty,2015g.</li> <li>Pedagogika vysshey shkoly: Uchebnik/OkolelovO.P.–M.: NITSINFRA-M, 2017 176s.</li> <li>K.R. Kalkeeva, andothers.HigherSchoolPedagogy Astana, 2015/-252p.</li> <li>A.K. Mynbayeva. Basics of Higher School Pedagogy Almaty. 2008, 155p.</li> </ol>

Module 10		
Moduledesignation	PSYC 52004 Management psychology	
Semester(s) in which th	1,2	
Person	Mambetalina 4 S	
responsibleforthemod	BaizhumanovaB.S	
ule	n	
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.	Workload: 60 hours, of which contact hours:	
contact hours, self-	Lectures - 8 hours; practical - 15 hours; self-study - 37 hours.	
study hours) Credit points	2	
Preui points	2 Computer based testing	
Kequirea ana	Computer-based testing	
recommended		
prerequisites for		
Joining the module	Objectivez	
Mouule objectives/intere	Objectives.	
d logming	The formation of socio-psychological knowledge in undergraduate students	
a learning	in the context of solving the problems of modernization of social	
ouicomes	consciousness, defined by the state program Course to wards the future.	
	modernization of Kuzakhstan's taentity Expected learning outcomes:	
	Know:	
	- 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;	
	Skills:	
	- 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	
	projessional activities,	
	- Explain and interpret subject knowledge (concepts, ideas, incortes) in the	
	jielu oj psychology,	
	- expluin socio	
	- ennical values of the society as a product of integration processes in the	
	systems of basic knowledge of the module of psychology,	
	- undivide different studitions in different spheres of communication from the	
	position of correlation with the system of values, social, dustness, cultural,	
	iegui unu cinicul norms of Kuzukhsiuni sociely;	
	to present information about afferent stages of development of Kazakhstant	
	society, culture, lunguage, social and interpersonal relations in a well-	
	- develop programs for solving conflict situations in society including in	
	professional society.	

Content	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 de 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
Exam sand assessment formats	Types of control of academic achievements: Rubric 1oral examination-50 minutes Final 2oral questioning- 50minutes 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 module, 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	<ul> <li>course.</li> <li>Primary literature:</li> <li>Nazarbayev N.A. On the Threshold of the XXI Century Astana, 2016.</li> <li>Nazarbayev N.A. "Course to wards the future: modernization of Kazakhstan's identity".</li> <li>Aronson E. Kopkeum tylgan zhalgyz [Matin] = The Social Animal: eleumettik psychlogakirispe: [oxynak]/ E. Aronson;aud. D. Duisenbekov [earth.b.] 11-bas.</li> <li>- Astana: "Yntty x audarma bureaucy'koramdyk kory.2018 407.[2]6 (Rukhani</li> <li>Zhangyru)</li> <li>Godefroy J. What is psychology. Volume 2 Moscow: The World, 2005 276 pp.</li> <li>Daniel Goleman. Emotional Intelligence.Why it can mean more than IQ.Mann, Ivanov &amp; Ferber Publishing House: 2018560c.</li> <li>Glukhanyuk, N.S. General psychology:Textbook/ N.S. Glukhanyuk M.: Academia, 2017 172c.</li> <li>Glukhanyuk, N.S. General psychology: Textbook/M.I. EnikeevM.: Norma, 2017 176 c.</li> <li>Enikeev M.I. General and social psychology: Textbook/M.I. EnikeevM.: Norma, 2017 176 c.</li> <li>Inanikov, V.A. General psychology: Textbook/M.I. EnikeevM.: Norma, 2017 176 c.</li> <li>Inanikov, V.G. General psychology: Textbook/M.I. EnikeevM.: Norma, 2017 176 c.</li> <li>Inanikov, V.G. General psychology: Textbook/M.I. EnikeevM.: Norma, 2017 176 c.</li> <li>Inanikov, V.G. General psychology in schemes and comments: Textbook/V.G. Krysko Moscow: Vuzovskiy textbook, 2017 336 c.</li> <li>Krysko V.G. General psychology: Textbook/V.V. Nurkova, N.B. Berezanskaya.</li> <li>Lyubertsy: Yurait, 2016 524 c.</li> <li>Krezpov, I.Sh. Cheatsheets: general psychology: Textbook for Academic Bachelor's Degree/</li> <li>Y.D. Shadrikov V.D. General Psychology: Textbook for Academic Bachelor's Degree/</li> <li>Makaroval. V. General Psychology: Textbook for Academic Bachelor's Degree/</li> <li>Makaroval. V.G. General Psychology: Textbook for Academic Bachelor's Degree/</li> <li>Makaroval. V.G. General Psychology: Textbook for theSPO /I.V. Makarova. Lyubertsy: Yurait, 2016 182 c.</li> <li>Maklakov, A.G. General</li></ul>
	<ol> <li>http://www.akolda.k2</li> <li>http://azps.ru/</li> <li>http://psychology.net.ru/articles</li> <li>http://www.psychology-online.net/</li> <li>http://psynet.narod.ru/main.htm</li> <li>http://psyfactor.org/</li> </ol>

Module designation	BIOL 52002 Molecular and cell biology
Semester(s)in which the module is	2
taught	
Person responsible for the	Olga Bulgakova
module	
Language	Russian, Kazakh
Relation to curriculum	Profile/University
Teaching methods	Lecture(interactivemethod,communicativemethod,seminar(casestudy,com municativemethod)
Workload(incl. contact hours, self-	Totalworkload:150
study hours)	Contacthours:Lectures-30,Seminars-
~	15StudentsIndividualWork:105
Credit points	SECTS
Required and recommended Prerequisitesforjoiningthemo dule	Cytology, histology, biochemistry, molecular biology
Module objectives/in tended	As a result of studying the module, the graduate student
learning outcomes	mustknowthefunctioningofcellsignallingpathways; the mainfeatures of the
	main cell signalling pathways; principles of influence on cell signalling
	pathways for the treatment of diseases; must be able to applythe
	knowledge gained to study systems for transmitting external signals to
	the cell; must apply the knowledge gained
	toassesschangesofthemechanismsofsignaltransductioninpathological
	conditions, use the knowledge gained in the field of research of intercellular communication
	systemstosolvenrofessionalnrohlems:musthavetheskillstoannlythe
	systems cost reprojection appropriate statistic provider science in their skills of the methodological foundations of modern science in their
	research activities
Content	Mechanisms of inter cellular and intra cellular signaling. Types
	ofreceptors.Signalamplificationsystemsinthecell.Carcinogenesis
Examsandassessmentformats	Twooral rating(20minuteseach)andonefinaloralexam(40minutes)
Studyandexaminationreq	Thefinalscore, consists of the results of the rating control and the exam, with
uirements	60% being the rating control, 40% - the result of
	theexam.Studentsmusthaveafinalgradeof 50% or highertopass
Technical, multimedia	https://edu.enu.kz/, https://www.microsoft.com/,
tools and software	https://www.labster.com/, https://fen.enu.kz/subpage/material-no-
	<u>tehnicheskaya-baza-kaf-obg</u>
Readinglist	1. Signal Transduction: Principles, Pathways, and Processes 1st Edition.
	pp. 452. – 2014 – ISBN -13:978 - 10218218103 Lewin's GENES XI Kindle
	Dullon, - 2013, - p. 2057 2 Pollard T.D. et al. Coll Biology 2nd Edition/Elegnica, 2016 - 000
	2. 10111111.et al. Cell Biology. Sha Eallon/Eisevier - 2010 p. 908 Hardeover ISBN: 0780323341264
	3 Proteins: Conceptsin Riochemistry 1st Edition Garland Science
	ledition, 416 n. (March 14, 2016) ISBN - 13.978 - 0815345022
	4. The Cell. 2nd edition. A Molecular Approach. Geoffrev M Cooper
	( <i>Ed</i> ), <i>ISBN</i> - 10: 0 - 87893 - 106 - 6
	5. https://pubmed.ncbi.nlm.nih.gov/

Module 12		
Module designation	BIOL 52002Cell cycle genetics	
Semester(s) in which the	2	
module is taught		
Person responsible for the	Olga Bulgakova	
module	Dussian Kazakh	
Palation to ourrigulum	Russiali, Razakli	
Relation to curriculum	Tione elective	
Teaching methods	Lecture (interactive method, communicative method, seminar	
	(case study, communicative method)	
Workload (incl. contact hours,	Total workload:150	
self-study hours)	Contact hours: Lectures-30, Seminars-15	
	Students Individual Work: 105	
Credit points	SECIS	
quisitesforjoiningthemodule	Cytology, histology, biochemistry, molecular biology	
Module objectives/intended	As a result of studying the module, the graduate student must	
learning outcomes	know: current data on regulators and participants of the cell	
	cycle, about the peculiarities office 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, NOS, ELISA, westernolouing, initiation,	
	synthesis (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	The final score, consists of the results of the rating control and the	
requirements	exam, with 60% being the rating control, 40% - the result of the	
1	exam. Students must have a final grade of 50% or higher to pass	
Technical, multimedia tools and	https://edu.enu.kz/, https://www.microsoft.com/,	
software	https://www.labster.com/, https://fen.enu.kz/subpage/material-no-	
	tehnicheskaya-baza-kaf-obg	
Reading list	1. Cell Cycle Control. Editors: Noguchi, Eishi, Gadaleta, Mariana C. (Eds.), Springer, 2014, ISBN 978 -1-4939 – 0888 - 2 Cell Cycle Control and Dygregulation Protocols. Editors:	
	Giordano, Antonio, Romano, Caetano (Eds.), 2004, ISBN 978 - 1- 59259 – 822 - 9	
	3. The Eukaryotic Cell Cycle, J. A. Bryant, Dennis Francis,	
	1 aylor $\alpha$ Francis, 2008, 18 BIN 9/8 – 0 – 4184 – 0/81 - 6 4. Cell Cycle Oscillators Editors Courts Amanda S	
	Weston, Louise (Eds.), Springer, 2016, ISBN 978 -1 – 4939 - 2957- 3	
	5. https://pubmed.ncbi.nlm.nih.gov/	

Module	13
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Module designation	BIOL 52002Molecular Virology
Semester(s) in which the	2
module is taught	
Person responsible for the	Tamara Ukbaeva
module	
Language	Russian,Kazakh
Relation to curriculum	Profile/elective
Teaching methods	Lecture (interactive method, communicative method, seminar
	(case study, communicative method)
Workload (incl. contact hours,	Total workload:150
self-study hours)	Contact hours: Lectures-30, Seminars-15
	Students Individual Work:105
Credit points	5ECTS
Required and recommended	Virology
Prerequisites for joining	
the module	
Module	The main goal of mastering the module is the assimilation by
objectives/intended	student soft the basic provisions of virology, the principles of
learning outcomes	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 module, 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
	(40minutes)
Study and examination	The final score, consists of the results of the rating control and the
requirements	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
Technical, multimedia	https://edu.enu.kz/, https://www.microsoft.com/,
tools and software	https://www.labster.com/, https://fen.enu.kz/subpage/material-no-
	tehnicheskaya-baza-kaf-obg

Reading list	1. Nicholas H. Acheson. Fundamentals of
8	Molecular Virology, 2nd Edition – Wiley, 2011. – 528p.
	2. Alan Cann. Principles of Molecular Virology 6th Edition –
	Academic Press, 2015. – 318p.
	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.
	5. Reeti Khare. Guideto Clinicaland Diagnostic Virology 1st
	Edition
	- ASM Press, 2019 – 311p.

Module designation	BIOL 52002 Molecular bases of pharmacology
Semester(s)in which the module is	2
taught	
Personresponsibleforthe module	AsiyaDukenbaeva
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-	Totalworkload:150
study hours)	Contact nours: Lectures-30, Seminars-15 Students Individual
Cradit painta	
Credit points Required and recommanded	DECIS Piechomistry, Potony, Popia malagular and constin processor
nerequisites for joining the	Diochemistry, Bolany, Basic molecular and genetic processes
module	
Module objectives/intended	As a result of mastering the module, the student must know the
learning outcomes	main classes of macromolecules-targets of pharmacological agents:
<b>3 1 1 1</b>	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.
	Cholinomimeticagents. Holyoplockingagents. Pharmacology of
	Bharmacological regulation of body functions in the field of
	histaminergic donaminergic and serotonergic structures Drugs
	that affect the central nervous
	System Hypnotics.antiepileptic.Antiparkinsonianagents
Exams and assessment formats	Two oral rating(20minuteseach) and one final oral exam(40minutes)
Study and examination	The final approximate of the regults of the rating control and the
	The final score consists of the results of the fating control and the
requirements	exam. Students must have a final grade of 50% or higher to pass
Technical multimedia tools and	https://edu.enu.kz/_https://www.microsoft.com/
software	https://www.labster.com/_https://fen.enu.kz/subpage/material-no-
	tehnicheskava-baza-kaf-obq
Reading list	1.ShimanovskyN.L., Epinetov M. A. Melnikov M. Ya.2. Molecular
	and nano pharmacology. MOSCOW: FIZMATLITPUBL.,2010
	624P.ISBN 978-5-9221-1208-6.
	3.D.A. Harkeevich/Pharmacology
	Pharmacology: textbook and workshop for higher educational
	institutions / E. V. Konopleva Moscow: Yurayt publishing
	house,2019446P(Higher Education).—ISBN978-5-534-01500-
	S. Kuendukey E.O. Americkeleye A.E. Kuendementele of Male sub-
	. Kuandykov E.O. AmanznolovaA.E./fundamentals of Molecular
	biology https://access.clarivate.com/
	https://access.clanvale.com/
	<u>naps.//pusiticu.nusi.min.min.gov/</u>

Module designation	BIOL 53003 Genetics of microorganisms
Semester(s)in which the	2
module is taught	
Personresponsibleforthe	TamaraUkbaeva
module	
Language	Russian, Kazakh
Relation to curriculum	Profile/elective
Teaching methods	Lecture (interactive method, communicative method, seminar (case
<b>3</b>	study, communicative method)
Workload (incl. contact hours,	Totalworkload:150
self-study hours)	Contact hours: Lectures-30. Seminars-15 Students Individual Work:105
, , , , , , , , , , , , , , , , , , ,	
Credit points	5ECTS
Required and recommended	Medical Microbiology. Basic molecular and genetic processes
prerequisites for ioining the	
module	
Module objectives/intended	Formation of students' ideas about the molecular basis of heredity and
learning outcomes	hereditary variability of microorganisms, about the organization of the
	genetic apparatus of microorganisms, about the main mechanisms of
	bereditary variability about the mechanisms of DNA exchange the role
	horizontal gene transfer structure and role of migratory elements. As a
	result of mastering the module, 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 modules and in professional activities must master the basic
	methods of genetic analysis of pro and eukaryotes
	memous of genetic analysis of pro-and editalyoles.
Content	Genetics of bacteria. Molecular mechanisms of the mutation and repair
Content	process Recombination(combinative)variability Horizontal Gene
	Transfer In Bacteria Genetic Elements ISelements, Transposons
	Conjugative transposons. Genetic engineering
	Conjugative transposons. Cenetic engineering.
Exams and assessment	Two oral rating(20minuteseach) and one final oral exam(40minutes)
formats	
Study and examination	The final score consists of the results of the rating control and the
requirements	exam with 60% being the rating control 40% - the result of the exam
requirements	Students must have a final grade of 50% or higher to pass
Technical multimedia tools	https://edu.enu.kz/.https://www.microsoft.com/
and software	https://eu.enu.kz/subpage/material_no_tebnicheskava_baza_kaf_obg
	niips.men.enu.kz/subpage/matenai=no-tennicheskaya-baza-kai-obg
Reading list	LeremyW Dale SimonE Park Molecular Genetics of
	Bacteria 5thEdition 2010 400n
	2 BryukhanovA I RybakK V NetrusovA I Molecular
	microbiology 2012 480n (in Russian)
	2 UkbaevaTD AsemovaG D Genetics of microorganisms:textbook
	Almaty:Newbook 2021 130n (in Kazakh)
	A Josenh E Peters Larry Snyder Wendy Champness Tina Henkin
	Molecular Genetics of Pacteria 2012
	5 NCRL http://www.pchi.plm.pib.gov
	6. nubmod http://www.nubi.nlm.nlm.gov
	o.publicu- <u>nilp.//www.ncbi.nim.nim.gov/publica</u>
	7. UKUAEVA I. D., AUItaeVaG.K. Genetics of fillerior anistis: teaching
	aid for students and undergraduates of biological specialties,
	Ministry of Education and Science of the Republic of
	Kazaknstan, L.N. Gumilyov, EurasianNationalUniversity
	Astana:ENUthem.L.N.Gumilyov,201881p.

Module designation	BIOL 52002 Mathematical processing of the results of molecular
_	genetic studies
Semester(s)in which the module is taught	3
Personresponsibleforthe module	KulshatAkanova
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	5ECTS
Required and recommended prerequisites for joining the module	Basic molecular and genetic processes
Module objectives/intended learning outcomes	As a result of studying the module, 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 Statistical and Stat plus packages when processing data
Content	Subject of mathematical processing of results molecular genetic research. Principlesofbiometrics.Discreteandcontinuous random variables. Pairwise regression analysis. Multiple Linear Regression: Least squares in a pairwise regression model. Least squaresinmultiple model regression.Correlation analysis. Dispersion analysis.Specificationofvariables.Multicollinearity. Heteroscedasticity.Dynamic series
Exams and assessment formats	Two oral rating(20minuteseach) and one final oral exam(40minutes)
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
Technical, multimedia tools and	https://edu.enu.kz/, https://www.microsoft.com/,
software	https://fen.enu.kz/subpage/material-no-tehnicheskaya-baza-kaf-obg
Reading list	DrebushchakT.NIntroduction To Chemometrics.Analysis Practice.Experimentaldata.Educationalallowance /Novosib.stateun-t.Novosibirsk,2011,88p. Ivanter, E.V., Korosov,A.V.And228 Elementary biometrics: textbook Petrozavodsk: Petr SU Publishing House,2010,104p. GmurmanV.E. Guide to meeting the challenges of probability theory and the metical statistics. Educational allowanceM.: Higherschool,1998. N. Johnson, F.Lyon.Statistics and planning experiment in technology and scienceM.:World,1980 SmirnovS.A. Computer technology in science and education. Educational allowanceIvanovo,2016136p. <u>https://pubmed.ncbi.nlm.nih.gov/</u>

Module designation	BIOL 52002 Introduction to Structural Biology
Semester(s)in which the module is	3
taught	
Personresponsibleforthe module	AinashSuleimenova
Language	Russian, Kazakh
Relation to curriculum	Profile/University
Teaching methods	Lecture (interactive method, communicative method, seminar (case
Workload (incl. contact hours self-	Total workload:150
study hours)	Contact hours: Lectures-30, Seminars-15 Students Individual
	Work:105
Credit points	5ECTS
Required and recommended prerequisites for joining the module	Biochemistry, Molecularbiology
Module objectives/intended learning outcomes	As a result of studying the module, <b>the master should know</b> : physicochemical principles underlying the methods and devices used in molecular biology, and on this basis-understanding the possibilities and applications of these methods; should <b>be able</b> effective independent planning of complex experiments or the analysis of biopolymers that are part of complex biological objects:
Content	analysis of biopolymers that are part of complex biological objects; <b>must have the skills</b> interpretation of the received results The structure of nucleic acids. Molecular bases of nucleic acid biosynthesis. Molecular basis of PNA biosynthesis. PNA 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. Proteins.Modeling of protein Protein modifications. X-ray structural analysis. Proteincrystallization.Cryoelectronicmicroscopy.Nuclear Magnetic Resonance Spectroscopy (NMR). Coagulation and mobility of proteins.
Exams and assessment formats	Two oral rating(20minuteseach) and one final oral exam(40minutes)
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
Technical, multimedia tools and software	https://edu.enu.kz/, https://www.microsoft.com/, https://fen.enu.kz/subpage/material-no-tehnicheskaya-baza-kaf-obg
Reading list	Molecular biology, Konichev, Alexander Sergeevich; Sevastyanova, GalinaAndreevna,2015(in Russian) .https://www.ozon.ru/context/detail/id/163818356/
	Bersimbay RI Molecular biology//Textbook, Astana.L.N. LNGumilyovENU,2014,304p. (in Kazakh)
	https:// <u>www.enu.kz/gylym/gylymi-zertteu-instituti/institut-</u> kletochnoy- biologii-biotekhnologii/ Molecular biology. The structure and function of proteins, Stepanov V.M., 2015. (in Russian)
	https:// <u>www.twirpx.com/file/197009/</u> 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

Moduledesignation	BIOL 53003 Genetics of cancer and multifactorial diseases
Semester(s)in which the module is taught	3
Person responsible for themodule	AlmiraAkparova
Language	Russian,Kazakh
Relationtocurriculum	Compulsory/elective
Teachingmethods	Lecture(interactive method,communicative method.seminar(casestudy.communicative method)
Workload(incl.contact	Totalworkload:210
hours, self-study hours)	Contacthours:Lectures-30,Seminars- 45StudentsIndividualWork:135
Creditpoints	7ECTS
Required and recommended prerequisites for joining the module	Genetics,Biochemistry; Molecular biology;Human Anatomy
Module objectives/intende d learning outcomes	As a result of studying the module, 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, diabetesmellitus, 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 developmentof its directions, relationship with othersciences; must have the skills: be able to apply molecular genetic methods, conduct statistical analysis of data.
Content	Classification and prevalence of multifactorial diseases. Genetic prediction of polygenic diseases. Geographic structuring of human genetic diversity. Regional clustering of populations by genome- wideSNPsets. Carcinogenesis as a multistage process of accumulation of mutations. Classification of carcinogens. Molecular mechanisms of carcinogenesis. Genetics of common diseases
Exams and assessment formats	Two oral ratings (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.
Technical, multimedia tools and software	https://edu.enu.kz/, https://www.microsoft.com/, https://fen.enu.kz/subpage/material-no-tehnicheskaya-baza-kaf-obg
Readinglist	<ol> <li>HaybaeckJ.MechanismsofMolecularCarcinogenesis//Springer,Cham,S witzerland,2017,302pp.</li> <li>K.I. Baumann, Z. Halata, I. Moll. The Merkel Cell. Structure- Development-Function-Cancerogenesis//Springer-Verlag BerlinHeidelberg,2009.</li> <li>Ruban,E.D.Human Genetics With The Basics Of Medical Genetics: a textbook for students / Eleonora Dmitrievna RubanRostov-on- Don:Phoenix,2015319p.</li> <li>Chernoshei, D.A. Immunology // BSMU. – 2018. – 66 p.<u>http://www.ncbi.nlm.nih.gov/pubmed</u></li> <li><u>https://pubmed.ncbi.nlm.nih.gov/</u></li> </ol>

Moduledesignation	BIOL 53003 Molecular bases of endocrinology
Semester(s) in which the module	3
is taught	
Person responsible for	TamaraUkbayeva
Language	Russian, Kazakh
Relationtocurriculum	Compulsory/elective
Teachingmethods	Lecture(interactive method, communicative method seminar(casestudy communicative method)
Workload(incl.contact	Totalworkload:210
hours.self-study hours)	Contacthours: Lectures-30. Seminars-
	45StudentsIndividualWork: 135
Creditpoints	7ECTS
Required and	Cytology and Histology;Biochemistry;Human Anatomy
recommended	
prerequisites for joining	
Module	As a result of studying the module, the <b>student must know</b> Hormones as
objectives/intend ed learning outcomes	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; <b>should be</b> able to: use knowledge in the field of molecular
	endocrinology to solvepractical problems; find links
	between molecular endocrinology and other biological
	Sciences; must navelneskuis: be able to use molecular genetic methods
	(FCR,DIVASequencing, DNA microarrays) to study various aspects of molecular endocrinology
	DNA microurraysho shady 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 variousclasses 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	The final score, consists of the results of the rating control and the exam,
examination	with 60% being the rating control, 40% - the result of the exam. Students
requirements	must have a final grade of 50% or higher to pass
Technical, multimedia tools	https://edu.enu.kz/, https://www.microsoft.com/,
and software	https://fen.enu.kz/subpage/material-no-tehnicheskaya-baza-kaf-obg
Readinglist	<ol> <li>Gerald Litwack. Hormonal Signaling in Biology and Medicine: Comprehensive Modern Endocrinology // Academic Pr. – 2019 712p.ISBN:0128138149,9780128138144(InEnglish)</li> <li>Shustov S.B. Clinical endocrinology // M: Medical InformationAgency.–</li> </ol>
	2012.–632c.ISBN978-5-9986-0094-4(In Russian).
	3. Zaitsev V.V.Molecular endocrinology: guidelines for
	practicaltraining201433c.(InRussian)
	4. Franklyn F. Bolander, Jr. Molecular Endocrinology, 2004 ISBN:078.0-12-111232-5(InEnglish)
	5 http://www.nchi.ulm.nih.gov/nuhmed
	C. <u>mp.//www.ncol.mm.nm.gov/puomed</u>

Moduledesignation	BIOL 52002 The latest molecular genetics and cellular technologies
Semester(s) in which the module is	3
taught	
Person responsible for the module	AsiyaDukenbaeva
Language	Russian,Kazakh
Relationtocurriculum	Profile/elective
Teachingmethods	Lecture(interactive method,communicative
W. 11. 1/. 1	method, seminar (casestudy, communicative method)
Workload(incl.contact hours, self-	Totalworkload: 150 Content house Loctures 15 Seminant
siuay nours)	Contact nours: Lectures- 15, Seminurs – 30 Students Individual Work: 135
Creditpoints	7ECTS
Required and recommended	Cellhiology Biochemistry
prerequisites for joining the	
module	
Module objectives/intended	As a result of mastering the module, the student must have an idea of
learning outcomes	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 nucleotidesequences 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
Content	Interpret interature data
Content	Genetic engineering of arugs. Keprogramming of numun calls Tachnologias for the therapeutic use of <b>PNA</b> Interformed
	Molecular cloping strategy Types of vector molecules and their
	construction Methods of genetic engineering Genetic engineering of
	hacteria andveast
Exams and assessment formats	two oral rating(20 minutes each)and one final oral exam(40 minutes)
Study and examination	The final score, consists of the results of the rating control and the exam,
requirements	with 60% being the rating control, 40%-the result of the exam.
	Students must have a final grade of 50% or higher to pass
Technical, multimedia tools and	https://edu.enu.kz/, https://www.microsoft.com/,
software	<u>https://www.labster.com/, https://fen.enu.kz/subpage/material-no-</u>
Pagdinglist	<u>Tennicneskava-baza-kaj-obg</u>
Redainglist	I.BONSOVA I. N., CMUVAKOV G. IMEDICAL GENETICS 2NA ea., 18pr Magaowy Yumay Publishing House 2010 150g JSPN:078 5 524 07228 6
	1410500W. 1414441 HOUSHHIG110486-2019-1595ISDIN.9/0-J-554-0/350-0- Flectronictext//FRSVIRAYT_LIRI + https://wait.mu/hook/medicinekaya
	genetika-4345672 Osinoval. A -
	GENETICSIN2Ch, PARTI2nded_ispr and add Texthookforuniversities-
	Moscow: YuraytPublishingHouse-2019-243sISBN:978-5-534-07721-6-
	Electronictext//EBSYURAYT-
	URL:https://urait.ru/book/genetika-v-2-ch-chast-1-434577
	3. Osipova L. AGENETICS. IN 2 h. PART 2 2nd ed., ispr. and
	add. Textbookforuniversities-Moscow: YuraytPublishingHouse-2019-
	251sISBN:978-5-534-07722-3-Electronictext//EBSYURAYT-
	URL:https://urait.ru/book/genetika-v-2-ch-chast-2-437663
	4. Ed. Alferova G. AGENETICS 3rd ed., ispr. and add. Textbook
	foracademicbaccalaureate-Moscow:YuraytPublishingHouse-2019-
	200cISBN:978-5-534-07420-8-Electronictext//EBSYURAYT-
	URL:https://urait.ru/book/genetika-434370
	5. Subbotina, I.N. Molecular Biology And Genetic Engineering: practicum
	/ I. IN. SUDDOUINA, F. A. INIKOIAEVA, O.A. E. KharsekinaKrasnoyarsk: Sib fodor un t 2018 60n ISDN078 5 7628 2057
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Moduledesignation	BIOL 63004 Genomics and proteomics
Semester(s) in which the module is	3
laught Parson responsible for the module	OlgaBulgakova
Language	Russian Kazakh
Relationto curriculum	Profile/plactive
Teachingmethods	Lecture(interactive method, communicative
W. 11. 1/: 1	The head has a second sec
workload(incl.contact nours,seif- study hours)	Totatworktoaa: 150 Contact hours: Lectures- 15,Seminars – 30StudentsIndividualWork:135
Creditpoints	SECTS
Required and recommended prerequisites for joining the module	Molecular biology
Module objectives/intended learning outcomes	In the course of studying the module, the graduate student must know structure l 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; <b>must be able to</b> use methods of genome research intheir 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;Comparativeanalysis of the organization and structure of the genomes of viruses,prokaryotes and eukaryotes and organelles; Comparative analysis of theorganization and structure of the genomes of viruses, prokaryotes andeukaryotes and organelles; Comparative analysis of the organization andstructure of the genomes of viruses, prokaryotes andeukaryotes and organelles; Comparative analysis of the organization andstructure of the genomes of viruses, prokaryotes and eukaryotes andorganelles; Comparative analysis of the organization and structure of the genomes of viruses, prokaryotes 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 itsdynamism. Formation mechanisms dynamism of the proteome. Threelevels of functioning: basic functions of proteins products, physiologicalfunctions 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	The final score, consists of the results of the rating control and the
examination requirements	exam, with 60% being the rating control, 40%-the result of the exam. Studentsmust have a final grade of 50% or higher to pass
Technical, multimedia tools and software	<u>https://edu.enu.kz/, https://www.microsoft.com/,</u> <u>https://www.labster.com/, https://fen.enu.kz/subpage/material-no-</u> tehnicheskaya-baza-kaf-obg

Readinglist	1. EukaryoticGenomicDatabases, Editors: Kollmar, Martin(Ed.), Springer,
	2018,577
	2. GeneExpressionAnalysis,Editors:Raghavachari,Nalini,Garcia-
	Reyero,Natàlia(Eds., Springer, 2018, 378
	3. HandbookofStatisticalGenomics, 4 <sup>th</sup> Edition,Editors:DavidJ.Balding,Id
	aMoltke,JohnMarioni,2019,1224
	4. Genomics and Proteomics: Principles, Technologies, and
	Applications, Edited By Devarajan Thangadurai, Jeyabalan Sangeetha,
	2021, AppleAcademicPress, ISBN9781774635377
	5. <u>https://pubmed.ncbi.nlm.nih.gov/</u>

#### Module designation BIOL 63004 Mutagenesis and reparation Semester(s) in which the module is 3 taught responsible Person for AlmiraAkparova themodule Language Russian,Kazakh Relation to curriculum *Compulsory/elective* **Teachingmethods** *Lecture(interactive method,communicative* method,seminar(casestudy,communicative method) Totalworkload:150 Workload (incl. contact hours, self-Contacthours: Lectures-30, Seminarsstudy hours) 15StudentsIndividualWork:135 Creditpoints 5ECTS Basic molecular and genetic processes, Molecular and cell biology Required and recommended for joining prerequisites themodule *As a result of studying the module, the student must know history of the* Module objectives/intended learning outcomes 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. two oral rating(20 minutes each)and one final oral exam(40 minutes) Exams and assessment formats The final score, consists of the results of the rating control and the exam, Study and examination requirements with 60% being the rating control, 40% - the result of the exam. Students must have a final grade of 50% or higher to pass Technical, multimedia tools and https://edu.enu.kz/. https://www.microsoft.com/. https://fen.enu.kz/subpage/material-no-tehnicheskava-baza-kaf-obg software 1. Haybaeck J.Mechanisms of Molecular Carcinogenesis Readinglist //Springer, Cham, Switzerland, 2017, 302pp. https://www.springer.com/gp/ book/9783319536576 2. AbilevS.K., GlazerV.M.Mutagenesiswiththebasicsofgenotoxicology// Moscow, St. Petersburg: Nestor-History. -2015 .—*304p*. 3. K.I.Baumann, Z.Halata, I.Moll. The Merkel Cell. Structure-Development-Function- Cancerogenesis // Springer-VerlagBerlinHeidelberg, 2009.https://link.springer.com/book/10.1007/978-3-662-10358-6. Ruban, E.D. Human genetics with the basics of medical genetics: a textbook for students /EleonoraDmitrievnaRuban.-Rostov-on-Don: Phoenix, 2015 .-- 319 p. 5. https://pubmed.ncbi.nlm.nih.gov/

Module23	
Module designation	BIOL 63004 Eukaryotic genome
Semester(s) in which the module is taught	3
Person responsible for themodule	OlgaBulgakova
Language	Russian, Kazakh
Relation to curriculum	Profile/elective
Teaching methods	Lecture(interactive method,communicative method seminar(casestudy communicative method)
Workload(incl contact hours self-	Totalworkload 150
study hours)	Contacthours: Lectures-30, Seminars-
<b>·</b> <i>· · ·</i>	15StudentsIndividualWork:135
Creditpoints	5ECTS
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 module, 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, typesof regulatory sequences and features of their functioning, types offrecurring sequences in genomes their role in evolution, types offunctional codes of genomic DNA, advantages and disadvantagesof methods of recognition of functional sites in genomic DNA; <b>must be able to</b> operate knowledge of the structure of genomesof pro- and eukaryotes, find information on the identified scientific problem,evaluate utility and choose information resources containing the data necessary for analysis; <b>must have the</b> <b>skills</b> views on the structure and content of the genomes of organisms,representations of epigenomics and epigenetic mechanisms, theskills of interpreting the results obtained in the context of the tasksset at the initial stages of the study, skills in the analysis andsystematization 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 ofmitochondria 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	twooralrating(20minuteseach)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
Technical, multimedia tools and	https://edu.enu.kz/, https://www.microsoft.com/,
software	https://fen.enu.kz/subpage/material-no-tehnicheskaya-baza-kaf-obg
Readinglist	<ol> <li>Eukaryotic Genomic Databases. Methods and Protocols. Editors: Kollmar, Martin (Ed.), 2018, Springer,ISBN978-1-4939-7737- 6</li> <li>Viswanatha Chaitanya, Kolluru. Genome and Genomics. FromArchaeatoEukaryotes,2019,Springer,ISBN978-981-15-0702-1</li> <li>TheCell,2ndedition,AMolecularApproach,GeoffreyMCooper(Ed),ISB N-10:0-87893-106-6</li> <li>Topics in Current Genetics. Springer.ISSN: 1610-2096</li> <li><u>http://www.ncbi.nlm.nih.gov/pubmed</u></li> </ol>

Moduledesignation	BIOL 52002 Selected chapters of biotechnology
Semester(s)in which the module is taught	3
Person responsible for themodule	AsiyaDukenbaeva
Language	Russian,Kazakh
Relation to curriculum	Profile/elective
Teachingmethods	Lecture(interactive method,communicative method,seminar(casestudy,communicative method)
Workload(incl.contact hours,self- study hours)	Totalworkload:150 Contacthours:Lectures-15,Seminars- 30StudentsIndividualWork:135
Creditpoints	SECTS
Required and recommended prerequisites for joining the module	Genetic engineering, Molecular and cell biology
Module objectives/intended learning outcomes	The purpose of the module: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 inindustrial production, agriculture, healthcare and the environment.Objectives of the course: Stimulating the metabolism of cells toproduce the intended products while suppressing other metabolicreactions. * 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. Technologyof 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
Technical, multimedia tools and software	https://edu.enu.kz/, https://www.microsoft.com/, https://fen.enu.kz/subpage/material-no-tehnicheskaya-baza-kaf-obg
Readinglist	<ol> <li>Fundamentals of Biotechnology Authors: Almagambetov, K. H.Fundamentalsofbiotechnology:laboratoryworkonthesubjectofAnimalB iotechnology/ZhumabaevaB.A.Readingtool- Almaty:Kazakhuniversity,2015176pages</li> <li>Biryukov, V. V. Onerkasiptik biotechnologiya negizderi / V. V.Biryukov M.: KolosS, 2004 296 b ISBN 5-9532-0231- 8("KolosS");ISBN5-98109-008-1("chemistry"ANO»)</li> <li>Blinov,v.A.Zhalpybiotechnologiya:daristerkursy.2bolikte.1- Bolim/V.A.BlinovSaratov,2003.</li> <li>Biotechnologiyanegizderi/N.P.ElinovSt.Petersburg:Gylym,1995 ISBN 5-02-026027-4</li> <li>Microbiology,microbiology,virology,Microbiologyzhanevirology-St. Petersburg: GIORD, 2009 368 b ISBN 978-5-98879-075-4</li> </ol>

#### Moduledesignation BIOL 52002 Structure and organization of the genome Semester(s) in which the module is 3 taught responsible OlgaBulgakova Person for themodule Language Russian,Kazakh Relation to curriculum *Profile/elective* **Teachingmethods** *Lecture(interactive method,communicative* method,seminar(casestudy,communicative method) Totalworkload:150 Workload(incl.contact hours, self-Contacthours: Lectures-15, Seminarsstudy hours) 30StudentsIndividualWork:135 Creditpoints 5ECTS *Genetic engineering, Molecular and cell biology* Required and recommended prerequisites for joining themodule As a result of studying the module, **the graduate student mustknow:**the Module objectives/intended learning outcomes peculiarities of the structural organization of the genomesof various organisms (pro- and eukaryotes, viruses); features of the functioning of genomes, i.e. molecular mechanisms of the main genetic processes that provide heredity andvariability 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 methodological for entire base thestudyof genomes; independently determine goals and set research tasks; must have the skillsindependent development of the design of the experiment for theanalysis 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 OFeukaryotes. Structure and organization of genomes of microorganisms. 3-Dgenomics. Spatial organization of the eukaryotic genome. Histoneproteins 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. of genomes.Epigenome.Genome Evolution research methods. Fundamentals of functional genomics. two oral rating(20 minutes each)and one final oral exam(40 minutes) Exams and assessment formats The final score, consists of the results of the rating control and the exam, Study and examination with 60% being the rating control, 40% - the result of theexam. Students requirements must have a final grade of 50% or higher to pass Technical, multimedia tools and https://edu.enu.kz/, https://www.microsoft.com/, https://fen.enu.kz/subpage/material-no-tehnicheskaya-baza-kaf-obg software 1. Dan Graur. Molecular and Genome Evolution . 2016 ISBN-13:978-Readinglist 1605354699 2. Dhavendra Stvlianos Kumar. Antonarakis. Medical and HealthGenomics1stEdition.KindleEdition.ISBN-13:978-0124201965 3. Christophe Lambert Darrol Baker George P. Patrinos. HumanGenome Informatics: Translating Genes into Health (TranslationalandAppliedGenomics)1stEdition,KindleISBN-13:978-0128094143 4. Lori A.S. Snyder. Bacterial Genetics and Genomics.

2020ISBN:9780815345695

http://www.ncbi.nlm.nih.gov/pubmed

5.

Moduledesignation	EDUC 62008 Teaching internship
Semester(s) in which the module is	3
taught	
Person responsible for themodule	NurmukhambetovaGaziza
Language	Russian, Kazakh
Relation to curriculum	Basic/University
Teachingmethods	-
Workload(incl.contact hours,self- study hours)	120
Creditpoints	4ECTS
Required and recommended prerequisites for joining the module	Pedagogy of higher education, Molecular and cell biology, Psychology of management
Module objectives/intended learning outcomes	To know content of biological education, development and analysis of the curriculum, work program in the subjects of thebiological cycle, methods, means and forms of theoretical andpractical studies in biology; be able to conduct training sessions with students in biological modules, 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 modules 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	fulfillment of an individual task keeping a diarv on
requirements	practice, characteristics from the head of the practice base
Technical, multimedia tools and	https://edu.enu.kz/, https://www.microsoft.com/,
software	https://fen.enu.kz/subpage/material-no-tehnicheskaya-baza-kaf-obg
Readinglist	<ol> <li>Active and interactive educational technologies(forms of conducting classes)in higher school:textbook/comp.T.G.Mukhina N.Novgorod:NNGASU,201397p.(inRussian)</li> <li>BabaevS.B.Tulgalykpedagogy.Fundamentalsofpedagogicaltheory: training manual Almaty: Nurpress, 2013336 pages. (InKazakh)</li> <li>Biribekova F. B., Zhanatbekova N. zh. modern pedagogicaltechnologies technologies: textbook Almaty: higher educationalinstitutions of the Republic of Kazakhstan Association, 2014. -360pages.(InKazakh)</li> </ol>

Moduledesignation	EDUC 62009 Research practice
Semester(s) in which the module is	4
taught	
Person responsible for	AigulDinmukhamedova
themodule	
Language	Russian, Kazakh
Relation to curriculum	Profile/University
Togohiyomothoda	
Teachingmeinoas	- 260
study hours)	500
Creditnoints	12ECTS
Required and recommended	Basic molecular and genetic processes Conservation of hiological
prerequisites for joining the module	diversity, Molecular and cell biology,
Module objectives/intended learning outcomes	Purpose of research practice systematization, expansion and consolidation of professional knowledge, the formation of undergraduate students' skillsin conducting independent scientific work, research and experimentation. As a result of the internship, the undergraduate must knowthe 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 andscientific activities, predict their results, design and carry outtheir 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 education al technologies, searching for information and creative solutions.
Content	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.
Exams and assessment formats	Defense of practicereport
Study and examination	fulfillment of an individual task, keeping a diary on
requirements	practice, characteristics from the head of the practice base
Technical, multimedia tools and	https://edu.enu.kz/, https://www.microsoft.com/,
software	<u>https://jen.enu.kz/subpage/material-no-tehnicheskaya-baza-kaf-obg</u>
Keadingiist	<ul> <li>AnareevG.I. Fundamentals of scientific work and registration of the results of scientific activity / G.I. Andreev, S. A. Smirnov, V. A. TikhomirovM.: Financeandstatistics, 2003, 272p. (inRussian)</li> <li>KarnaukhovaV.K., SotserdotovaG.V.Scientific research methods Irkutsk: RIOISU.2002 (inRussian)</li> <li>http://www.kazneb.kz/-ScientificElectronicLibraryofKazakhstan</li> <li><u>http://www.ncbi.nlm.nih.gov/pubmed</u></li> <li><u>https://www.scopus.com/search/form.uri?display=basic#basic</u></li> </ul>

Moduledesignation	EDUC 53001Scientific-research work of graduate students
Semester(s)in which the module is taught	1,2,3,4
Person responsible for themodule	AigulDinmukhamedova
Language	Russian,Kazakh
Relation to curriculum	-
Teachingmethods	-
Workload(incl.contact hours,self- study hours)	720
Creditpoints	24 ECTS
Required and recommended prerequisites for joining the module	Cellbiology
Module objectives/intended learning outcomes	The goal is to prepare the undergraduate for independent research work (the end result of which is the defense of a dissertation). As a result of the research work, the undergraduate must know the research issues, the history of the development of the particular problem being studied, its role and place in the research direction; have specific knowledge on the problem under study; be able to carry out scientific and experimental work in a particular area of biology; be able to work with specific equipment, devices, Internet resources, databases; possess the skills of public presentation of the results of the study, search for the necessary information
Content	Fulfillment of tasks in accordance with the approved individual work plan of the undergraduate. Implementation of research on an actual biological problem within the framework of a master's thesis. Preparation of publications (reports, abstracts, articles) and presentations at national and international conferences. Preparation and defense of a master's thesis.
Exams and assessment formats	report
Study and examination requirements	implementation of an individual work plan
Technical, multimedia tools and	https://edu.enu.kz/, https://www.microsoft.com/,
software	https://fen.enu.kz/subpage/material-no-tehnicheskaya-baza-kaf-obg
Readinglist	https://enu.kz/downloads/noyabr-2021/polozhenie-o-magistrature- 2021.pdf https://enu.kz/downloads/materials/ktpo.pdf https://enu.kz/downloads/may/pr%20enu%2018- 17%20pravila%20oformleniya%20magisterskoi%20dissertatsii%20proek ta.pdf Law of the Republic of Kazakhstan "On Science https://adilet.zan.kz/rus/docs/Z1100000407 "On state support for industrial and innovative activities" https://adilet.zan.kz/rus/docs/P1100001007 Patenting of inventions and utility models

Moduledesignation	MFA 62010Module of final assessment
Semester(s) in which the module is	4
taught	
Person responsible for	RakhmetkazhyBersimbay
themodule	
Language	Russian,Kazakh
Relationtocurriculum	-
Teachingmethods	-
Workload(incl.contact hours, self-	360
study hours)	
Creditpoints	12 ECTS

Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	The purpose of the final attestation of a master's student is to assess the learning outcomes and key competencies achieved upon completion of the study of the master's educational program
Content	Defense of a master's thesis is carried out in the presence of: - positive feedback from the supervisor;
	<ul> <li>a reast one publication on the topic of the dissertation in scientific journals or speech at an international or republican scientific conference;</li> <li>extracts from the minutes of the meeting of the graduating department on the recommendation for defense;</li> </ul>
	<ul> <li>an opponent's review containing a comprehensive description of the dissertation work and a reasoned conclusion on the possibility of awarding an academic master's degree.</li> </ul>
Exams and assessment formats	Master's thesis defense
Study and examination requirements	Students who have completed the educational process in accordance with the requirements of the educational program, the working curriculum, as well as those who have passed the preliminary defense (extended session) based on the results of the dissertation research, are allowed to the final certification.
Technical, multimedia tools and software	https://edu.enu.kz/, https://www.microsoft.com/, https://fen.enu.kz/subpage/material-no-tehnicheskaya-baza-kaf-obg
Readinglist	https://enu.kz/downloads/noyabr-2021/polozhenie-o-magistrature- 2021.pdf https://enu.kz/downloads/materials/ktpo.pdf https://enu.kz/downloads/may/pr%20enu%2018- 17%20pravila%20oformleniya%20magisterskoi%20dissertatsii%20proekt a.pdf https://adilet.zan.kz/rus/docs/

Reviewed at a meeting of the Department of General Biology and Genomics. Date  $\underline{14.04}$  20.22 Record No  $\underline{9}$ 

Head of Department \_\_\_\_\_\_ Bersimbay R.I. \_\_\_\_\_\_ 14.04.22 (signature) (full name) (date)