Modular Handbook Form

Module name:	**M1 History and philosophy of science**
Module level as required:	Master's program
Abbreviation as required:	H&PS
Subtitle as required:	
Lesson type as required:	Lecture, seminar
Training semester:	1 semester
Person responsible for the module:	Suleimenov T.A.
Teacher:	Candidate of Philosophical Sciences, Associate professor
Language:	Russian, Kazakh
Connection with curriculum:	Base discipline, compulsory component
Form of teaching / weekly training load in a semester:	Full time / Lectures – 1h., seminars – 1h., current MSIW – 3h., MSIWT – 0.5h., Total labor coefficient – 5.5 hours
Training load:	Lectures – 15h., seminars – 15h., current MSIW – 45h., intermediate MSIW – 7.5h., MSIWT – 7.5h., Total labor coefficient – 90 hours
Credit points:	3 ECTS
Prior knowledge for compliance with the examination requirements:	Rating according to the results of intermediate and midterm control – not lower 25 points
Recommended prior knowledge:	Compulsory modules of Bachelor's program: Philosophy, Modern history of Kazakhstan
Module objectives / planned learning outcomes:	After completion of the course, master students should be able to: - recognize forms and methods of pre-scientific, scientific and extra-scientific cognition, as well as modern methods of cognition; - choose ways of solving problems arising in the course of research activities and requiring in-depth professional knowledge; - discuss collegial choice of necessary research methods in practical lessons, with critical analysis and understanding of the modern theory and practice realties based on the methodology of natural science knowledge; - put in order and comprehensively examine the features of the classification of sciences in the modern world; - submit a creative scientific report on the search for features of the study of knowledge about science.
Content:	**Lectures:** History and philosophy of natural and technical sciences. New European science. Science in culture and civilization, emergence of science, its historical dynamics, structure of scientific knowledge, philosophical problems of specific sciences. Communicative technologies of the XXI century and their role in the modern science. Philosophical problems of the modern global civilization development. Modern current methodical, methodological and philosophical problems of natural and social sciences and humanities, as well as special branches of scientific knowledge in accordance with specialization of master students. **Seminars:** The subject of history and philosophy of science. Worldview basics of science. Functions of philosophy of science. Emergence and formation of science. New European science. Main concepts and directions of non-classical and post-non-classical stage of science development. Structural levels of scientific knowledge. Science as a profession. Philosophical basics of science and scientific

	picture of the world. Scientific traditions and scientific revolutions. History and philosophy of natural and technical sciences. History and philosophy of social sciences and humanities. Philosophical problems of development of modern global civilization.
Learning / examination outcomes / control forms:	Current control: reports on individual studies of modern methods of pre-scientific, scientific and extra-scientific knowledge with a collective discussion; collective reports and discussions on practical studies of the modern theory and practice realities based on the methodology of natural science knowledge; presentations of scientific reports on the search for features of studying knowledge about science, glossaries, annotations, oral surveys. Final control: exam
Technical teaching aids:	Handouts, interactive board, modern computers
Literature:	1. Kokhanovsky V.P. Basic philosophy of science. M. Phoenix. 2010. 2. History and philosophy of science. Under the editorship of Kryanev Yu.V., Motorina L.Ye. M.: Infra-M, 2011. 3. Lipkina A.I. Philosophy of science. – Moscow. 2009. 4. Myrzaly S.K. History and philosophy of science. – Almaty, 2014. (In Kazakh). 5. Martynov M.I., Kravchenko L.G. Philosophy: intensive training course. – Minsk: TetraSystems, 2012. – 304 p.

Module name:	**M2 Foreign language (professional)**
module level as needed:	Master'sprogramme
reduction as needed:	FL
subtitle as needed:	
type of employment as needed:	Seminars
semester:	1 semester
the responsible person for the module:	"Foreign languages for technical specialties" Department
lecturer :	Makulbek Azamat Bolatbekovich - Senior lecturer
language:	English
relation with curriculum:	Basic discipline, a required component
form of training / weekly academic load in a semester:	Full time / seminars – 2h., current MSIW – 3h., MSIWT – 0.5h., Total labor coefficient – 5.5 hours
study load:	seminars – 30h., current MSIW – 45h., intermediate MSIW – 7.5h., MSIWT – 7.5h., Total labor coefficient – 90 hours
credit scores:	3 ECTS
prerequisites for accordance with the examination requirements:	Rating according to the results of intermediate and midterm control not lower than 25 points
recommended prerequisites:	Required undergraduate modules: Foreign language 1, 2, Profession-oriented foreign language
Module Objectives / expected results of study:	After completion of the module, master's studentsshould be able to: - perceive and understand public speaking (lectures, presentations, television and Internet programs). - free to read, translate the original literature in the specialty with subsequent analysis, - to participate in professional discussions, scientific debates, round table discussions; - to present a presentation of a scientific research, an article on a specialty in a foreign language;

	- work with lexicographic sources in a foreign language.
content:	The study of the subject area of the specialty in a foreign language corresponding to the level B2, C1. Reading. Improving reading skills: mastering the main types of reading (introductory, learning, viewing, searching) of foreign original sources with varying degrees of content coverage. Formation of the ability to isolate the reference semantic blocks in the material, to determine the logical links between them, to critically interpret and analyze fragments of text depending on the specific characteristics and target setting. Writing. Development of skills for the preparation of written communications on scientific topics in the specialty: scientific report, abstracts on the topic of scientific research, poster report, reviewing of original sources in a foreign language, annotation of a scientific text, summary. The basic principles of business writing, the design of written documentation for international scientific cooperation. Listening. Listening to authentic professional-oriented materials with speech of foreign language speakers in audio and video recordings. Understanding the general content of authentic records. Listening to lectures, messages containing professional information. Speaking. Development of skills of oral communication in the specialty in monological form: presentation with a scientific report, communication, presentation of scientific research. Development of skills of professional oral communication in the form of dialogue / polylogue: scientific discussion, scientific debate, debate, round table discussions, the use of situational games (case study).
study / examination results forms of control:	Current control: written work on the translation of technical texts, the presentation of technical texts on specialization, tests, role exchange, oral surveys. Final Control – Exam
technical training tools:	Handouts, interactive whiteboard, modern computers
literature:	1. Harrison R., S.Philot, L. Curnick. New Headway Academic skills. Reading, Writing, and Study Skills. Oxford University Press, 2013. 2. Technical English. - Oxford University Press, 2013. 3. Stepanova T.A. English for technical specialties. - Practical course. St. Petersburg, 2006. 4. English grammar in use. Raymond Murphy. –Cambridge-University-press, 2006. 5. May P. IELTS. Practice Tests. Oxford University Press, 2013.

Module name:	**M3Psychology of management**
module level as needed:	Master'sprogramme
reduction as needed:	
subtitle as needed:	
type of employment as needed:	Lecture, seminars (practical work)
semester:	1 semester
the responsible person for the module:	"General psychology"Department
lecturer :	Shalharbekova N.A. - PhD
language:	Russian, Kazakh
relation with curriculum:	Required component
form of training / weekly academic load in a semester:	Full time / Lectures – 1h., seminars – 1h., current MSIW – 3h., MSIWT – 0.5h., Total labor coefficient – 5.5 hours
study load:	Lectures – 15h., seminars – 15h., current MSIW – 45h.,

	intermediate MSIW – 7.5h., MSIWT – 7.5h., Total labor coefficient – 90 hours
credit scores:	3 ECTS-credits
prerequisites for accordance with the examination requirements:	Rating according to the results of intermediate and midterm control not lower than 25 points
recommended prerequisites:	Modules of bachelor's programme: Philosophy, Actual problems and modernization of public consciousness
Module Objectives / expected results of study:	After completion of the module, Master's students should be able to: - to show sociability and socio-psychological competence in professional activities; - possess the skills of mental self-regulation; - to conduct a methodological analysis of the problem of personality psychology; - to set and solve psychological problems associated with developmental and correctional processes in accordance with the requirements of science and practice; - show positive thinking and initiative in solving actual pedagogical and research tasks; - to work in a team, to offer new motivational solutions to psychological problems related to professional activities.
content:	Lectures: Basic approaches and principles of modern psychological science, necessary in the professional activities of highly qualified specialists. Formation of the scientific-theoretical worldview on the fundamental psychological concepts, the development of ideas about psychological science, revealing the content of the discipline. Formation of skills and abilities of psychological researches of a personality, acquaintance with the main methods of experimental psychological research and the main directions of psycho-correction work; practical skills, ability to apply, interpret and draw conclusions based on the results obtained. Practical works: Psychology as a modern science. The main methods of psychological research. Introduction to the psychology of personality. The main theories of personality. Personality and culture, temperament. Character, abilities, emotions. Activity and its main characteristics. Sensation and perception. Attention and memory. Imagination, thinking, speech. The verge of communication: the exchange of information, interaction. Psychological features of people's perception and understanding of each other.
study / examination results forms of control:	Current control: protection of written research reports, presentations. Final control-exam
technical training tools:	Handouts, interactive whiteboard, modern computers
literature:	1. Gippenreiter Y.B. Introduction to General Psychology. -M.: CheRO, 2013.-195p. 2. Krylov A.A. Psychology. -M: Prospect, 2014.-230 p. 3. Nemov R.S. Psychology.-M: Enlightenment, 2014, V.1. – 250 p. 4. Zhonisbekova Zh.A., Koyshybaeva N.I. A study guide for masters of all specialties in the discipline "Psychology", Shymkent: SKSU, 2016.-180p. 5.Lawton Jean-Marc. Aqa A-Level Psychology: Revision MadeEasy .-Hodder Education, 2017. - 256 p.

Module name:	**M4 Higher School Pedagogy**

Module level as required:	Master's program
Abbreviation as required:	
Subtitle as required:	
Lesson type as required:	Lectures, seminars
Training semester:	1 semester
Person responsible for the module:	Almetov N.S.
Teacher:	D.P. n., professor
Language:	Russian, Kazakh
Connection with curriculum:	Basic discipline, a required component
Form of teaching / weekly training load in a semester:	Full time / Lectures – 1h., seminars – 1h., current MSIW – 3h., MSIWT – 0.5h., Total labor coefficient – 5.5 hours
Training load:	Lectures – 15h., seminars – 15h., current MSIW – 45h., intermediate MSIW – 7.5h., MSIWT – 7.5h., Total labor coefficient – 90 hours
Credit points:	3 ECTS
Prior knowledge for compliance with the examination requirements:	Rating according to the results of intermediate and midterm control – not lower 25 points
Recommended prior knowledge:	Undergraduate Modules: Philosophy, Pedagogical Practice
Module objectives / planned learning outcomes:	After undergraduates have completed the course, they should be able to: - to discuss the problems of conducting research in higher education and foresee new needs and requirements of education; - strive for the need for continuous professional development; - analyze pedagogical situations and give them a justification; - apply effective university education technologies; - criticize the existing methods of the pedagogical process; - organize lectures and practical classes on specialization among students with the adjustment of the program for a specific educational context.
Content:	Lectures: Modern higher education paradigms. The system of higher vocational education in Kazakhstan. Methodology of pedagogical science. Methodological apparatus of pedagogical research. Professional competence of a high school teacher. The organization of the learning process based on the credit system of education in higher education. Methods and forms of training in the preparation of future professionals. New educational technology in higher education. The activities of the advisor, tutor and office registrar at the university. Technology of compiling teaching materials. Higher school as a social institution of education and the formation of the personality of a specialist. The essence and the main directions of educational work at the university. Seminar classes: Methodological foundations of higher education pedagogy. The teacher and high school student is a creatively self-developing personality. Priority strategies and trends in the development of higher education, pedagogical regularities, principles and methods. Forms of organization of studies in high school. The essence and priority strategies of education of students, pedagogical innovation and pedagogical monitoring. The organization of the educational process of higher education. The concept of research,

	intellectual, innovative universities.
Learning / examination outcomes / control forms:	Current control: carried out using systematic and systematic observation of the work of the group as a whole and each undergraduate individually, testing knowledge and skills acquired by undergraduates in the course of studying a new material, its repetition, consolidation and practical application. - protection in writing of materials in order to test theoretical knowledge and skills, apply them to solve specific problems, problems, determine the degree of written language, the ability to logically, adequately build a problem, compose your text and present it, evaluate the work, experiment, problem ; - discussions with professional teachers, written surveys. Final control exam
Technical teaching aids:	Handouts, interactive whiteboard, modern computer
Literature:	1. Akhmetova G.K., Isaeva Z.A. Pedagogy: a textbook for graduate universities. - Almaty: Kazakh University, 2012.-328 p. 2. Shalgynbaeva Қ.K. Pedagogy. - Astana: publishing house of ENU named after Gumilyov, 2016. (in Kazakh) 3. Tileuova S.S. Higher school pedagogy. - Shymkent, 2013. (in Kazakh). 4. Mynbayeva A.K., Sadvakasova Z.M. Innovative teaching methods or how interesting to teach.-Almaty.2010. -174s 5. Crawley E.F., Malmqvist J., Östlund S., Brodeur D.R., Edström K. Rethinking Engineering Education: The CDIO Approach .- 2nd Edition. — Springer, 2014. — 319 p.

Module name:	**M 5 Methods of teaching specialty discipline**
Module level as required:	Master's program
Abbreviation as required:	MTSD
Subtitle as required:	
Lesson type as required:	Lectures, seminars
Training semester:	1 semester
Person responsible for the module:	Abildayeva R.
Teacher:	k.b. n., associate professor
Language:	Russian, Kazakh
Connection with curriculum:	Basic discipline, component of choice
Form of teaching / weekly training load in a semester:	Full time / Lectures -2 hours; practical classes -2 hours; current MSIW – 3,66h., MSIWT – 1.5h., Total labor coefficient – 9.16 hours
Training load:	Lectures – 30h., practical classes – 30h., current MSIW – 55h., intermediate MSIW – 12.5h., MSIWT – 22.5h., Total labor coefficient – 150 hours
Credit points:	5 ECTS
Prior knowledge for compliance with the examination requirements:	Rating according to the results of intermediate and midterm control – not lower 25 points
Recommended prior knowledge:	Undergraduate modules: Philosophy, Pedagogical practice
Module objectives / planned learning outcomes:	Once undergraduates have completed the study of this course, they should be able to:

	- develop syllabus and working curriculum of the discipline; - make notes of lectures, methodical instructions to performance of laboratory works and practical classes; - to make an educational and methodical complex of the bachelor's discipline and to make the results of their research in the content of lectures, laboratory and practical classes; - to organize the teaching of specialized disciplines specialty "Biotechnology»; - to apply various pedagogical technologies in the educational process.
Content:	**Lectures:** Implementation of the competence approach in education. Bologna process. Credit system of education. Technology of individual training. Technologies of natural learning, integrated learning, block learning, paracentric learning. Multimedia learning technology. Teaching specialized disciplines by analyzing and solving problem situations and cases. Solving problems drafting a group project or conducting a role-playing game. Methods of improving knowledge. Organizational forms of training. Organization, planning of educational process in higher school. Structure of classes. Organization of creative work of students. The main methodological features of the study of specialized disciplines specialty "Biotechnology". The main objectives of the training course. Course content and structure. The principles and rationale for the selection of the material. Development and updating of educational and methodical documentation, implementation of the results of research work in the educational process. **Practical class:** Study of the structure of educational activities of SKSU. M. Auezova. Study of normative documents of higher school in the field of planning and organization of educational process. Analysis of the main provisions of the state educational standards and curriculum structure. The study of methods, forms and technologies of teaching University students. Application of various pedagogical technologies in the educational process of a technical University. Syllabuses and working programs of the disciplines of teaching materials. Preparation of standard working curricula, individual curricula. Analysis and organization of interdisciplinary connections of disciplines of the curriculum.
Learning / examination outcomes / control forms:	Current control: delivery of independent works of the undergraduate in the form of abstracts, presentations, cases. Final control – exam
Technical teaching aids:	Handouts, normative documents, posters, slides on the topic, videos, presentations.
Literature:	1. Isaeva Z. A. and others. Active forms and methods of education at the University. –Almaty, 2015. 2. Pionowa R. S. Pedagogy of higher education.-Minsk: the highest school, 2015. [In Byelorussia] 3.Mynbayeva A. K.,Sadvakasova Z. M. Innovative teaching methods or how interesting it is to teach.-Almaty.2010. -174 p. 4. Drescher Yu. N. Andragogy, Modern technologies in the preparation and conduct of the educational process, 2017. [In Russian] 5. Information technology in teacher education: the Textbook.-Moscow: Publishing Corporation "Dashkov and K°",2016.-304 p.[In Russian]

Module name:	**M6.1 Modern methods in biotechnology**
Module level as required:	Master’s program
Abbreviation as required:	MMB
Subtitle as required:	

Lesson type as required:	Lectures, , laboratory classes
Training semester:	*1 semester*
Person responsible for the module:	Rysbayeva G.A.
Teacher:	k.b. n., associate professor
Language:	Russian, Kazakh
Connection with curriculum:	Profile discipline, a required component
Form of teaching / weekly training load in a semester:	Intramural / Lectures -2 hours; laboratory classes -2 hours; current MSIW – 3,66h., MSIWT – 1.5h., Total labor coefficient – 9.16 hours
Training load:	Lectures – 30h., laboratory classes – 30h., current MSIW – 55h., intermediate MSIW – 12.5h., MSIWT – 22.5h., Total labor coefficient – 150 hours
Credit points:	5 ECTS credits
Prior knowledge for compliance with the examination requirements:	Rating according to the results of intermediate and midterm control – not lower 25 points
Recommended prior knowledge:	Undergraduate Modules: Fundamentals of Biotechnology, Industrial Biotechnology, Biotechnology Objects
Module objectives / planned learning outcomes:	After undergraduates have completed the course, they should be able to: - apply chemical, physical and genetic engineering methods used in biotechnology; - independently carry out the isolation, purification and analysis of proteins; - to carry out manipulations with DNA extraction from plant and bacterial cells; - independently evaluate the effectiveness of nutrient media of different hormonal and mineral composition when cultivating isolated plant tissues; - to obtain regenerated plants by direct organogenesis.
Content:	**Lectures:** Biotechnology, as an interdisciplinary branch of science. Methods for studying membrane structures in biotechnology. Chemical methods used in biotechnology. Physical methods used in biotechnology. Methods of proteomic analysis. Methods for the isolation and analysis of nucleic acids. Methods of genetic engineering in biotechnology. Applied aspects of genetic engineering technology. Immunological research methods. Immunobiotechnology. Stem cell biotechnology. Cloning technology at the molecular level. Cloning technologies at the cellular and organism level. **Laboratory classes.** Isolation and analysis of DNA from bacterial cells. Methods for introducing foreign DNA into yeast and E. coli cells. Conduct PCR qualitative and quantitative. Methods for determining the bioluminescent activity of various proteins and carrying out solid-phase immunoassay. The method of genomic fingerprinting (DNA typing) and its application. Comparison of the effectiveness of nutrient media of different hormonal and mineral composition during the cultivation of isolated plant tissues. Obtaining regenerated plants by direct organogenesis.
Learning / examination outcomes / control forms:	Current control: carried out using systematic and systematic observation of the work of the group as a whole and each undergraduate individually, testing knowledge and skills acquired by

	undergraduates in the course of studying a new material, its repetition, consolidation and practical application. - protection in writing of materials in order to test theoretical knowledge and skills, apply them to solve specific problems, problems, determine the degree of written language, the ability to logically, adequately build a problem, compose your text and present it, evaluate the work, experiment, problem ; - discussions with professional teachers, written surveys. Final control exam
Technical teaching aids:	Handouts, interactive whiteboard, modern computer
Literature:	1. Zagoskina N.V. Biotechnology: theory and practice. - M .: Onyx, 2009. - 496 p. 2. Myrzakozha D., Mirzakhodzhaev A. Modern methods of research. Almaty, 2012, 403 p. 3. Turasheva S.K. Fundamentals of biotechnology: biotechnology of higher and lower plants. Textbook. Almaty: Kazakh University, 2016. - 402 p. ISBN 978-601-04-1876-11. 4. Genetic bases of plant breeding. 4 tons. Biotechnology plant breeding. Cellular engineering. / Scientific. ed. A.V. Kilchevsky, L.V. Khotyleva. Minsk: Belarus. Navuka, 2012, 489 p. 5. Bioanalytics: Analytical Methods and Concepts in Biochemistry and Molecular Biology; Wiley; 1 edition (May 29, 2018) – by by Friedrich Lottspeich (Editor), Joachim W. Engels (Editor). – 1134 p. ISBN-10: 9783527339198

Module name:	**M 6.2 Photobiological processes and bioenergy**
Module level as required:	Master's program
Abbreviation as required:	PPB
Subtitle as required:	
Lesson type as required:	Lectures, laboratory classes
Training semester:	1 semester
Person responsible for the module:	Kedelbaev B. Sh.
Teacher:	Doctor of technical Sciences, Professor
Language:	Russian, Kazakh
Connection with curriculum:	Profile discipline, component of choice
Form of teaching / weekly training load in a semester:	Intramural / Lectures -2 hours; laboratory classes -2 hours; current MSIW – 3,66h., MSIWT – 1.5h., Total labor coefficient – 9.16 hours
Training load:	Lectures – 30h., laboratory classes – 30h., current MSIW – 55h., intermediate MSIW – 12.5h., MSIWT – 22.5h., Total labor coefficient – 150 hours
Credit points:	5 ECTS
Prior knowledge for compliance with the examination requirements:	Rating according to the results of intermediate and midterm control – not lower 25 points
Recommended prior knowledge:	Undergraduate modules: Fundamentals of biotechnology, Industrial biotechnology, General and molecular genetics.
Module objectives / planned learning outcomes:	Once undergraduates have completed the study of this course, they should be able to: - to increase the productivity of photosynthesis of various plants using the mechanisms of photobiological processes;

	- to use the laws and mechanisms of action of light on biological systems of varying complexity and organization; - apply methods of qualitative and quantitative analysis to determine the functional purpose of energy supply processes in Biosystems; - to use the principles of bioenergy to solve modern problems of plant physiology, human and animal physiology, biotechnology, medicine, sports; - to formulate thermodynamic aspects of photosynthesis.
Content:	**Lectures:** Light absorption in biological systems. Luminescence in biological systems. Primary and initial stages of photo-transformations of biologically significant molecules. The sensitized mechanism of photobiological processes. Biological basis of photobiological processes important for photomedicine.Energy conversion in a living cell. The main ways of using energy in living organisms. Integration and regulation of energy exchange. Evolution of energy systems. **Laboratory classes:** Method of pulse photolysis and kinetic spectrophotometry in studies of fast photoprivate visual pigments. The use of chemiluminescent methods in biology and medicine. Photosynthetic ability of plants. Thermodynamic aspects of photosynthesis. Principles of bioenergy for solving modern problems of plant physiology, human and animal physiology, biotechnology, medicine.
Learning / examination outcomes / control forms:	Current control: is carried out through systematic and systematic observation of the work of the group as a whole and each undergraduate individually, testing of knowledge, skills acquired by undergraduates in the study of new material, its repetition, consolidation and practical application. - protection of written materials for the purpose of verification of theoretical knowledge and skills, applying them to specific tasks, problems, determining degrees of proficiency in the written language, the ability to logically adequate to the problem to build, to compose your text and outline it, to assess the work, experiment, problem; - discussions with professional teachers, written surveys. Final control –exam
Technical teaching aids:	Handouts, normative documents, posters, slides, videos, presentations.
Literature:	1. Artyukhov V. G. Biophysics: textbook for universities / Artyukhov V. G. – Ekaterinburg: Academic Project, Business book, 2015. – 295 p. ISBN 978-5-8291-1081-9 [In Russian] 2. Uzdensky A. B. Bioenergetic processes: textbook/ A. B. uzdensky. – Rostov-on-don: publishing House of southern Federal University (SFU), 2011. – 174 p. – ISBN 978-5-9275-0829-7[In Russian] 3. Atlas of physiology. In two volumes. Volume 1: study guide / Kamkin A. G., Kiseleva I. S. - M. : GEOTAR-Media, 2013. [In Russian] 4. Cherenkevich, S. N. Biological membranes: manual for students of higher educational institutions of physical, biological, biochemical, biotechnological specialties [text] / SN. Cherenkevich, G. G. Martinovich, A. I. Khmelnitsky.-Minsk: BSU, 2009.-183 p. [In Russian] 5. Principles of Bioenergetics, Springer; 2013 edition (December 15, 2012) - by Vladimir P. Skulachev (Author), Alexander V. Bogachev (Author), Felix O. Kasparinsky (Author). – 436 p. ISBN-10: 9783642334290[In English]

Module name:	**M 7.1 Problems of Environmental Pollution in Agro-industrial Complex**
Module level as required:	Magistracy
Abbreviation as required:	PZOSvAK

Subtitle as required:	
Lesson type as required:	Lectures, laboratory, practical
Training semester:	1 semester
Person responsible for the module:	Aymenova J.
Teacher:	PhD, senior lecturer
Language:	Russian, Kazakh
Connection with curriculum:	Core discipline, elective component
Form of teaching / weekly training load in a semester:	Intramural / Lectures -2 hours; laboratory classes -2 hours; practical classes – 1h, current, MSIW – 4h., MSIWT – 2 h., Total labor coefficient – 11 hours
Training load:	Lectures – 30h., laboratory classes – 30h., classes – 15 h, current MSIW – 60h., intermediate MSIW – 15h., MSIWT – 30h., Total labor coefficient – 180 hours
Credit points:	6 ECTS-credits
Prior knowledge for compliance with the examination requirements:	Rating according to the results of intermediate and midterm control – not lower 25 points
Recommended prior knowledge:	Undergraduate modules: Fundamentals of biotechnology, Industrial biotechnology, Ecology and basics of life safety, the Creation of low-waste technologies in the agro-industrial complex
Module objectives / planned learning outcomes:	Once undergraduates have completed the study of this course, they should be able to: - to develop effective means of pollution control of various environmental objects; - know the methods of waste regeneration and their transformation into raw materials for subsequent stages of production; -to be able to solve the problems of environmental protection and environmental management through the use of biological agents and biological processes - to make an assessment of the prevented ecological damage for the biotechnological enterprises, water resources, atmospheric air, land resources, an economic assessment of introduction of resource-saving technology; - possess the skills of analysis, short-term and long-term forecasting of environmental and economic effects, the result of the introduction of resource-saving technologies; - to carry out production and environmental monitoring.
Content:	Problems of environmental pollution in agricultural production, its importance in modern society. Biological processing of industrial waste of various industries, the use of microorganisms -hydrocarbon destructors for cleaning contaminated soils and safety problems of using microorganisms obtained by genetic engineering methods, and some products of microbial synthesis. A set of modern research methods in the field of environmental biotechnology for wastewater and soil treatment. **Laboratory.** Types of reactors for waste processing of livestock farms. Biological monitoring system for microbiological treatment of waste. Control of pathogenicity. Characteristics of methods of oxidation and membrane filtration of water. **Practical.** Biotechnology use of agricultural waste. Bioremediation technology using microorganisms phytoremediation Technology. Characteristics of aerobic wastewater treatment processes. Characteristics and composition of activated sludge microbiota and biofilm Characteristics

	of anaerobic wastewater treatment processes
Learning / examination outcomes / control forms:	Current control: is carried out through systematic and systematic observation of the work of the group as a whole and each undergraduate individually, testing of knowledge, skills acquired by undergraduates in the study of new material, its repetition, consolidation and practical application. - Final control –exam
Technical teaching aids:	Handouts, normative documents, posters, slides, presentations.
Literature:	1. Biotechnology: Theory and practice / N. In. Zagoskina, [and others]. – M.: Publishing house: Onyx. - 2009. – 496 p. 2) Volkova, T. G. Ecological biotechnology: textbook for universities / T. G. Volova. - Novosibirsk: Chronograph, 2007. – 141c. 3. Industrial ecology: textbook / B. S. Ksenofontov, G. P. Pavlikhin, E. N. Simakova. - M.: ID FORUM: nits Infra-M, 2013. - 208 p. 4. Exploring Environmental Issues: Focus on Risk Biotechnology supply, American Forest Foundation; 2nd edition (2009) - by American Forest Foundation (Author) – 140 p. 5. Agricultural biotechnology / ed. edited by V. S. of Sheveluch. – Moscow: Higher school, 2003. – 469c

Module name:	**M 7.2 Environmental Aspects of Biotechnological Processes**
Module level as required:	Master's program
Abbreviation as required:	EABP
Subtitle as required:	
Lesson type as required:	Lectures, laboratory classes, practical classes
Training semester:	1 semester
Person responsible for the module:	Saparbekova A.A. Nadirova G.K.
Teacher:	k.b. n., associate professor k.t. n.,
Language:	Russian, Kazakh
Connection with curriculum:	Profile discipline, component of choice
Form of teaching / weekly training load in a semester:	Intramural / Lectures -2 hours; laboratory classes -2 hours; practical classes – 1h, current, MSIW – 4h., MSIWT – 2 h., Total labor coefficient – 11 hours
Training load:	Lectures – 30h., laboratory classes – 30h., classes – 15 h, current MSIW – 60h., intermediate MSIW – 15h., MSIWT – 30h., Total labor coefficient – 180 hours
Credit points:	6 ECTS-кредитов
Prior knowledge for compliance with the examination requirements:	Rating according to the results of intermediate and midterm control – not lower 25 points
Recommended prior knowledge:	Undergraduate modules: Fundamentals of biotechnology, Industrial biotechnology
Module objectives / planned learning outcomes:	After studying this course undergraduates will be able to: - analyze the ways of abiotic transformation of pollution in the environment; - to carry out the analysis of technogenic impact on the environment; - to choose the right ecobiotechnologies methods, techniques, devices, and technical systems for the bioremediation of natural ecosystems and clearing of industrial sewage; - to implement a biological monitoring system for microbiological treatment of waste and pathogenicity;

	- to substantiate the ecological approach to obtain transgenic animals and plants.
Content:	**Lectures:** Tasks of biotechnology in increasing the production of environmentally friendly products**.** The use of bioengineering and selection in the production of environmentally friendly high-yielding varieties of plants. Biotechnological methods to improve the ecological situation in animal husbandry. Preparation of transgenic animals and plants, ecological characteristics of the chosen approach. Bioextraction of radionuclides and heavy metals from soil and water. Biological method of plant protection in agriculture. Environmental genetics and epigenetics in crop production. Aerobic waste management. Extraction of useful substances from wastewater and waste. **Practical training:** Environmental risk of genetic engineering methods in biotechnology. Structure of organochlorine pesticides. Ways of their biological decomposition. The study of populations of soil microorganisms in the various samples, pollution level. Study of microbial populations of bottom sediments. Preparation of the technological scheme of water purification. Stage of anaerobic decomposition of biowaste. **Laboratory.** Types of reactors for waste processing of livestock farms. Biological monitoring system for microbiological treatment of waste. Control of pathogenicity. Characteristics of methods of oxidation and membrane filtration of water.
Learning / examination outcomes / control forms:	Current control: delivery of independent works of the undergraduate in the form of abstracts, presentations, cases. Final control – exam
Technical teaching aids:	Handouts, normative documents, posters, slides, videos, presentations.
Literature:	1. Kuznetsov A. E. [et al.] Applied ecobiotechnology: textbook for universities in the specialty "Biotechnology": 2 t /Moscow: Binom. Knowledge laboratory, ISBN 978-5-9963-0151-5. - T. 1. — 2010. — 629 p., — ISBN 978-5-9963-0152-2 2. Industrial ecology: textbook / B. S. Ksenofontov, G. P. Pavlikhin, E. N. Simakova. - M.: ID FORUM: nits Infra-M, 2013. - 208 p. 3. Leykin Yu. a. fundamentals of environmental regulation: Textbook / Y. A. Leikin. - M.: Forum: nits INFRA-M, 2014. - 368 c. 4. Tikhonova I. O. Ecological monitoring of water bodies: Textbook - M.: Forum: SIC Infra-M, 2012. 5. Exploring Environmental Issues: Focus on Risk Biotechnology Supplement, American Forest Foundation; 2nd edition (2009) - by American Forest Foundation (Author) – 140 p. ISBN-10: 0997080620

Module name:	**M8 Research work of master's student 1**
Module level as required:	Master's program
Abbreviation as required:	MRSW
Subtitle as required:	
Lesson type as required:	
Training semester:	1 semester
Person responsible for the module:	Department: Biotechnology
Teacher:	Leading full-time teachers of the educational program with an academic degree
Language:	Russian, Kazakh
Connection with curriculum:	Additional types of training

Form of teaching / weekly training load in a semester:	
Training load:	
Credit points:	2 ECTS
Prior knowledge for compliance with the examination requirements:	
Recommended prior knowledge:	Modern methods in biotechnology, Biotechnology to improve the productivity of agrocenoses, biocontrol of pathogenic microorganisms in the soil, Biotechnology for the production and processing of biomass, a Progressive course of genetic engineering
Module objectives / planned learning outcomes:	Once undergraduates have completed the course, they should be able to:: - to formulate the purpose and objectives of the dissertation research, the object and subject of research; - to carry out dissertation research using advanced information technologies; - to conduct research in the field of mineral acids, salts and fertilizers technology; - to use the best international experience in the field of technology of mineral acids, fertilizers and salts, based on modern achievements of science and production; - prepare a report on R & D and protect the scientific results.
Content:	Analysis of modern achievements of science and technology in a particular field of production with the study of practical recommendations and methods for solving research problems. Substantiation of the relevance of the chosen research topic. Conducting literature survey and patent search for new methods of production in the study area of research and new technologies for the production of inorganic soedineniya the subject of the master thesis with the use of electronic databases.The purpose of the study. Chemical analysis of used raw materials, chemical wastes and identification aminosalicilova composition of physico-chemical methods of research. Registration and protection of the report on research work for 1 semester.
Learning / examination outcomes / control forms:	academic/ exam results form of control:
Technical teaching aids:	Information electronic resources of the University, laboratory equipment, reagents and raw materials
Literature:	1. General provisions Klonowa S. M., Egorova T. A., S. A. Sivukhina Biotechnology. Moscow, 2010. 2. F. A.: Almaty Region. V., Kostanay, Ul. Industrial, 41.V., Kalashnikov A. S., S. A. Sivukhina Biotechnology:theory and practice. Moscow, 2009. 3. Zayadan B. P. Environmental biotechnology / / Tutorial-Almaty, "Kazakh University", 2014, - 315c. in the dictionary implemented two-way transfer.yaz.) 4. Schmidt R. Visual biotechnology and genetic engineering. M., "Binom", 2014. 5. Sabirjanov D. S., Tasybaeva.B., - M.: Publishing house KAZ.SSR.B. Методическипрофессиональнойорганизации, написаниюизащитемагистерскойдиссертации. - Shymkent: yukgu them.M. Auezov M. Auezov, 2016. - 50s.

Module name:	**M 9.1 Modern Problems of Branch Biotechnology**

Module level as required:	Master's program
Abbreviation as required:	MPBB
Subtitle as required:	
Lesson type as required:	Lectures, laboratory classes
Training semester:	2 semester
Person responsible for the module:	Ahanov U.K.
Teacher:	c. a. s., associate professor
Language:	Russian, Kazakh
Connection with curriculum:	Core discipline, elective component
Form of teaching / weekly training load in a semester:	Intramural / Lectures -2 hours; laboratory classes -1 hours; current MSIW – 3,33h., MSIWT – 1h., Total labor coefficient – 7.33 hours
Training load:	Lectures – 30h., laboratory classes – 15h., current MSIW – 50h., intermediate MSIW – 10h., MSIWT – 15h., Total labor coefficient – 120 hours
Credit points:	4 ECTS
Prior knowledge for compliance with the examination requirements:	Rating according to the results of intermediate and midterm control – not lower 25 points
Recommended prior knowledge:	Undergraduate modules: Fundamentals of biotechnology, Introduction to the specialty, Inorganic and analytical chemistry
Module objectives / planned learning outcomes:	Once undergraduates have completed the study of this course, they should be able to: - to analyze the main areas of application of modern biotechnology and its main aspects (chemical, microbiological, biochemical); - independently prepare preparations of living microorganisms; - to study the morphology of microorganisms as objects of production of biologically valuable products on solid nutrient media; - to apply the methods of cell engineering for the creation of microorganisms and plant cells; - isolate amino acids and organic acids by thin-layer chromatography and eluates.
Content:	Lectures: Multidisciplinary modern biotechnology. The main areas of application of modern biotechnology and its main aspects (chemical, microbiological, biochemical). General biology, Microbiology and cell physiology. Molecular biology and cell genetics. Bioorganic chemistry and biochemistry. Biophysical chemistry. Biotechnology for food and light industry. Medical biotechnology. Biotechnology of energy production for energy. Biotechnology for the oil and mining and processing industries. Environmental biotechnology. Laboratory classes: Preparation of preparations of living microorganisms. Study of the morphology of microorganisms as objects of obtaining biologically valuable products on solid nutrient media. The study of biodegradation of organic contaminants otsilindrovannye heterotrophic microorganisms. Isolation of amino acids and organic acids by thin-layer chromatography and eluates. Production experiments on biodegradation of highly toxic organic compounds on the example of mineral oils.
Learning / examination outcomes / control forms:	Current control: is carried out through systematic and systematic observation of the work of the group as a whole and each undergraduate individually, testing of knowledge, skills acquired by undergraduates in the study of new material, its repetition, consolidation and practical application. - protection of written materials for the purpose of verification of

	theoretical knowledge and skills, applying them to specific tasks, problems, determining degrees of proficiency in the written language, the ability to logically adequate to the problem to build, to compose your text and outline it, to assess the work, experiment, problem; - discussions with professional teachers, written surveys. Final control –exam
Technical teaching aids:	Handouts, normative documents, posters, slides, videos, presentations.
Literature:	1. Klonowa S. M., Egorova T. A., E. A. Sivukhina Biotechnology. Moscow, 2010. 2. Zagoskina N. In. Nazarenko L. V., Kalashnikova E. A., Sivukhina E. A. Biotechnology:theory and practice. Moscow, 2009. 3.Zayadan B. K. Onaran G. Food biotechnology //Textbook "Kazakh Kazakh University", 2012, 334 p. (in Kazakh.yaz.) 4. Modern Biotechnology: Connecting Innovations in Microbiology and Biochemistry to Engineering Fundamentals, Wiley-AIChE; 1 edition (August 17, 2009) - by Nathan S. Mosier (Author), Michael R. Ladisch (Author) -464p. ISBN-10: 0470114851 5. Knowing New Biotechnologies: Social Aspects of Technological Convergence (Genetics and Society); Routledge; 1 edition (February 25, 2015) - by Matthias Wienroth (Editor), Eugénia Rodrigues (Editor) – 218 p. ISBN-10: 1138022934

Module name:	**M 9.2 Achievements and prospects of biotechnology**
Module level as required:	Master's program
Abbreviation as required:	APB
Subtitle as required:	
Lesson type as required:	Lectures, laboratory classes
Training semester:	2 semester
Person responsible for the module:	Yessimova A.M.
Teacher:	c.ch.s., associate Professor
Language:	Russian, Kazakh
Connection with curriculum:	Core discipline, elective component
Form of teaching / weekly training load in a semester:	Intramural / Lectures -2 hours; laboratory classes -1 hours; current MSIW – 3,33h., MSIWT – 1h., Total labor coefficient – 7.33 hours
Training load:	Lectures – 30h., laboratory classes – 15h., current MSIW – 50h., intermediate MSIW – 10h., MSIWT – 15h., Total labor coefficient – 120 hours
Credit points:	4ECTS
Prior knowledge for compliance with the examination requirements:	Rating according to the results of intermediate and midterm control – not lower 25 points
Recommended prior knowledge:	Baccalaureate modules: Fundamentals of biotechnology, Introduction to the specialty, Inorganic and analytical chemistry
Module objectives / planned learning outcomes:	Once undergraduates have completed the study of this course, they should be able to: - to formulate and solve modern scientific and practical problems in science and industry, to successfully carry out research activities in various biotechnology industries and organizations; - providing fundamental knowledge and practical skills at the intersection of biology, chemistry, guaranteeing their professional mobility in the real developing world.

Content:	**Lectures**: Prospects of development of food, medical and veterinary biotechnology. Biotechnology and dietetics. Transgenic animals and plants as bioreactors of food and medicinal products. Modeling of human diseases on animal systems. Human genome and development of medical biotechnology. Manipulation of embryonic stem cells. Cryopreservation and creation of banks of germ, germ and stem cells.. Biotechnological methods to improve the action of drugs. Engineering Enzymology. Biotransformation of organic substances. **Laboratory**. Study of methods of isolation of the target product to obtain the final bioproduct. The study of the composition of the biomass method VZHKH. Study of heat release and oxygen consumption in bacterial growth
Learning / examination outcomes / control forms:	Current control: is carried out through systematic and systematic observation of the work of the group as a whole and each undergraduate individually, testing of knowledge, skills acquired by undergraduates in the study of new material, its repetition, consolidation and practical application. - protection of written materials for the purpose of verification of theoretical knowledge and skills, applying them to specific tasks, problems, determining degrees of proficiency in the written language, the ability to logically adequate to the problem to build, to compose your text and outline it, to assess the work, experiment, problem; - discussions with professional teachers, written surveys. Final control –exam
Technical teaching aids:	Handouts, normative documents, posters, slides, videos, presentations.
Literature:	1. Klonowa S. M., Egorova T. A., E. A. Zhivukhina Biotechnology. Moscow, 2010. 2. Zagoskina N. In. Nazarenko L. V., Kalashnikova E. A., Zhivukhina E. A. Biotechnology:theory and practice. Moscow, 2009. 3. Zayadan B. K. Onerkhan G. Food biotechnology //Textbook "Kazakh Kazakh University", 2012, 334 p. (in Kazakh.yaz.)4. Modern Biotechnology: Connecting Innovations in Microbiology and Biochemistry to Engineering Fundamentals, Wiley-AIChE; 1 edition (August 17, 2009) - by Nathan S. Mosier (Author), Michael R. Ladisch (Author) -464p. ISBN-10: 0470114851 5. Knowing New Biotechnologies: Social Aspects of Technological Convergence (Genetics and Society); Routledge; 1 edition (February 25, 2015) - by Matthias Wienroth (Editor), Eugénia Rodrigues (Editor) – 218 p. ISBN-10: 1138022934

Module name:	**M 10.1 Molecular Genetic Basis of Modern Biotechnology**
Module level as required:	Master's program
Abbreviation as required:	МГОСБ
Subtitle as required:	
Lesson type as required:	Lectures, laboratory classes, practical classes
Training semester:	2 semester
Person responsible for the module:	Ymirzak T
Teacher:	D. a. s., Professor,
Language:	Russian, Kazakh
Connection with curriculum:	Core discipline, elective component
Form of teaching / weekly training load in a semester:	Intramural / Lectures -2 hours; laboratory classes -2 hours; practical classes – 1h, current, MSIW – 4h., MSIWT – 2 h., Total labor coefficient – 11 hours

Training load:	Lectures – 30h., laboratory classes – 30h., classes – 15 h, current MSIW – 60h., intermediate MSIW – 15h., MSIWT – 30h., Total labor coefficient – 180 hours
Credit points:	6 ECTS-кредитов
Prior knowledge for compliance with the examination requirements:	Rating according to the results of intermediate and midterm control – not lower 25 points
Recommended prior knowledge:	Модули бакалавриата: Основы биотехнологии, Общая и молекулярная генетика, Неорганическая и аналитическая химия
Module objectives / planned learning outcomes:	After undergraduates have completed the course, they should be able to: - to formulate and generalize knowledge of the molecular genetic basis of modern biotechnology; - to characterize the vector systems used for cloning in cells of prokaryotes and eukaryotes; - analyze DNA fragments and determine complete nucleotide sequences; - identify and connect DNA fragments; - independently carry out the selection of cells inheriting the recombinant molecules with the desired gene.
Content:	**Lectures:** The emergence of molecular biotechnology. Bio-objects used in molecular biotechnology. Molecular genetic basis for the implementation of genetic information in the cell. Genetic engineering tools. Vector systems used for cloning in prokaryotic and eukaryotic cells. Gene cloning. Analysis of DNA fragments and determination of complete nucleotide sequences. Advances in biotechnology and genetic engineering in agriculture and medicine. **Practical classes:** Macroobjects of animal origin. Bio-objects of plant origin. Methods of "cutting" and identification of DNA fragments. Connecting DNA fragments. Vector systems used in molecular cloning in prokaryotic cells. Types of vectors: plasmid and phage vectors of natural and artificial origin. Principles of vector design. Expression of foreign genetic information in the cells of bacteria, yeast, plants and animals. Methods of introducing the cloned DNA into the cells of bacteria, plants and animals. Methods for selecting cells that inherit recombinant molecules with the desired gene.ю **Laboratory classes.** Reproduction and handling of bacterial strains The method of preparation of a typical PCR reaction. Typical PCR parameters. Comparison of the effectiveness of different hormonal and mineral composition of nutrient media in the cultivation of isolated plant tissues
Learning / examination outcomes / control forms:	Current control: is carried out through systematic and systematic observation of the work of the group as a whole and each undergraduate individually, testing of knowledge, skills acquired by undergraduates in the study of new material, its repetition, consolidation and practical application. - protection of written materials for the purpose of verification of theoretical knowledge and skills, applying them to specific tasks, problems, determining degrees of proficiency in the written language, the ability to logically adequate to the problem to build, to compose your text and outline it, to assess the work, experiment, problem; - discussions with professional teachers, written surveys.

	Final control –exam
Technical teaching aids:	Handouts, normative documents, posters, slides, videos, presentations.
Literature:	1. Zhimulev I.F. General and Molecular Genetics: Textbook for universities.-Novosibirsk: “Siberian University”, 2006.- 479 p. 2.Konichev A.S., Sevastyanov G.A. Molecular biology. 2 nd edition. -M: “Academia”, 2005.- 400 p. 3. Bersimbayev I. Obshchaya i molekulyarnaya genetika: Uchebnoye posobiye / R. Bersimbayev K. Mukhambetzhany. - Almaty: Kazakhskiy universitet, 2005. - 264 s. 4. Борисова, Т.Н. Генетика человека с основами медицинской генетики. [Текст] / Т.Н. Борисова, Г.и. Чуваков. – 2-е изд. испр и доп. – М. :Юрайт, 2016. – 182с. Borisova, T.N. 5. Human genetics with the basics of medical genetics. [Text] / T.N. Borisova, G. and. Dude - 2nd ed. corrected and add. - M.: Yurayt, 2016. - 182s. 6. Omirzak T.U. General and Molecular Genetics (lecture course) .- Shymkent: “Alem”, 2017.-288 p. 7. Mutaliyeva, B.Zh. General and molecular genetics methodical instructions to practical classes on the discipline of "General and molecular genetics" for students 5B070100 - "Biotechnology" specialty / B. Zh. Mutaliyeva. - Shymkent : SKSU, 2013. – 40 8. BRS Biochemistry, Molecular Biology, and Genetics (Board Review Series), LWW; Sixth edition (September 14, 2013) - by Michael Lieberman PhD, Rick Ricer MD – 432 p. ISBN-10: 9781451175363

Module name:	**M 10.2 Industrial microorganisms**
Module leve:	Master’s program
Abridged:	IM
Subtitle:	
View classes:	Lectures, laboratory classes, Practical classes
Semester of study:	2 semester
Responsible person for the module:	Kedelbaev B. Sh., Turalieva M.
Teacher:	Doctor of technical Sciences, Professor, PhD
Language:	Russian, Kazakh
Communication with the curriculum:	Profile discipline, component of choice
Form of study /weekly teaching load per semester:	Intramural / Lectures -2 hours; laboratory classes -2 hours; practical classes – 1h, current, MSIW – 4h., MSIWT – 2 h., Total labor coefficient – 11 hours
Teaching load:	Lectures – 30h., laboratory classes – 30h., classes – 15 h, current MSIW – 60h., intermediate MSIW – 15h., MSIWT – 30h., Total labor coefficient – 180 hours
Credit score:	6 ECTS-кредитов
Prerequisites to meet exam requirements:	Rating according to the results of intermediate and midterm control – not lower 25 points
Recommended prerequisites	Undergraduate modules: Fundamentals of biotechnology, General and molecular genetics, Inorganic and analytical chemistry
The objectives of this module /	Once undergraduates have completed the study of this course, they should

planned learning outcomes:	be able to: - cultivate microorganisms using a variety of nutrient media, including anaerobic conditions; - to allocate pure culture of microorganisms by various methods; - identify microorganisms by microscopic, cultural and biochemical methods; - prepare colored bacteriological preparations of microorganisms; - it is logical and consistent to justify the adoption of technological decisions based on the knowledge gained.
Module content:	**Lectures:** Considers the main types of culture media used for the cultivation of industrial microorganisms and the principles of formulation of industrial culture media and technology of cultivation of microorganisms, the use of microorganisms in the industrial production of steroid hormones and metabolites. Substantiates the advantages of microbiological method of obtaining primary and secondary metabolites, the use of biotechnological methods in various industries. Characterizes the methods of obtaining pure cultures of microorganisms and microbial biomass for agriculture, medicine, food industry. **Practical classes:** Technological process of deep growing of microorganisms in bioreactors. Stages of cultivation. Selection of strains of microorganisms. Preparation of microbial culture. Preparation sterilization of nutrient media. Optimization of multicomponent composition of nutrient medium. Preparation of the bioreactor for seeding. Growing microorganisms in the reactor. Technology of industrial cultivation. **Laboratory classes:** Quantitative account of the number of microorganisms in various substrates. Methods of microscopy of biological objects and control of cell population characteristics. Measurement of redox potential of biological systems. Progressive methods of process control.
Teaching / exam results form of control:	Current control: is carried out through systematic and systematic observation of the work of the group as a whole and each undergraduate individually, testing of knowledge, skills acquired by undergraduates in the study of new material, its repetition, consolidation and practical application. - protection of written materials for the purpose of verification of theoretical knowledge and skills, applying them to specific tasks, problems, determining degrees of proficiency in the written language, the ability to logically adequate to the problem to build, to compose your text and outline it, to assess the work, experiment, problem; - discussions with professional teachers, written surveys. Final control –exam
Technical training tools:	Handouts, normative documents, posters, slides, videos, presentations.
Literature:	1. Klenova, S. M. Biotechnology: a textbook / S. M. Klanova, T. A. Egorova, E. A. Sivukhina. – Moscow: Academy, 2010. - 256 p. – ISBN 978-5-7695-6697-4[In Russian] 2. Korostyleva L. A. Fundamentals of ecology of microorganisms / L. A. Korostyleva, A. G. Koshchaev. – Publishing house "LAN", 2013 – 240 p [In Russian] 3. Netrusov, A. I. Ecology of microorganisms. – 2nd ed. – Moscow: Yurayt, 2016. [In Russian] 4. Gosmanov R. G. Sanitary Microbiology : studies. allowance / R. G. Gosmanov, A. H. Volkov, A. K. Galiullin, A. I. Ibrahimova – Electron. dan. – SPb.: DOE, 2010. – 432 p.[In Russian] 5. Brock Biology of Microorganisms, Pearson; 15 edition (January 14, 2017) - by Michael T. Madigan (Author), Kelly S. Bender (Author), Daniel H. Buckley (Author), W. Matthew Sattley (Author), David A.

	Stahl (Author). – 1056 p. **ISBN-10:** 0134626109 [In English]

Module name:	**M 11.1 Basics of Experimental Research**
Module level as required:	Master's program
Abbreviation as required:	DER
Subtitle as required:	
Lesson type as required:	Lectures, laboratory classes
Training semester:	2 semester
Person responsible for the module:	Daulbay A.D., Aitkylova R.
Teacher:	C.a.s., associate professor c.h.s.,
Language:	Russian, Kazakh
Connection with curriculum:	Core discipline, elective component
Form of teaching / weekly training load in a semester:	Intramural / Lectures -2 hours; laboratory classes -2 hours; current MSIW – 3,66h., MSIWT – 1.5h., Total labor coefficient – 9.16 hours
Training load:	Lectures – 30h., laboratory classes – 30h., current MSIW – 55h., intermediate MSIW – 12.5h., MSIWT – 22.5h., Total labor coefficient – 150 hours
Credit points:	5 ECTS
Prior knowledge for compliance with the examination requirements:	Rating according to the results of intermediate and midterm control – not lower 25 points
Recommended prior knowledge:	Baccalaureate modules: Fundamentals of biotechnology, Basic research and patenting, Objects of biotechnology, Instruments and methods of research of biological systems
Module objectives / planned learning outcomes:	Once undergraduates have completed the study of this course, they should be able to: - determine the research topic, formulate the goal, make a plan for the implementation of the study; - to collect, study and process information; - analyze and process the results of experimental studies; - present the results of research activities; - critically evaluate the research plan.
Content:	**Lectures**: Methodology and methods of scientific research. Empirical level of knowledge. The facts, empirical generalization, an empirical law. Methods of empirical research: observation, description, counting, measurement, comparison, experiment. Stages of organization of experimental research. Object and subject of research, research planning, information accumulation, data processing, analysis of research results, formulation of conclusions. Requirements for registration of scientific work. Design of tables, graphic material, list of references. Visual presentation of the results of the study. Presentation of research work. **Laboratory research:** Identification of equipment required for research. Selection of the optimal method of experimental research, development of research methods. Results of the experiment on the study of the value of individual nutrients for the development of microorganisms Primary processing of experimental data. Coordination of theoretical and experimental studies
Learning / examination outcomes / control forms:	Current control: is carried out through systematic and planned observation of the work of the group as a whole and each master student individually, testing of knowledge, skills acquired by undergraduates in the study of new material, its repetition, consolidation and practical application.

	- protection of written materials for the purpose of verification of theoretical knowledge and skills, applying them to specific tasks, problems, determining degrees of proficiency in the written language, the ability to logically adequate to the problem to build, to compose your text and outline it, to assess the work, experiment, problem; - discussions with professional teachers, written surveys. Final control –exam
Technical teaching aids:	Handouts, normative documents, posters, slides, videos, presentations.
Literature:	1. Shipilina, L. A. Methodology and methods of psychological and pedagogical research: studies. manual for graduate students and undergraduates / L. A. Shipilina. - 3rd ed., stereotype. - M.: FLINTA, 2011. - 204 p. 2. In Cougar.M. Fundamentals of scientific research: textbook / V. M. Kozhukhar. - M. Publishing and trading Corporation "Dashkov and K". 2010. - 2016 p. 3. Kozhukhar, V. M. Workshop on the basics of scientific research : studies. the allowance / V. M. Cougar. - M. : ASV, 2008. - 112 p. 4. Kosnikov S. N. The theory of decision making: textbook. manual, book of problems / SN. Kosnikov; ed. by Dr. Ekon. Sciences, prof. A. G. Burda. – Krasnodar : Kubsau, 2013. – 54 sec • 5. How to read and criticize a research paper: Notes for students reading primary literature (with teaching tips for teachers), Wspc (January 16, 2014) - Foong May Yeong (author). - 116 p. ISBN-10: 9814579165

Module name:	**M 11.2 Ensure Genetic Security in the Biotechnological Production**
Module level as required:	Magistracy
Abbreviation as required:	EGSBTP
Subtitle as required:	
Lesson type as required:	Lectures, laboratory classes,
Training semester:	2 semester
Person responsible for the module:	Alibaev N.N.
Teacher:	D. a. s., Professor
Language:	Russian, Kazakh
Connection with curriculum:	Profile discipline, a component of choice
Form of teaching / weekly training load in a semester:	Intramural / Lectures -2 hours; laboratory classes -2 hours; current MSIW – 3,66h., MSIWT – 1.5h., Total labor coefficient – 9.16 hours
Training load:	Lectures – 30h., laboratory classes – 30h., current MSIW – 55h., intermediate MSIW – 12.5h., MSIWT – 22.5h., Total labor coefficient – 150 hours
Credit points:	5 ECTS
Prior knowledge for compliance with the examination requirements:	Rating according to the results of intermediate and midterm control – not lower 25 points
Recommended prior knowledge:	Undergraduate Modules: Fundamentals of Biotechnology, Industrial Biotechnology, General and Molecular Genetics
Module objectives / planned learning outcomes:	After undergraduates have completed the course, they should be able to: - know the concept of biosafety regarding the basic principles and methodology for assessing the risk of adverse effects of genetic

	engineering activities in biotechnological enterprises; - assess the risk of possible adverse effects of genetically engineered organisms on the environment and human health; - comply with the biological safety of genetically modified sources in food production; - to carry out food toxicological and hygienic assessment of genetically modified food sources; - apply the regulatory and legislative framework for food safety in the Republic of Kazakhstan.
Content:	**Lectures:** Biosafety. Legal framework for biosafety regulation. Basic terms and concepts. Basic principles and strategies for obtaining GMOs. The main achievements of genetic engineering of microorganisms, plants and animals. Basic principles and methodology for assessing the risk of adverse effects of genetic engineering. Risk assessment of possible adverse effects of genetically engineered organisms to the environment and human health. Legal regulation of biosafety. The main regulatory and legal acts of the international and national biosafety systems. **Laboratory classes:** Features of the growth of microorganisms on nutrient media of different composition. The effect of salts of biogenic and non-biogenic heavy metals on animal and vegetable proteins. Biological safety of genetically modified sources in food production.
Learning / examination outcomes / control forms:	Current control: carried out using systematic and systematic observation of the work of the group as a whole and each undergraduate individually, examination of knowledge and skills acquired by undergraduates during the study of new material, its repetition, consolidation and practical application. - protection in writing of materials in order to test theoretical knowledge and skills, apply them to solve specific problems, problems, determine the degree of written language, the ability to logically, adequately build a problem, compose your text and present it, evaluate the work, experiment, problem ; - discussions with professional teachers, written surveys. Final control exam
Technical teaching aids:	Handouts, regulatory documents, posters, slides, videos, presentations.
Literature:	1. Fundamentals of toxicology [Text]: study guide. - Moscow: INFRA-M, 2016. - 279 with 2. Abilev S.K. Mutagenesis with the basics of genotoxicology: a tutorial / SK Abilev, V.M. Glaser. - Moscow; St. Petersburg: Nestor History, 2015. - 304 seconds 3. Agricultural biotechnology and bioengineering [text]: textbook / ed. Vs Shiveruhi. - ed. 4th, pererabot and add. - Moscow: LENAND, 2015. - 704 p. 4. Prokhorova I.M., Kovaleva M.I., Fomicheva A.N. Genetic toxicology: study guide - Yaroslavl: YarGU, 2009. - 132 p. 5. Genetic Technology and Food Safety (Ius Comparatum - Global Studies in Comparative Law), Springer; 1st ed. 2016 edition (December 17, 2015) - by Roland Norer (Editor). - 437 p. ISBN-10: 9783319239934

Module name:	**M12.1 Cellualar and Tissue Biotechnology in Agro-industrial Complex**
Module level as required:	Master's program
Abbreviation as required:	CTBAI
Subtitle as required:	
Lesson type as required:	Lectures, laboratory classes,
Training semester:	2 semester
Person responsible for the module:	Mutaliyeva B.Zh.
Teacher:	Candidate of Chemical Sciences, Associate professor
Language:	Russian, Kazakh
Connection with curriculum:	Profile discipline, optional component
Form of teaching / weekly training load in a semester:	Intramural / Lectures -2 hours; laboratory classes -2 hours; current MSIW – 3,66h., MSIWT – 1.5h., Total labor coefficient – 9.16 hours
Training load:	Lectures – 30h., laboratory classes – 30h., current MSIW – 55h., intermediate MSIW – 12.5h., MSIWT – 22.5h., Total labor coefficient – 150 hours
Credit points:	5 ECTS
Prior knowledge for compliance with the examination requirements:	Rating according to the results of intermediate and midterm control – not lower 25 points
Recommended prior knowledge:	Modules of Bachelor's program: Principles of biotechnology, Biochemistry, Inorganic and analytic chemistry
Module objectives / planned learning outcomes:	After completion of the module, students should be able to: - know modern directions of cellular and molecular biotechnology, know theoretical and practical foundations of the discipline; - have skills of research and teaching activities, achievements, use of cellular biotechnology in prokaryotic and eukaryotic systems; - possess skills of statistical processing of experimental data for analysis of technological processes in the production of various types of biotechnological products, use of research methods and instruments for research, as well as skills of laboratory research; - demonstrate basic knowledge in the field of cellular biotechnology, use knowledge of cellular biotechnology in practice; - apply standards and technical conditions for product quality control, use terminology, both in the field of education and in the field of biotechnology, identify causes of violation of technological processes in the production of biotechnological products.
Content:	**Lectures:** The latest advances in the field of biotechnology. Application of cellular cultures and cellular technologies. Important aspects of theoretical and practical foundations of cellular biotechnology. Genomics, proteomics and bioinformatics. Bioinformatics in planning, organization and implementation of biotechnological problems. Somatic hybridization. Cellular biotechnology of microbiological systems. Use of recombinant microorganisms for obtaining of commercial products. Microbiological production of pharmaceuticals. Biodegradation of toxic compounds and biomass utilization. Bacteria that stimulate plant growth. Microbial insecticides. Biotechnology of microbial-plant interaction. Cellular biotechnology in medicine. Genetic engineering of plants. Excretion of plants resistant to insect pests,

	viruses and herbicides. **Laboratory lessons:** Rules for working with cellular cultures. Isolation of protoplasts from leaf mesophyll. Suspension culture. Obtaining suspension culture from callus. Counting cell density in suspension culture. Sowing suspension on a solid agar medium (method of plating). Isolation of protoplasts: preparation of enzyme solutions and tissue fermentation.
Learning / examination outcomes / control forms:	Current control: carried out using systematic and planned observation of the work of a group as a whole and each master student individually, test of knowledge and skills acquired by master students in the course of studying a new material, its repetition, reinforcement and practical application; - defense in writing of materials in order to test theoretical knowledge and skills, apply them to solve specific tasks, problems, determine the degree of written language, ability to logically, adequately build a problem, compose own text and present it, evaluate the work, experiment, problem; - discussions with professional teachers, written surveys. Final control: exam.
Technical teaching aids:	Handouts, regulatory documents, posters, slides, videos, presentations
Literature:	1. Becker M.Ye. Introduction to biotechnology / M.Ye. Becker. – M.: Food industry, 2005. – 248 p. 2. Becker M.Ye. Introduction to biotechnology / M.Ye. Becker. – M.: Book on Demand, 2012. – 115 p. 3. Biotechnology / Under the editorship of Ye.S. Voronin. – M.: Giord, 2008. – 350 p. 4. Kalenov S.V. Online training of biotechnologists. Elements of virtual educational environment. Training aid / S.V. Kalenov, V.I. Panfilov, A.Ye. Kuznetsov. – M.: DMK Press, 2014. – 94 p. 5. Klunova S.M. Biotechnology / S.M. Klunova, T.A. Yegorova, Ye.A. Zhivukhina. – M.: Academy, 2010. – 256 p. 6. Schmid R. Visual biotechnology and genetic engineering / R. Schmid. – M.: Binom. Laboratory of knowledge, 2014. – 328 p.

Module name:	**M 12.2 Kinetics of Biochemical Processes**
Module level as required:	Master's program
Abbreviation as required:	КБП
Subtitle as required:	
Lesson type as required:	Lectures, laboratory classes,
Training semester:	2 семестр
Person responsible for the module:	Kedelbaev B., Mytalieva B.
Teacher:	Doctor of technical Sciences, Professor Candidate of Chemical Sciences, Associate professor
Language:	Russian, Kazakh
Connection with curriculum:	Profile discipline, optional component
Form of teaching / weekly training load in a semester:	Intramural / Lectures -2 hours; laboratory classes -2 hours; current MSIW – 3,66h., MSIWT – 1.5h., Total labor coefficient – 9.16 hours
Training load:	Lectures – 30h., laboratory classes – 30h., current MSIW – 55h., intermediate MSIW – 12.5h., MSIWT – 22.5h., Total labor coefficient – 150 hours
Credit points:	5 ECTS-кредитов

Prior knowledge for compliance with the examination requirements:	Rating according to the results of intermediate and midterm control – not lower 25 points
Recommended prior knowledge:	Undergraduate modules: Fundamentals of biotechnology, Biochemistry, Inorganic and analytical chemistry
Module objectives / planned learning outcomes:	After studying this course, the students should be able: - explain the basic kinetic laws of chemical and enzymatic reactions; - interpret the physical essence of chemical equilibrium; - to determine the dependence of the rate of chemical reaction on the temperature and concentration of reacting substances; - calculate the experimental data on the rate constants, activation energy and pre-exponential factors of chemical reactions; - to investigate the regularities of chemical reactions in time.
Content:	Lectures: Examines the main issues of the kinetic laws of the chemical and enzymatic reactions, the physical essence of chemical equilibrium, the dependence of the rate of chemical reaction on temperature and concentration of reacting substances. Characterizes the main stages of protein biosynthesis: transcription, translation, the basic principles of protein engineering, the properties of the genetic code and the principles of regulation of metabolic processes. **Practical training:** the Dependence of the chemical reaction rate of concentration. Molecularity and order of reaction. Kinetic equations of reactions of the first, second and zero orders. The rule of van't Hoff, in particular biochemical processes. Activation energy, Arrhenius equations. Chemical equilibrium. The displacement of the chemical equilibrium, principle of Le Chatelier.
Learning / examination outcomes / control forms:	Current control: carried out through systematic and continuous monitoring of the work of the group as a whole and each undergraduate individually, testing of knowledge, skills acquired by undergraduates in the study of new material, its repetition, consolidation and practical application. - the protection of written materials for the purpose of verification of theoretical knowledge and skills, applying them to specific tasks, problems, determining degrees of proficiency in the written language, the ability to logically adequate to the problem to build, to compose your text and outline it, to assess the work, experiment, problem; - discussions with professional teachers, written surveys. Final control –exam
Technical teaching aids:	Handouts, normative documents, posters, slides, videos, presentations.
Literature:	1. Belousova, N. B. Chemical kinetics : studies. aid / N. V. Belousova, O. V. Belousov. – Krasnoyarsk : IPK SFU, 2009. – 136 p. 2. Chorkendorff, I. Modern chemical catalysis and kinetics / I. Chorkendorff, H. Niemantsverdriet; lane. from English. V. I. Roldugin.2nd edition.Dolgoprudny: Intelligence,2013.-500 p. 3. Budanov V. V., Lomova T. N. Chemical kinetics: study guide. - St. Petersburg: LAN', 2014. - 288 p. 4. Fundamentals of Chemical Reaction Engineering (Dover Civil and Mechanical Engineering), Dover Publications (September 19, 2012) – by Mark E. Davis PhDC (Author), Robert J. Davis (Author) – 384 p. ISBN-10: 0486488551 5. Biochemistry; W. H. Freeman; Eighth edition (April 8, 2015) – by

	by Jeremy M. Berg (Author), John L. Tymoczko (Author), Gregory J. Gatto Jr. (Author), Lubert Stryer (Author) – 1232 p. ISBN-10: 1464126100

Module name:	**M13 Teaching practice**
Module level as required:	Master's program
Abbreviation as required:	PP
Subtitle as required:	
Lesson type as required:	
Training semester:	2 semester
Person responsible for the module:	"Biotechnology" chair
Teacher:	Main regular teachers of the study program, appointed at the meeting of the chair
Language:	Russian, Kazakh
Connection with curriculum:	Additional types of training
Form of teaching / weekly training load in a semester:	
Training load:	240 hours
Credit points:	8 ECTS
Prior knowledge for compliance with the examination requirements:	
Recommended prior knowledge:	Modules of Master's program: Psychology, History and philosophy of science
Module objectives / planned learning outcomes:	After completion of the module, students should be able to: - professionally master basic methodical methods of carrying out lessons with understanding of the structure and goals of the educational system; - apply logical and critical thinking to solve problems in the field of biotechnology; - demonstrate ability to carry out lessons and effectively communicate with both individual students and groups; - use innovative teaching methods in teaching activities and be able to effectively manage time; - combine existing teaching methods of carrying out lessons and professionally respond to the diverse needs of students; - improve own self-education and evaluate learning outcomes and achievements of students.
Content:	Development of professional research culture in the field of biotechnology, as a condition of teaching skills and teaching creativity, formation of professional and teaching skills in the field of biotechnology, culture of scientific and teaching thinking. Development of training methodical documents on the profile discipline. Preparation for lessons and carrying out practical and laboratory lessons in special disciplines of the Bachelor's program "Biotechnology". Development of new active forms of carrying out lessons with students and their application in practical lessons. Attendance of lectures by leading teachers of the chair, as well as participation in educational and other types of work with students. Participation in seminars and conferences on the introduction of

	modern teaching methods.
Learning / examination outcomes / control forms:	Final control: defense of a report.
Technical teaching aids:	Participation of lessons of leading teachers
Literature:	1. Akhmetova G.K., Issayeva Z.A. Pedagogics: textbook for Master's programs of universities. – Almaty: Kazakh University, 2012. – 328 p. 2. Tileuova S.S. Pedagogics of high school. – Shymkent, 2013. (in Kazakh). 3. Mynbayeva A.K., Sadvakasova Z.M. Innovative teaching methods or how interesting to teach. – Almaty, 2010. – 174 p. 4. Issayeva Z.A. and others. Active forms and methods of teaching in university. – Almaty, 2015. 5. Drescher Yu.N. Andragogy. Modern technologies in the preparation and carrying out the training process, 2017.

Module Name:	**M14 Research work of master's student 3**
Module level as necessity:	Master's program
Abbreviation as necessity:	RWOU2
Subtitle as necessity:	
Type of lesson as necessity:	
Semester:	2 semester
Responsible person for the module:	Department: Biotechnology
Lecturer:	Leading full-time faculty members with an academic degree
Language:	Russian, Kazakh
Connection with the curriculum:	Additional types of training
Form of study / weekly workload per semester:	
Study load:	
Credit points:	2 ECTS
Prerequisites for matching exam requirements:	
Recommended prerequisites:	Genomics; Proteomics; Chemical, microbiological and biochemical aspects of modern biotechnology; Kinetics of biochemical processes
Module objectives / expected learning results:	After undergraduates have completed the course, they should be able to: - use the obtained theoretical knowledge of the technology of mineral acids, fertilizers and salts for experimental work; - to conduct scientific research in the field of chemical technology of inorganic compounds and draw conclusions on the results of the work; - justify and develop technological regimes for the production of inorganic acids, salts and fertilizers; - propose new methods for producing inorganic compounds in accordance with the topic of the study; - perform technological calculations on the topic of dissertation research.
Content:	The study of current problems of production on the topic of master's thesis. The choice of methods for performing experimental research and methods of analysis of raw materials, industrial chemical wastes,

	intermediates and products. Conducting experimental research work according to the plan of the academic period with the use of the instrumental base of the departmental laboratory and analytical instruments of the testing regional laboratory of engineering profile (IRLIP). Use of advanced information technologies for processing the results of experimental studies. Performing technological calculations of the process, apparatus or object of study.
study / examination results forms of control:	Current control: the results of scientific research, performed technological calculations. Final control - report
technical training tools:	Laboratory equipment and instruments, chemical glassware, reagents and raw materials.
references	1. Fundamental Laboratory Approaches for Biochemistry and Biotechnology, Wiley; 2 edition (May 26, 2009) - by Alexander J. Ninfa (Au thor), David P. Ballou (Author), Marilee Benore (Author) – 480 p. ISBN-10: 0470087668 2. Case Study Research and Applications: Design and Methods, SAGE Publications, Inc; Sixth edition (November 3, 2017) - by Robert K. Yin (Author). – 352 p. ISBN-10: 9781506336169 3. Zagoskina N.V., Nazarenko L.V., Kalashnikova E.A., Zhivukhina E.A. Biotechnologists: theory and practice. Moscow, 2009. 4. Sabyrkhanov DS, Tasybaeva Sh.B., Baizhanova S.B. Guidelines for organizing, writing and defending a master's thesis. - Shymkent: SKSU them. M.Auezov, 2016. - 50s. 5. GOST 7.32 - 2001. Report on research work. Structure and design rules.

Module name:	**M 15.1 Equipment of enterprises of biotechnological industry**
Module level as required:	Master's program
Abbreviation as required:	EEBI
Subtitle as required:	
Lesson type as required:	Lectures, laboratory classes
Training semester:	3 semester
Person responsible for the module:	Bigara T.C.
Teacher:	candidate of agricultural Sciences, associate Professor
Language:	Russian, Kazakh
Connection with curriculum:	Profile discipline, component of choice
Form of teaching / weekly training load in a semester:	Intramural / Lectures -2 hours; laboratory classes -2 hours; current MSIW – 3,66h., MSIWT – 1.5h., Total labor coefficient – 9.16 hours
Training load:	Lectures – 30h., laboratory classes – 30h., current MSIW – 55h., intermediate MSIW – 12.5h., MSIWT – 22.5h., Total labor coefficient – 150 hours
Credit points:	5 ECTS- credit
Prior knowledge for compliance with the examination requirements:	Rating according to the results of intermediate and midterm control – not lower 25 points
Recommended prior knowledge:	Undergraduate modules: Fundamentals of biotechnology, Biochemistry, Inorganic and analytical chemistry
Module objectives / planned learning outcomes:	Once undergraduates have completed the study of this course, they should be able to:

	- to be able to competently perform material, thermal, technological calculations; - to have skills in the design of hardware and technological equipment of the main biotechnology industries
Content:	**Lectures:** Modern methods of calculation of technological schemes. Typical process operators. Calculation of technological indicators of the cultivation process. General scheme of calculation of the process in the bioreactor. The calculation of the cultivation process on the basis of kinetic relationships. Material balance. General view of the balance of raw materials and the final product. Calculation of the processes of concentration of the culture liquid and isolation of the finished product. Methods of biomass extraction. Calculation of flotation process. Calculation of the centrifugation process calculation Of the separation process. Classification of filters. Method of calculation of dryers. **Laboratory classes:** Hardware and technological design of the main technological equipment. Organization of technological preparation of production. Objectives and content of a single system of technological preparation of production. Technological mode and its choice. Economic optimization. Technical and economic analysis and justification of the choice of resource-saving process. Principles of analysis and calculation of biotechnological production.
Learning / examination outcomes / control forms:	Current control: is carried out through systematic and systematic observation of the work of the group as a whole and each undergraduate individually, testing of knowledge, skills acquired by undergraduates in the study of new material, its repetition, consolidation and practical application. - protection of written materials for the purpose of verification of theoretical knowledge and skills, applying them to specific tasks, problems, determining degrees of proficiency in the written language, the ability to logically adequate to the problem to build, to compose your text and outline it, to assess the work, experiment, problem; - discussions with professional teachers, written surveys. Final control –exam
Technical teaching aids:	Handouts, normative documents, posters, slides, videos, presentations.
Literature:	1. Prikhodko N. A. Esimova A. M., Nadirova K. J. bioengineering, lectures, SKSU, 2007 – 120 p. 2. Kalunian K. A. the Equipment of microbiological industries.-M.: Agropromizdat, 2003,-398 p. [In Russian] 3. Berezin M. V., Varfolomeev S. D. Biokinetica. – M.:Science, 2007 -231 p. [In Russian] 4. Gaponov, K. P. Processes and equipment of microbiological industries.-M.:Lay Down.and food. prom th,2010,-240 p. [In Russian] 5. Gracheva I. M., Gavrilova N. N., Ivanova L. A. Technology of microbial protein preparations, amino acids and fats. – Moscow: Food industry, 2012. – 448 p. [In Russian]

Module name:	**M 15.2 Equipment for conducting biotechnological processes**
Module level as required:	Master's program
Abbreviation as required:	ECBP

Subtitle as required:	
Lesson type as required:	Lectures, laboratory classes
Training semester:	3 semester
Person responsible for the module:	M. A. Yessimova
Teacher:	candidate of chemical Sciences, associate Professor
Language:	Russian, Kazakh
Connection with curriculum:	Profile discipline, component of choice
Form of teaching / weekly training load in a semester:	Intramural / Lectures -2 hours; laboratory classes -2 hours; current MSIW – 3,66h., MSIWT – 1.5h., Total labor coefficient – 9.16 hours
Training load:	Lectures – 30h., laboratory classes – 30h., current MSIW – 55h., intermediate MSIW – 12.5h., MSIWT – 22.5h., Total labor coefficient – 150 hours
Credit points:	5 ECTS
Prior knowledge for compliance with the examination requirements:	Rating according to the results of intermediate and midterm control – not lower 25 points
Recommended prior knowledge:	Undergraduate modules: Fundamentals of biotechnology, Biochemistry, Inorganic and analytical chemistry
Module objectives / planned learning outcomes:	Once undergraduates have completed the study of this course, they should be able to: -have the skills to manage the processes and apparatus of biotechnological production; - to analyze the process occurring in the bioreactor; -to determine the optimal parameters of cultivation, - to develop and calculate the equipment for; - apply theoretical basis of the physico-mathematical disciplines for the solution of the task.
Content:	**Lectures:** The specifics of the implementation of biotechnological processes. Equipment for the implementation of biotechnological processes and obtaining the final product. Technical support of biotechnological processes. Equipment for anaerobic processes during conversion of vegetable raw materials. The process of methane fermentation to biogas (methane-tanks). Construction of equipment for aerobic fermentation. Instrumental design of aerobic surface fermentation. Equipment for the final stage of biotechnological production and production of the finished product. Grocery calculation of production of biotechnological drugs. Calculation and selection of the main technological equipment. **Laboratory classes:** Design features of the main and auxiliary equipment for the preparation of the nutrient medium for the production fermenter
Learning / examination outcomes / control forms:	Current control: is carried out through systematic and systematic observation of the work of the group as a whole and each undergraduate individually, testing of knowledge, skills acquired by undergraduates in the study of new material, its repetition, consolidation and practical application. - protection of written materials for the purpose of verification of theoretical knowledge and skills, applying them to specific tasks, problems, determining degrees of proficiency in the written language, the ability to logically adequate to the problem to build, to compose your text and outline it, to assess the work, experiment, problem; - discussions with professional teachers, written surveys.

	Final control –exam
Technical teaching aids:	Handouts, normative documents, posters, slides, videos, presentations.
Literature:	1. Prikhodko N. A. Esimova A. M., Nadirova K. J. bioengineering, lectures, SKSU, 2007 – 120 C. 2. Kalunian K. A. the Equipment of microbiological industries.-M.: Agropromizdat, 2003,-398 p. [In Russian] 3. Berezin M. V., Varfolomeev S. D. Biokinetica. – M.:Science, 2007 -231 p. [In Russian] 4. Gaponov, K. P. Processes and equipment of microbiological industries.-M.:Lay Down.and food. prom th,2010,-240 p. [In Russian] 5. Gracheva I. M., Gavrilova N. N., Ivanova L. A. Technology of microbial protein preparations, amino acids and fats. – Moscow: Food industry, 2012. – 448 p. [In Russian]

Module name:	**M 16.1 Biotechnology of biomass production and processing**
Module level as required:	Master's program
Abbreviation as required:	BBPP
Subtitle as required:	
Lesson type as required:	Lectures, laboratory classes, practical classes
Training semester:	3 semester
Person responsible for the module:	Bigara T.C., Jakasheva M. A.
Teacher:	candidate of agricultural Sciences, associate Professor, PhD
Language:	Russian, Kazakh
Connection with curriculum:	Profile discipline, component of choice
Form of teaching / weekly training load in a semester:	Intramural / Lectures -2 hours; laboratory classes -2 hours; practical classes -1 hours, current MSIW – 4h., MSIWT – 1h., Total labor coefficient –10 hours
Training load:	Lectures – 30h., laboratory classes – 30h., practical classes -15 hours,current MSIW – 60h., intermediate MSIW – 15h., MSIWT – 30h., Total labor coefficient – 150 hours
Credit points:	6 ECTS- credit
Prior knowledge for compliance with the examination requirements:	Rating according to the results of intermediate and midterm control – not lower 25 points
Recommended prior knowledge:	Undergraduate modules: Fundamentals of biotechnology, Industrial biotechnology, Objects biotechnology, Inorganic and analytical chemistry, Biochemistry
Module objectives / planned learning outcomes:	Once undergraduates have completed the study of this course, they should be able to: - to characterize the main methods of obtaining biotechnology products from renewable raw materials (biomass), methods of preparing biomass for its processing using enzymatic processes; - to select methods and technologies for processing plant raw materials, technological control of biotechnological products; - to analyze the quality and safety of raw materials and processed products; - apply the methods of pretreatment of raw materials, and the methods of bioconversion of raw materials using a variety of biotechnology agents and methods of cultivation; - use of agrochemical, the method of biomass processing.

Content:	**Lectures:** Composition and sources of plant biomass. Methods of pretreatment of plant substrates. Microbiological processing of the main components of plant raw materials. Enzymes involved in the decomposition of plant biomass. Variety of processes based on biotechnological processing of plant biomass. **Laboratory classes:** Bioethanol production. Production of feed protein. Composting and silage. Processing of animal waste to produce biogas. **Practical classes:** Preliminary mechanical treatment. Methods of biomass processing: thermochemical, physico-chemical, biochemical. Technology for producing alternative fuels from biomass. Anaerobic digestion of biomass. Ethanol fermentation of biomass. Acetonaphthone fermentation of biomass. Agrochemical method of biomass processing.
Learning / examination outcomes / control forms:	Current control: is carried out through systematic and systematic observation of the work of the group as a whole and each undergraduate individually, testing of knowledge, skills acquired by undergraduates in the study of new material, its repetition, consolidation and practical application. - protection of written materials for the purpose of verification of theoretical knowledge and skills, applying them to specific tasks, problems, determining degrees of proficiency in the written language, the ability to logically adequate to the problem to build, to compose your text and outline it, to assess the work, experiment, problem; - discussions with professional teachers, written surveys. Final control –exam
Technical teaching aids:	Handouts, normative documents, posters, slides, videos, presentations.
Literature:	1. Deep processing of biomass and agricultural waste: scientific.analytical.review. – - M:FGNU "Rosinformagrotech", - 2014, 252 p. [In Russian] 2. Fortov V. E., Popel O. S. Energetics in the modern world. – Dolgoprudny: Publishing House "Intellect", 2011. -168 p. [In Russian] 3. Ilyin, D. Yu. Fundamentals of biotechnology of agricultural products processing: textbook / D. Yu. Ilyin, G. V. Ilyina. – Penza: RIO pgskha, 2016 – 115 p. [In Russian] 4.Thermochemical Processing of Biomass: Conversion into Fuels, Chemicals and Power; Wiley; 1 edition (April 18, 2011) - by Robert C. Brown (Editor), Christian Stevens (Series Editor). – 350 p. ISBN-10: 0470721111[In English] 5. Nelson V. Introduction to Renewable Energy. London, New York: CRC Press, 2011. [In English]

Module Name:	**M 16.2 Progressive course of genetic engineering**
Module level as necessity:	Master's program
Abbreviation as necessity:	PCGE
Subtitle as necessity:	
Type of lesson as necessity:	Lectures, laboratory classes, practical classes
Semester:	3 semester
Responsible person for the module:	Alibaev N.
Lecturer:	D. a. s., professor
Language:	Russian, Kazakh
Connection with the curriculum:	Profile discipline, component of choice
Form of study / weekly workload	Intramural / Lectures -2 hours; laboratory classes -2 hours; practical

per semester:	classes -1 hours, current MSIW – 4h., MSIWT – 1h., Total labor coefficient –10 hours
Study load:	Lectures – 30h., laboratory classes – 30h., practical classes -15 hours,current MSIW – 60h., intermediate MSIW – 15h., MSIWT – 30h., Total labor coefficient – 150 hours
Credit points:	6 ECTS credits
Prerequisites for matching exam requirements:	Rating according to the results of intermediate and midterm control – not lower 25 points
Recommended prerequisites:	Undergraduate Modules: Fundamentals of Biotechnology, Biotechnology Objects, General and Molecular Genetics
Module objectives / expected learning results:	After undergraduates have completed the course, they should be able to: - know the theoretical foundations of genetic engineering and the applied aspects of its application; - to present and critically analyze information on the achievements and prospects of the introduction of genetic engineering methods into the practice of creating new forms of plants, animals and microorganisms; - to put into practice the obtained theoretical knowledge in the field of genetic engineering; - be familiar with the terminology, basic concepts and methods of genetic engineering, information about the problems of using genetically modified products.
Content:	Lectures: Tasks and methods of genetic engineering. Features of the genetic modification of bacteria. The main directions of genetic engineering of microorganisms. Transformation of plant cells. Transgenic plants for practical breeding purposes. Transgenic plants for pharmacology and medicine. Genetic transformation of animal cells. Transgenic animals for the purposes of practical breeding. Genetic modification of human cells. Gene therapy problems. Genetically Modified Organisms (GMOs) and their safety assessment. Genetic engineering and evolution. Debatable aspects. Workshop classes: DNA amplification methods. The mechanism of PCR. Plateau effect. Factors affecting the accuracy of amplification. The main types of errors and ways to improve the accuracy of synthesis. The processivity of DNA polymerase. Rules for constructing primers. Selection of the optimal annealing temperature of the primers. Allele-specific PCR. PCR with real-time signal recording. Using RNA as a template for amplification.
study / examination results forms of control:	Current control: carried out using systematic and systematic observation of the work of the group as a whole and each undergraduate individually, testing knowledge and skills acquired by undergraduates in the course of studying a new material, its repetition, consolidation and practical application. - protection in writing of materials in order to test theoretical knowledge and skills, apply them to solve specific problems, problems, determine the degree of written language, the ability to logically, adequately build a problem, compose your text and present it, evaluate the work, experiment, problem - discussions with professional teachers, written surveys. Final control exam

technical training tools:	Handouts, interactive whiteboard, modern computer
references	1. Bryukhanov, A.L. Molecular Microbiology / A.L. Bryukhanov, K.V. Rybak, A.I. Netrusov; by ed. prof. A.I. Netrusova. - Moscow: Moscow University Press, 2012. - 467 p. 2. Granik, V.G. Genetics: chemical and biomedical aspects [Text] / V. G. Granik. - Moscow: University Book, 2011. - 437 p. 3. Human genetic engineering: challenges, problems, risks / E.N. Gnatik. - M .: Librokom, 2009. - 239 p. ISBN 978-5-397-00027-7 4. Inge-Vechtomov S.G. "Genetics with the basics of breeding", 2010, Publisher: NL St. Petersburg. 5. BRS Biochemistry, Molecular Biology, and Board Review Series, LWW; Sixth edition (September 14, 2013) - by Michael Lieberman PhD, Rick Ricer MD - 432 p. ISBN-10: 9781451175363

Module name:	**M17.1 Biotechnology of Processing and Storage of Agricultural Plants**
Module level as required:	Master's program
Abbreviation as required:	BP and SAP
Subtitle as required:	
Lesson type as required:	Lectures, laboratory classes
Training semester:	3 semester
Person responsible for the module:	Yusupov Sh.
Teacher:	Ph. D., associate Professor
Language:	Russian, Kazakh
Connection with curriculum:	Core discipline, elective component
Form of teaching / weekly training load in a semester:	Intramural / Lectures -2 hours; laboratory classes -2 hours; current MSIW – 3,66h., MSIWT – 1.5h., Total labor coefficient – 9.16 hours
Training load:	Lectures – 30h., laboratory classes – 30h., current MSIW – 55h., intermediate MSIW – 12.5h., MSIWT – 22.5h., Total labor coefficient – 150 hours
Credit points:	5 ECTS-credits
Prior knowledge for compliance with the examination requirements:	Rating according to the results of intermediate and midterm control – not lower 25 points
Recommended prior knowledge:	Undergraduate modules: Fundamentals of biotechnology, Industrial biotechnology, General and molecular genetics
Module objectives / planned learning outcomes:	Once undergraduates have completed the study of this course, they should be able to: - to choose and use effective methods of production and primary processing of agricultural products; - have skills: use of General scientific methodology, and technology of research work, skills of registration of its results
Content:	**Lectures:** the concept of product quality in manufacturing manufacturing technology: perspective and current state. innovation and scientific support in manufacturing. classification and range of products in the manufacturing industry. product quality and factors affecting it. The regulation of product quality in manufacturing. standardization of quality management system. law on standardization and certification. the structure of the standard and its

	concepts. standardization in the product quality management system in the marketing environment. barcoding of products. Organization for standardization. interstate and international associations. basic concepts of quality control. Biotransformation of secondary raw materials of processing enterprises, crop and livestock wastes Laboratory research: Methods of quality control, analysis and the main ways to intensify the process of storage and processing of agricultural products. Analysis of modern methods of storage and processing of crop production: sorption, convective. conductive, sublimation or molecular drying.Processing of industrial crops
Learning / examination outcomes / control forms:	Current control: is carried out through systematic and systematic observation of the work of the group as a whole and each undergraduate individually, testing of knowledge, skills acquired by undergraduates in the study of new material, its repetition, consolidation and practical application. - protection of written materials for the purpose of verification of theoretical knowledge and skills, applying them to specific tasks, problems, determining degrees of proficiency in the written language, the ability to logically adequate to the problem to build, to compose your text and outline it, to assess the work, experiment, problem; - discussions with professional teachers, written surveys. Final control –exam
Technical teaching aids:	Handouts, normative documents, posters, slides, videos, presentations.
Literature:	1. Fedyukin V. K.. Basics of qualimetry, M. Information publishing house "Filin". 2004.-296c. 2. Chebotarev O. N. The technology of flour, cereals. M. Publishing center "March" 2004. – 688c. 3.Voblikov E. M. Grain storage technology. M. Publishing house "LAN". 2003.- 448c. 4.Introduction to Animal Science: Global, Biological, Social and Industry Perspectives (6th Edition) (What's New in Trades & Technology), Pearson; 5 edition (March 27, 2017)- by W. Stephen Damron (Author). – 704 p. ISBN-10: 9780134436050 6. Reproductive Technologies in Farm Animals, CABI; 2 edition (July 17, 2017) - by I. Gordon (Author). – 350 p. ISBN-10: 1780646038 7. Principles of Plant Genetics and Breeding, Wiley-Blackwell; 2 edition (October 1, 2012) - by George Acquaah (Author). – 756 p. ISBN-10: 9780470664759
Module name:	**M17.2 Achievements of Genetic Engineering in the Agro-Industrial Complex**
Module level as required:	Master's program
Abbreviation as required:	AGEAIC
Subtitle as required:	
Lesson type as required:	Lectures, laboratory classes,
Training semester:	3 semester
Person responsible for the module:	Alibayev N.N., Dzhakasheva M.A.
Teacher:	Doctor of Agricultural Sciences, Professor, PhD, Senior lecturer
Language:	Russian, Kazakh

Connection with curriculum:	Profile discipline, optional component
Form of teaching / weekly training load in a semester:	Intramural / Lectures -2 hours; laboratory classes -2 hours; current MSIW – 3,66h., MSIWT – 1.5h., Total labor coefficient – 9.16 hours
Training load:	Lectures – 30h., laboratory classes – 30h., current MSIW – 55h., intermediate MSIW – 12.5h., MSIWT – 22.5h., Total labor coefficient – 150 hours
Credit points:	5 ECTS
Prior knowledge for compliance with the examination requirements:	Rating according to the results of intermediate and midterm control – not lower 25 points
Recommended prior knowledge:	Modules of Bachelor's program: Principles of biotechnology, Industrial biotechnology, General and molecular genetics
Module objectives / planned learning outcomes:	After completion of the module, students should be able to: - recognize belonging of animals to the main areas of productivity and assess their role in the agro-industrial production; - solve main tasks of population genetics (role of mutations, epimutations, autopolyploidy, cytoplasmic heredity and selection in breeding); - apply genetic-statistical analysis methods for solving problems of population genetics in their use in breeding experiments; - select, justify and master methods that are adequate to the goal of preserving genetic diversity of populations or species as a whole; - own methods of measuring genetic diversity.
Content:	Lectures: Status of animal genetic resources. Genetic erosion trends. Flows of animal genetic resources. Impact of gene flows on the diversity (increase and decrease) of farm animals. Value and use of genetic resources of farm animals in the national economy. Genetic resources of farm animals and their resistance to diseases. Breeds that are resistant or tolerant to diseases. Methods of genetic improvement for maintaining the sustainable use of genetic status of farm animals. Selection of grain crops on product quality. Innovative assessment and selection methods in wheat breeding. Features of breeding on the quality of products of first generation hybrids. Laboratory lessons: Methods that use DNA markers to assess genetic diversity of animals and plants. Use of markers to assess effective population size. Molecular tools for identifying functional variability. Planning a breeding scheme.
Learning / examination outcomes / control forms:	Current control: carried out using systematic and planned observation of the work of a group as a whole and each master student individually, test of knowledge and skills acquired by master students in the course of studying a new material, its repetition, reinforcement and practical application; - defense in writing of materials in order to test theoretical knowledge and skills, apply them to solve specific tasks, problems, determine the degree of written language, ability to logically, adequately build a problem, compose own text and present it, evaluate the work, experiment, problem; - discussions with professional teachers, written surveys. Final control: exam.
Technical teaching aids:	Handouts, regulatory documents, posters, slides, videos, presentations
Literature:	1. High-performance sequencing / D.V. Rebrikov and others. – M.: Binom. Laboratory of knowledge, 2015. – 232 p.

	2. Lichko K.P. Forecasting and planning of the agro-industrial complex development / K.P. Lichko. – 3rd edition, revised. – Moscow: Economics, 2013. – 412 p. 3. Introduction to Animal Science: Global, Biological, Social and Industry Perspectives (6th Edition) (What's New in Trades & Technology), Pearson; 6th edition (March 27, 2017) – by W. Stephen Damron (Author). – 704 p. ISBN-10: 9780134436050 4. Reproductive Technologies in Farm Animals, CABI; 2nd edition (July 17, 2017) – by I. Gordon (Author). – 350 p. ISBN-10: 1780646038 5. Principles of Plant Genetics and Breeding, Wiley-Blackwell; 2nd edition (October 1, 2012) – by George Acquaah (Author). – 756 p. ISBN-10: 9780470664759

Module name:	**M18 Research practice 2**
Module level as required:	Master's program
Abbreviation as required:	RP
Subtitle as required:	
Lesson type as required:	
Training semester:	3 semester
Person responsible for the module:	"Biotechnology" chair
Teacher:	Main regular teachers of the study program, appointed at the meeting of the chair
Language:	Russian, Kazakh
Connection with curriculum:	Additional types of training
Form of teaching / weekly training load in a semester:	
Training load:	
Credit points:	12 ECTS
Prior knowledge for compliance with the examination requirements:	
Recommended prior knowledge:	Modern methods in biotechnology. Biotechnology of increasing the productivity of agrocenoses. Biocontrol of pathogenic microorganisms in soil. Biotechnology for biomass production and processing. Progressive course in genetic engineering. Genomics. Proteomics. Chemical, microbiological and biochemical aspects of modern biotechnology. Kinetics of biochemical processes.
Module objectives / planned learning outcomes:	After completion of the module, students should be able to: - carry out statement of purpose and tasks of experimental fundamental and applied research; - independently develop plans for carrying out experimental research; - independently carry out scientific research using modern physicochemical, microbiological, biochemical methods of analysis; - process the obtained results and use them to solve scientific and technological problems.

Content:	Analytical review of known methods of production in the studied area of research and new technologies for obtaining biological products and biologically active substances in accordance with the goal and tasks of dissertation research. Mastering methods of analysis of raw materials, intermediate products and products using analytical instruments in research laboratory. Carry out theoretical and experimental research on the topic of dissertation in accordance with individual plan; analysis of raw materials and initial reagents used for scientific research; performing laboratory experiments on the topic of Master's dissertation. Processing and interpretation of the research results, formation of conclusions on the research section.
Learning / examination outcomes / control forms:	Final control: report. Differentiated pass
Technical teaching aids:	Informational electronic resources for carrying out an analytical review, analytical instruments and laboratory equipment
Literature:	1. Myrzakhozha D.A., Myrzakhodzhayev A.A. Physicochemical methods of analysis. – Almaty, 2009. – 113 p. 2. Lebukhov R.I. and others. Physicochemical methods of research. – Publishing house Lan, 2012. – 430 p. 3. Introduction to Biotechnology, Oxford University Press; 1st edition (January 16, 2014) – by Ashim K. Chakravarty – 656 p. ISBN-10: 9780198081814 4. Modern Biotechnology: Connecting Innovations in Microbiology and Biochemistry to Engineering Fundamentals, Wiley-AIChE; 1st edition (August 17, 2009) – by Nathan S. Mosier (Author), Michael R. Ladisch (Author) – 464 p. ISBN-10: 0470114851 5. GOST 7.32 – 2001. Report on research activities. Structure and rules for execution.

Module Name:	**M.20 Research work of master's student 3**
Module level as necessity:	Master's program
Abbreviation as necessity:	MRSW 3
Subtitle as necessity:	
Type of lesson as necessity:	
Semester:	3
Responsible person for the module:	Department: Biotechnology
Lecturer:	Leading full-time faculty members with an academic degree
Language:	Russian, Kazakh
Connection with the curriculum:	Additional types of training
Form of study / weekly workload per semester:	
Study load:	
Credit points:	3 ECTS
Prerequisites for matching exam requirements:	
Recommended prerequisites:	Master's disciplines
Module objectives / expected learning results:	After undergraduates have completed the course, they should be able to: know:

	- independently conduct research in the field of agricultural and environmental biotechnology; - develop and implement innovative biotechnological approaches; - as part of the group of authors, to carry out engineering calculations, to develop technological schemes and baseline data for the production of biological products of various spectra of action; - discuss and critically evaluate the economic importance of fundamental and applied research.
Content:	Conducting experimental research work in accordance with the plan of the academic period with the use of the instrumental base of the departmental laboratory and the analytical instruments of the Institute. The use of information technology and computer programs in the performance of final qualifying work. Selection and justification of the technological scheme of production, the calculation of the basic equipment in accordance with the theme of the master's thesis. Determination of the economic efficiency of the developed technology. Formation of conclusions for all sections of the work. Preparation of an article on a research topic for publication in a scientific journal, proceedings of scientific conferences or a collection of papers of undergraduates and doctoral students. Preparing a report on the research and development work for the 3 semester and protecting it with the presentation of the results.
study / examination results forms of control:	Current control: published scientific article, the results of research and development. Final control - report
technical training tools:	Laboratory equipment and instruments, chemical glassware, reagents and raw materials.
references	1. Fundamental Laboratory Approaches for Biochemistry and Biotechnology, Wiley; 2 edition (May 26, 2009) - by Alexander J. Ninfa (Au thor), David P. Ballou (Author), Marilee Benore (Author) - 480 p. ISBN-10: 0470087668 2. Case Study Research and Applications: Design and Methods, SAGE Publications, Inc; Sixth edition (November 3, 2017) - by Robert K. Yin (Author). - 352 p. ISBN-10: 9781506336169 3. Zagoskina N.V., Nazarenko L.V., Kalashnikova E.A., Zhivukhina E.A. Biotechnologists: theory and practice. Moscow, 2009. 4. Sabyrkhanov DS, Tasybaeva Sh.B., Baizhanova S.B. Guidelines for organizing, writing and defending a master's thesis. - Shymkent: SKSU them. M.Auezov, 2016. - 50s. 5. GOST 7.32 - 2001. Report on research work. Structure and design rules.

Module name:	**M.20 Research work of master's student 4**
Module level as required:	Master's program
Abbreviation as required:	MIRW (master's individual research work)
Subtitle as required:	
Lesson type as required:	
Training semester:	*4 semester*

Person responsible for the module:	Department: Biotechnology
Teacher:	Leading full-time teachers of the educational program with an academic degree
Language:	Russian, Kazakh
Connection with curriculum:	Additional types of training
Form of teaching / weekly training load in a semester:	
Training load:	
Credit points:	18 ECTS
Prior knowledge for compliance with the examination requirements:	
Recommended prior knowledge:	Master's courses
Module objectives / planned learning outcomes:	Once undergraduates have completed the study of this course, they should be able to: know: - independently conduct research in the field of agricultural and environmental biotechnology; - develop and implement innovative biotechnological approaches; - as a part of the team of authors to perform engineering calculations, to develop technological schemes and initial data for obtaining biological products of different spectrum of action; - discuss and critically evaluate the economic importance of fundamental and applied research.
Content:	The use of information technology and computer programs in the performance of final qualifying work. Selection and justification of the technological scheme of production, the calculation of the main equipment in accordance with the theme of the master's thesis. Drawing conclusions on all sections of the work. Preparation of the report on MIRW for the 4th semester and its protection with the presentation of the results.
Learning / examination outcomes / control forms:	Current control: published scientific article, results of MIRW. The final control - report
Technical teaching aids:	Laboratory equipment and devices, chemical utensils, reagents and raw materials.
Literature:	1. Fundamental Laboratory Approaches for Biochemistry and Biotechnology, Wiley; 2 edition (May 26, 2009) - by Alexander J. Ninfa (Au thor), David P. Ballou (Author), Marilee Benore (Author) – 480 p. ISBN-10: 0470087668 2. Case Study Research and Applications: Design and Methods, SAGE Publications, Inc; Sixth edition (November 3, 2017) - by Robert K. Yin (Author). – 352 p. ISBN-10: 9781506336169 3. Zagoskina N. In. Nazarenko L. V., Kalashnikova E. A., Zhivukhina E. A. Biotechnology:theory and practice. Moscow, 2009. 4. Sabirhanov D. S., Tasybaeva Sh. B. Baizhanova S. B. Methodical recommendations on organization, writing and defense of a master's thesis. - Shymkent: SKSU. M. Auezov, 2016. – 50p. 5. GOST 7.32 – 2001. Report of research work. Structure and rules of registration.

Module name:	**M21 Master's work**

Module level as required:	Master’s program
Abbreviation as required:	MW
Subtitle as required:	
Lesson type as required:	
Training semester:	*4* semester
Person responsible for the module:	Department: Biotechnology
Teacher:	Leading full-time teachers of the educational program, appointed by the meeting of the Department
Language:	Russian, Kazakh
Connection with curriculum:	Final certification
Form of teaching / weekly training load in a semester:	
Training load:	
Credit points:	12 ECTS
Prior knowledge for compliance with the examination requirements:	
Recommended prior knowledge:	Successful development of all the master's studied modules and passing a comprehensive exam in the specialty
Module objectives / planned learning outcomes:	Master's work is a Central part of training. With the help of this research work the graduate shows that he is able to: - to substantiate the actuality, theoretical and practical significance of the chosen theme of scientific research work; - conduct independent research in accordance with the developed program; - to present the results of a scientific report, article or report the research form. - to use the acquired knowledge in solving problems and do it largely independently and consciously; - professionally disclose the level of the current state of the solved scientific or technological problems; - to assess the reliability of the results and critically compare them with similar results of domestic and foreign works; - it is correct from a scientific point of view to present the results of research in the form of a completed, relevant to the requirements of the master's thesis to the Commission for protection; - to write scientific articles and applications for the invention on the profile subject.
Content:	This is the final qualifying work of the graduate of the master's program, confirming the acquired competence in the process of training in accordance with the chosen specialization of training. Defense of the master's thesis is held at an open meeting of the State examination Commission with the participation of the Chairman of the Commission and at least half of its members. The order and regulations of defense of the master's thesis are established by the Chairman of the Examination Committee and include: report of the student (10-15h. minutes) using (by decision of the issuing Department) information technology; the announcement of the opinion of the head of the master's thesis and the opinion of the reviewer; the questions of the members of the Commission and the answers of a student. If the comments of the reviewer, the student should answer them.

	The defense ends with providing the master's final word, in which he has the right to Express his opinion on the comments and recommendations made in the process of defending a master's thesis. After the final word of the master's thesis the procedure of defense of the final qualifying work is considered to be completed. The decision of the SAC (state attestation commission)on the final assessment is based on the estimates: - scientific supervisor, taking into account the theoretical and practical significance of the work; - reviewer for the work as a whole; - members of the SAC (state attestation commission) for the content of the work, its protection, including the report, answers to questions and comments of the reviewer.
Learning / examination outcomes / control forms:	Final control – defense of master's thesis
Technical teaching aids:	Projector, computer, slides
Literature:	1.ModernBiotechnology: DefiningandSolvingHumanProblems,MomentumPress (December 26, 2016) - by StephanieStockwell (Author). – 164 p. ISBN-10: 9781606509135 2. Sabirkhanov D. S., Tasybaeva Sh. B. Baizhanova S. B. Methodical recommendations on organization, writing and defense of a thesis. - Shymkent: SKSU M. Auezova, 2016. - 50s. 3. GOST 7.32 – 2001. Report on the research work. Structure and rules of registration. 4. Standard rules of the current control of progress, intermediate and final certification of students in higher education, approved by the order of the Minister of education and science of Kazakhstan dated March 18, 2008. No. 125.